

ALLNAMES:(UBTECH Robotics Corp. Ltd.)

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Machine translation

1. [20200206927](#) RELOCALIZATION METHOD AND ROBOT USING THE SAME

US - 02.07.2020

Int.Class [B25J 9/16](#) Appl.No 16427349 Applicant UBTECH ROBOTICS CORP LTD Inventor Longbiao Bai

The present disclosure provides a relocalization method including: obtaining submap boundary points; drawing a first submap based on the submap boundary points; extracting a second submap from the first submap; performing a template matching on a known map based on the second submap to obtain first matching results; obtaining second matching result each corresponding to each of the first matching results based on a positional relationship of the second submap in the first submap: matching boundary points in each of the second matching results with the submap boundary points to filter out third matching results from the second matching results; and selecting one of the third matching results as a relocalization result. The present disclosure further provides a robot. In the above-mentioned manner, it is capable of realizing a re localization with high accuracy, high preciseness, and low error rate while there are environmental changes.

2. [20200201339](#) ROBOT MOVEMENT CONTROL METHOD AND APPARATUS AND ROBOT USING THE SAME

US - 25.06.2020

Int.Class [G05D 1/02](#) Appl.No 16435580 Applicant UBTECH ROBOTICS CORP LTD Inventor Peng Nie

The present disclosure provides a movement control method for a robot as well as an apparatus and a robot using the same. The method includes: obtaining a starting position and an ending position of the robot, in response to a movement instruction being detected; determining a movement path of the robot based on the starting position and the ending position; obtaining pass qualification information of the robot, if the movement path intersects a line corresponding to a preset virtual wall; and moving the robot to the ending position according to the movement path, if the pass qualification information identifying the robot is allowed to traverse the virtual wall. By obtaining the pass qualification information, the robot can return to the working area from the non-working area in the case of an abnormality, while ensuring that the robot does not actively traverse from the working area to the non-working area.

3. [20200241112](#) LOCALIZATION METHOD AND ROBOT USING THE SAME

US - 30.07.2020

Int.Class [G01S 7/48](#) Appl.No 16699765 Applicant UBTECH ROBOTICS CORP LTD Inventor ZHICHAO LIU

The present disclosure provides a localization method as well as a robot using the same. The method includes: obtaining laser scan points and particles; mapping each of the laser scan points to a global coordinate system based on each of the particles to obtain global boundary points of each of the particles; finding a matching boundary point in the global boundary points by comparing the global boundary points of the particle with points corresponding to static objects in a known map; calculating a distance between the matching boundary point of the particle and the points corresponding to the static objects, and increasing a weight of the matching boundary point if the distance is less than a preset threshold; calculating a weight of the particle by matching the global boundary points of the particle with the known map; and estimating a localization result.

4. [20200206942](#) JOINT CONTROL METHOD FOR SERIAL ROBOT AND SERIAL ROBOT USING THE SAME

US - 02.07.2020

Int.Class [B25J 9/06](#) Appl.No 16669554 Applicant UBTECH ROBOTICS CORP LTD Inventor Yuesong Wang

The present disclosure provides a joint control method for a serial robot and a serial robot using the same. The method includes: performing an analysis on an end joint in the plurality of joints, and calculating the force of the previous joint acting on the end joint; performing an analysis on each of the other joints in the plurality of joints, and calculating the force of the previous joint acting on the joint; obtaining an angular velocity and an angular acceleration of each joint after obtaining the force of the previous joint acting on the joint, and calculating a torque corresponding to each joint; and projecting the torque corresponding to each joint to a motor corresponding to the joint to obtain a torque to be applied to the motor at a current time. In this manner, which improves the tracking precision of the end joint while reduces the tracking error.

5. [20200206958](#) JOINT AND ROBOT HAVING THE SAME

US - 02.07.2020

Int.Class [B25J 17/00](#) Appl.No 16583273 Applicant Ubtech Robotics Corp Ltd Inventor Youjun Xiong

A joint of a robot includes a first servo assembly having a first housing and a first servo arranged within the first housing and comprising an output shaft; an ankle support having two ends rotatably connected to the first housing; and a bearing assembly to connect one of the two ends of the ankle support to the first housing. The bearing assembly includes a first connecting member fixed to the first housing, a second connecting member fixed to the one of the two ends of the ankle support, and a bearing to rotatably connect the first connecting member to the second connecting member. The other one of the two ends of the ankle support is connected to the output shaft of the first servo.

6. [10667091](#) WIRELESS POSITIONING METHOD AND SERVER AND STORAGE MEDIUM WITH THE SAME

US - 26.05.2020

Int.Class [H04W 24/00](#) Appl.No 16396691 Applicant UBTECH ROBOTICS CORP LTD Inventor Yongsheng Zhao

The present disclosure provides a wireless positioning method as well as a server and a storage medium with the same. The method includes: obtaining a current ranging value between a first positioning device and a second positioning device, where there is no obstruction between the first positioning device and the second positioning device; determining a distance of the first positioning device and the second positioning device in a depth direction of a tunnel based on the current ranging value; and obtaining a current coordinate of the second positioning device based on the distance. In the above-mentioned manner, the automatic updating of the coordinate of the reference base station in the tunnel can be realized, the times of repeated measurements of the base station are reduced, thereby improving the construction efficiency of the tunnel and saving working loads.

7. [20210199183](#) HEAD MECHANISM AND ROBOT

US - 01.07.2021

Int.Class [F16H 21/54](#) Appl.No 16941579 Applicant UBTECH ROBOTICS CORP LTD Inventor LIANG HUANG

A head mechanism includes a base connectable to a body of a robot, a mounting member arranged above the base, a connecting member rotatably connected to the base and the mounting member. The connecting member, together with the mounting member, is rotatable relative to the base about a first axis, and the mounting member is rotatable relative to the connecting member about a second axis. The first axis and the second axis extend in different directions. The head mechanism further includes two first actuating mechanisms fixed to the base, and the two first actuating mechanisms are configured to drive the mounting member to rotate with respect to the base.

8. [20200209880](#) OBSTACLE DETECTION METHOD AND APPARATUS AND ROBOT USING THE SAME

US - 02.07.2020

Int.Class [G05D 1/00](#) Appl.No 16427362 Applicant UBTECH ROBOTICS CORP LTD Inventor Longbiao Bai

The present disclosure provides an obstacle detection method as well as an apparatus and a robot using the same. The method includes: obtaining, through the sensor module, image(s); detecting an obstacle image of an obstacle from the image(s) according to characteristic(s) of the obstacle; extracting image feature(s) of the obstacle; obtaining, through the sensor module, a position of the obstacle; associating the image feature(s) of the obstacle with the position of the obstacle; calculating a motion state of the obstacle based on the position information of the obstacle at different moments; and estimating the position of the obstacle in a detection blind zone of the robot based on the motion state. In such a manner, it is capable of providing more accurate position information of the obstacle in the detection blind zone, which is beneficial to the robot to plan a safe and fast moving path.

9. [20210197371](#) REDUNDANT ROBOTIC ARM CONTROL METHOD, REDUNDANT ROBOTIC ARM CONTROLLER, AND COMPUTER READABLE STORAGE MEDIUM

US - 01.07.2021

Int.Class [B25J 9/16](#) Appl.No 17134565 Applicant UBTECH ROBOTICS CORP LTD Inventor Liqun Huang

The present disclosure provides a redundant robotic arm control method, a redundant robotic arm, and a computer readable storage medium. The method includes: obtaining an external force acting on an end of the robotic arm and an external torque acting on each joint; calculating a first joint speed of each joint based on a degree of influence of the joint on the end in each motion dimension and the external force acting on the end; determining a zero space speed of each joint corresponding to a current position of the end based on a link torque of an external force acting on a link with respect to the joint; calculating a total joint speed based on the first joint speed and the zero space speed; and controlling the robotic arm to move according to the total joint speed.

10. [20210134268](#) METHOD FOR UTTERANCE GENERATION, SMART DEVICE, AND COMPUTER READABLE STORAGE MEDIUM

US - 06.05.2021

Int.Class [G10L 15/06](#) Appl.No 17006936 Applicant UBTECH ROBOTICS CORP LTD Inventor Rixing Huang

A computer-implemented method for utterance generation, a smart device, and a non-transitory computer readable storage medium are provided. The method includes: obtaining a first utterance to be answered, generating at least one random semantic vector, inputting the at least one random semantic vector and the first utterance into a trained generator, and obtaining at least one first answer outputted by the trained generator, wherein the trained generator is obtained based on a preset generative adversarial network. Due to the random semantic vector, even for the same utterance, the smart device can generate different answers corresponding to the different random semantic vectors, the possibility of generating too many identical answers during the human-machine conversation is reduced, and the fun during the human-machine conversation is enhanced.

11. [20210387332](#) JOINT CONTROL METHOD, COMPUTER-READABLE STORAGE MEDIUM AND MULTI-LEGGED ROBOT

US - 16.12.2021

Int.Class [B25J 9/16](#) Appl.No 17345005 Applicant UBTECH ROBOTICS CORP LTD Inventor Zhe Xu

A method for a multi-legged robot having a body and a number of legs, includes: obtaining a current pose of the body, forces applied to the body, and joint angles of each of supporting legs of the legs; creating a mapping matrix from the forces applied to the body to desired support forces applied to soles of the supporting legs; obtaining priority targets by prioritizing the forces acting in different directions, determining a weight matrix for each priority target, and creating an optimization model of the support forces for each priority target based on the mapping matrix and the weight matrices; solving the optimization model of each of the priority targets to obtain the desired support forces corresponding to each of the priority targets; and calculating joint torques of the supporting legs for joint control, based on the solved desired support forces and Jacobian matrices corresponding to the supporting legs.

12. [20220044004](#) METHOD AND DEVICE FOR DETECTING BLURRINESS OF HUMAN FACE IN IMAGE AND COMPUTER-READABLE STORAGE MEDIUM

US - 10.02.2022

Int.Class [G06K 9/00](#) Appl.No 17393408 Applicant UBTECH ROBOTICS CORP LTD Inventor Yusheng Zeng

A method for detecting blurriness of a human face in an image includes: performing a face detection in a target image; when a human face is detected in the target image, cropping the human face from the target image to obtain a face image and inputting the face image to a first neural network model to perform preliminary detection on a blurriness of the human face in the face image to obtain a preliminary detection result; and when the preliminary detection result meets a deep detection condition, inputting the face image to a second neural network model to perform deep detection on the blurriness of the human face in the face image to obtain a deep detection result.

13. [20210333082](#) ROTATION ANGLE DETECTION METHOD AND DEVICE THEREOF

US - 28.10.2021

Int.Class [G01B 5/24](#) Appl.No 16626519 Applicant UBTECH ROBOTICS CORP LTD Inventor Xi Bai

The present invention provides a rotation angle detection method and device thereof. The method includes calculating an estimated value of a rotation angle of a motor shaft during rotation according to a second rotation angle; determining an actual range of the rotation angle according to the estimated value of the rotation angle and a detection error of the second angle sensor; determining optional values of the rotation angle based on a relative relationship between a first rotation angle and the estimated value; determining an actual rotation angle of the motor shaft, based on a value falling within the actual range of the rotation angle among the optional values, and determining an actual rotation angle of the output shaft according to the actual rotation angle of the motor shaft. The present invention can improve the measurement accuracy of the rotation angles of the output shaft of the rotating mechanism.



14. [20210201925](#) STREAMING VOICE CONVERSION METHOD AND APPARATUS AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME US - 01.07.2021

Int.Class [G10L 21/013](#) Appl.No 17110323 Applicant UBTECH ROBOTICS CORP LTD Inventor Jiebin Xie

The present disclosure provides a streaming voice conversion method as well as an apparatus and a computer readable storage medium using the same. The method includes: obtaining to-be-converted voice data; partitioning the to-be-converted voice data in an order of data obtaining time as a plurality of to-be-converted partition voices, where the to-be-converted partition voice data carries a partition mark; performing a voice conversion on each of the to-be-converted partition voices to obtain a converted partition voice, where the converted partition voice carries a partition mark; performing a partition restoration on each of the converted partition voices to obtain a restored partition voice, where the restored partition voice carries a partition mark; and outputting each of the restored partition voices according to the partition mark carried by the restored partition voice. In this manner, the response time is shortened, and the conversion speed is improved.

15. [20220203526](#) HUMANOID ROBOT CONTROL METHOD, HUMANOID ROBOT USING THE SAME, AND COMPUTER READABLE STORAGE MEDIUM US - 30.06.2022

Int.Class [B25J 9/16](#) Appl.No 17504544 Applicant UBTECH ROBOTICS CORP LTD Inventor Jie BAI

A humanoid robot control method, a mobile machine using the same, and a computer readable storage medium are provided. The method includes: mapping posture information of leg joints of a human body to leg joint servos of a humanoid robot to obtain an expected rotation angle and an expected rotation angular velocity of non-target optimized joint servos of the leg joint servos and an expected rotation angle and an expected rotation angular velocity of target optimized joint servos of the leg joint servos; obtaining an optimization objective function corresponding to the target optimized joint servos of the leg joint servos; optimizing the expected rotation angle and the expected rotation angular velocity of the target optimized joint servos to obtain a corrected expected rotation angle and a corrected expected rotation angular velocity of the target optimized joint servos; and controlling each of the leg joint servos of the humanoid robot.

16. [20210197370](#) ROBOT CONTROL METHOD, COMPUTER-READABLE STORAGE MEDIUM AND BIPED ROBOT US - 01.07.2021

Int.Class [B25J 9/16](#) Appl.No 17133575 Applicant UBTECH ROBOTICS CORP LTD Inventor Chunyu Chen

A robot control method includes: acquiring distances between a center of mass [COM] of the biped robot and each of preset key points of feet of the biped robot, and acquiring an initial position of the COM of the biped robot; calculating a position offset of the COM based on the distances; adjusting the initial position of the COM based on the position offset of the COM to obtain a desired position of the COM of the biped robot; and determining desired walking parameters of the biped robot based on the desired position of the COM by using a preset inverse kinematics algorithm, wherein the desired walking parameters are configured to control the biped robot to walk.

17. [20200188807](#) BUILDING BLOCK AND BUILDING BLOCK SET HAVING THE SAME US - 18.06.2020

Int.Class [A63H 33/04](#) Appl.No 16541200 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun XIONG

A building block includes a main body comprising a plug module and a socket module. The plug module includes a plug body, a plug protruding from one side of the plug body and defining a first chamber, a number of first magnets arranged within the first chamber, and an insulating protrusion formed on a bottom of the first chamber. The socket module includes a socket body defining a second chamber, a number of second magnets arranged within the second chamber, and an insulating recess defined in a bottom of the second chamber. The first magnets and the second magnets are arranged in such a way that the first magnets of one of two building blocks are able to be magnetically connected to the second magnets of the other one of two building blocks.

18. [20200156721](#) ROBOT GAIT PLANNING METHOD AND ROBOT WITH THE SAME US - 21.05.2020

Int.Class [B62D 57/032](#) Appl.No 16452532 Applicant UBTECH ROBOTICS CORP LTD Inventor YOUJUN XIONG

The present disclosure provides a robot gait planning method and a robot with the same. The method includes: obtaining, through the sensor set, force information of feel of the robot under a force applied by a target object; calculating coordinates of zero moment points of the feet of the robot with respect to a centroid of a body of the robot based on the force information; and determining a gait planning result for the robot based on the coordinates of the zero moment points with respect to the centroid of the body. The present disclosure is capable of converting the force of the target object to the zero moment points, and using the zero moment points to perform the gait planning, so that the robot follows the target object in the case that the robot is subjected to a force of the target object.

19. [20200161803](#) ELECTRONIC BUILDING BLOCK AND BUILDING BLOCK KIT HAVING THE SAME US - 21.05.2020

Int.Class [H01R 13/62](#) Appl.No 16445243 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

An electronic building block includes a first side and a second side, a first magnet fixed to the first side and including a number of first magnet segments, a second magnet fixed to the second side and including a number of second magnet segments, a first power contact, a second power contact and a first communication contact arranged on the first side; and a third power contact, a fourth power contact and a second communication contact arranged on the second side and respectively coming into contact with the first power contact, the second power contact, and the first communication contact when the first magnet segments of one of two electronic building blocks is connected to the second magnet segments of the other of two electronic building blocks.

20. [20210197372](#) ID NUMBER SETTING METHOD, COMPUTER-READABLE STORAGE MEDIUM AND MODULAR DEVICE US - 01.07.2021

Int.Class [B25J 9/16](#) Appl.No 17134155 Applicant UBTECH ROBOTICS CORP LTD Inventor Wei He

An identification [ID] number setting method for a modular device that comprises a master building element and a plurality of slave building elements that are connected to the master building element, includes: disconnecting the slave building elements from the master building element; setting ID numbers of all of the slave building elements to be a preset ID number; and assigning new ID numbers to slave building elements of N tiers that are connected to one output interface of the master building element in an order from first tier to Nth tier, wherein the slave building elements of the first tier are slave building elements that are directly connected to the output interface, the slave building elements of the Nth tier are slave building elements that are indirectly connected to the output interface through slave building elements of a [N-1]th tier, N is a natural number greater than 1.

21. [20210203100](#) MODULAR DEVICE, CONTROL METHOD AND ROBOT US - 01.07.2021

Int.Class [H01R 13/62](#) Appl.No 16926634 Applicant UBTECH ROBOTICS CORP LTD Inventor Wei He



A modular device includes a polyhedral building element having a first type connector and a number of second type connectors; and a main control module comprising a plurality of second type connectors. The first type connector and the second type connectors are disposed on side surfaces of the building element. One of the second type connectors of the main control module is used to magnetically connect with the first type connector of the building element so as to detachably connect the building element to the main control module. The first type connector includes a first detection circuit, and each second type connector includes a second detection circuit.

22. [20210197388](#) ROBOT MAPPING METHOD AND ROBOT AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME US - 01.07.2021

Int.Class [B25J 9/16](#) Appl.No 16935231 Applicant UBTECH ROBOTICS CORP LTD Inventor RUI GUO

The present disclosure provides a robot mapping method as well as a robot and a computer readable storage medium using the same. The method includes: detecting a marker with identification information capable of being identified by the robot in a current scene; determining whether the detected marker meets a preset condition; and mapping the current scene based on the marker, if the detected marker meets the preset condition. The robot mapping method can not only map the current scene, but also effectively reduce the difficulty of loops and the number of false loops.

23. [20210197384](#) ROBOT CONTROL METHOD AND APPARATUS AND ROBOT USING THE SAME US - 01.07.2021

Int.Class [G05B 19/42](#) Appl.No 16843921 Applicant UBTECH ROBOTICS CORP LTD Inventor Zecai Lin

The present disclosure discloses a robot control method as well as an apparatus, and a robot using the same. The method includes: obtaining a human pose image; obtaining pixel information of key points in the human pose image; obtaining three-dimensional positional information of key points of a human arm according to the pixel information of the preset key points; obtaining a robotic arm kinematics model of a robot; obtaining an angle of each joint in the robotic arm kinematics model according to the three-dimensional positional information of the key points of the human arm and the robotic arm kinematics model; and controlling an arm of the robot to perform a corresponding action according to the angle of each joint. The control method does not require a three-dimensional stereo camera to collect three-dimensional coordinates of a human body, which reduces the cost to a certain extent.

24. [20210146538](#) METHOD FOR IMITATION OF HUMAN ARM BY ROBOTIC ARM, COMPUTER READABLE STORAGE MEDIUM, AND ROBOT US - 20.05.2021

Int.Class [B25J 9/16](#) Appl.No 16734393 Applicant UBTECH ROBOTICS CORP LTD Inventor Zecai Lin

A method for controlling an arm of a robot to imitate a human arm, includes: acquiring first pose information of key points of a human arm to be imitated; converting the first pose information into second pose information of key points of an arm of a robot; determining an angle value of each joint of the arm according to inverse kinematics of the arm based on the second pose information; and controlling the arm to move according to the angle values.

25. [20210182633](#) LOCALIZATION METHOD AND HELMET AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME US - 17.06.2021

Int.Class [G06K 9/62](#) Appl.No 17012016 Applicant UBTECH ROBOTICS CORP LTD Inventor Chenchen Jiang

The present disclosure provides a localization method as well as a helmet and a computer readable storage medium using the same. The method includes: extracting first feature points from a target image; obtaining inertial information of the carrier, and screening the first feature points based on the inertial information to obtain second feature points; triangulating the second feature points of the target image to generate corresponding initial three-dimensional map points, if the target image is a key frame image; performing a localization error loopback calibration on the initial three-dimensional map points according to at least a predetermined constraint condition to obtain target three-dimensional map points; and determining a positional point of the specific carrier according to the target three-dimensional map points. In this manner, the accuracy of the localization of a dynamic object such as a person when moving can be improved.

26. [20210191421](#) AUTONOMOUS MOBILE APPARATUS AND CONTROL METHOD THEREOF US - 24.06.2021

Int.Class [G05D 1/02](#) Appl.No 16935234 Applicant UBTECH ROBOTICS CORP LTD Inventor Rui GUO

The present disclosure provides an autonomous mobile apparatus and a control method thereof. The method includes: starting a SLAM mode; obtaining first image data captured by a first camera; extracting a first tag image of positioning tag(s) from the first image data; calculating a three-dimensional camera coordinate of feature points of the positioning tag(s) in a first camera coordinate system of the first camera based on the first tag image; calculating a three-dimensional world coordinate of the feature points of the positioning tag(s) in a world coordinate system based on a first camera pose of the first camera when obtaining the first image data in the world coordinate system and the three-dimensional camera coordinate; and generating a map file based on the three-dimensional world coordinate of the feature points of the positioning tag(s).

27. [20210331323](#) CONTROL SYSTEM AND METHOD FOR MOVEMENT OF NECK MECHANISM FOR ROBOT US - 28.10.2021

Int.Class [B25J 9/16](#) Appl.No 16861200 Applicant UBTECH ROBOTICS CORP LTD Inventor Houzhu Ding

A control system for a neck mechanism includes a perception system configured to track movement of an object, and a perception control system that controls a rotary motor to yaw a platform and controls a first linear actuator and a second linear actuator that is in parallel with the first linear actuator to pitch and roll the platform according to a target position of the platform. The perception system tracks movement of the object by estimating its position and pose in 3D space and the platform is moved according to a vision-based position and pose estimation result.

28. [20200209876](#) POSITIONING METHOD AND APPARATUS WITH THE SAME US - 02.07.2020

Int.Class [G05D 1/02](#) Appl.No 16396783 Applicant UBTECH ROBOTICS CORP LTD. Inventor Yongsheng Zhao

The present disclosure provides a positioning method and an apparatus with the same. The method includes: obtaining, by die sensor set, current track node information of a current track node of a map on which the to-be-positioned device is located, where the current track node information includes a color of the current track node; and determining position information of the to-be-positioned device based on the track node information. In the above manner, the positioning of the to-be-positioned device in a specific map can be realized.

29. [20210347038](#) MECHANICAL ARM US - 11.11.2021

Int.Class [B25J 9/04](#) Appl.No 16902205 Applicant UBTECH ROBOTICS CORP LTD Inventor CHENGGUN ZHANG

A mechanical arm includes a first link connectable to a surface, a second link, a third link, a fourth link, and a fifth link that are coupled to one another in series, and an end effector connectable to the fifth link. The end effector is rotatable about an axis of rotation same as an axis of rotation of the fourth link, and rotatable about an axis of rotation orthogonal to the axis of rotation of the fourth link. The first link, the second link, the third link, the fourth link, and the fifth link are collectively structured and configured to rotate such that the end effector is actuatable to a workspace under the surface.

30. [20220152827](#) BIPED ROBOT GAIT CONTROL METHOD AND ROBOT AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME US - 19.05.2022

Int.Class [B25J 9/16](#) Appl.No 17314039 Applicant UBTECH ROBOTICS CORP LTD Inventor Xingxing Ma

A biped robot gait control method as well as a robot and a computer readable storage medium are provided. During the movement, the system obtains a current supporting pose of a current supporting leg of the biped robot, and calculates a relative pose between the supporting legs based on the current supporting pose and a preset ideal supporting pose of a next step. The system further calculates modified gait parameters of the next step based on the relative pose between the two supporting legs and a joint distance between left and right ankle joints in an initial state of the biped robot when standing. Finally, the system controls the next supporting leg to move according to the modified gait parameters.

31. [20220207913](#) METHOD AND DEVICE FOR TRAINING MULTI-TASK RECOGNITION MODEL AND COMPUTER-READABLE STORAGE MEDIUM US - 30.06.2022

Int.Class [G06V 40/16](#) Appl.No 17562963 Applicant UBTECH ROBOTICS CORP LTD Inventor Yusheng Zeng

A method for training a multi-task recognition model includes: obtaining a number of sample images, wherein some of the sample images are to provide feature-independent facial attributes, some of the sample images are to provide feature-coupled facial attributes, and some of the sample images are to provide facial attributes of face poses; training an initial feature-sharing model based on a first set of sample images to obtain a first feature-sharing model; training the first feature-sharing model based on the first set of sample images and a second set of sample images to obtain a second feature-sharing model with a loss value less than a preset second threshold; obtaining an initial multi-task recognition model by adding a feature decoupling model to the second feature-sharing model; and training the initial multi-task recognition model based on the sample images to obtain a trained multi-task recognition model.

32. [20200207432](#) ROBOTIC LEG AND ROBOT HAVING THE SAME US - 02.07.2020

Int.Class [B62D 57/032](#) Appl.No 16708464 Applicant UBTECH ROBOTICS CORP LTD Inventor Youpeng Li

A robotic leg assembly includes a main body having a first end and an opposite second end, a first servo arranged at the first end of the main body, a second servo connected to the main body and comprising an output shaft, a servo holder arranged at the second end of the main body, a third servo received in the servo holder, and a linkage bar mechanism. Each of a first initial angle of the first rotary member and a second initial angle of the second rotary member is in a predetermined range.

33. [20210200990](#) METHOD FOR EXTRACTING IMAGE OF FACE DETECTION AND DEVICE THEREOF US - 01.07.2021

Int.Class [G06K 9/00](#) Appl.No 17134467 Applicant UBTECH ROBOTICS CORP LTD Inventor Yusheng Zeng

The present disclosure provides a method for extracting a face detection image, wherein the method includes: obtaining a plurality of image frames by an image detector, performing a face detection process on each image frame to extract a face area, performing a clarity analysis on the face area of each image frame to obtain a clarity degree of a face, conducting a posture analysis on the face area of each image frame to obtain a face posture angle, generating a comprehensive evaluation index for each image frame in accordance with the clarity degree of the face and the face posture angle of each image frame, and selecting a key frame from the image frames based on the comprehensive evaluation index. Such that the resource occupancy rate during image data processing may be reduced, and the quality of the face detection process may be improved.

34. [20210181747](#) ROBOT CLIMBING CONTROL METHOD AND ROBOT US - 17.06.2021

Int.Class [G05D 1/02](#) Appl.No 17113132 Applicant UBTECH ROBOTICS CORP LTD Inventor Shuping Hu

A robot climbing control method is disclosed. A gravity direction vector in a gravity direction in a camera coordinate system of a robot is obtained. A stair edge of stairs in a scene image is obtained and an edge direction vector of the stair edge in the camera coordinate system is determined. A position parameter of the robot relative to the stairs is determined according to the gravity direction vector and the edge direction vector. Poses of the robot are adjusted according to the position parameter to control the robot to climb the stairs.

35. [20200201280](#) CONTROL METHOD FOR ELECTRONICALLY CONTROLLED SERVO MECHANISM AND ELECTRONICALLY CONTROLLED SERVO MECHANISM AND ROBOT THEREOF US - 25.06.2020

Int.Class [G05B 19/23](#) Appl.No 16581791 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

The present disclosure provides a control method for an electronically controlled servo mechanism as well as an apparatus and a robot thereof. The method is for an electronically controlled servo mechanism including a servo having a PI controller, which includes: obtaining related parameter(s) of the PI controller before tuning, where the related parameters includes a proportional coefficient and an integral coefficient; obtaining a current rotational angle of an output shaft of the servo, and calculating an angular deviation between the obtained current rotational angle and an expected rotational angle of an output shaft of the servo; and tuning the related parameter(s) of the PI controller based on the proportional coefficient, the integral coefficient, and the angular deviation. In such a manner, the parameter(s) of the PI controller are tuned to make it equivalent to a P controller, thereby avoiding the large oscillation caused by external interference.

36. [20200206944](#) ACCELERATION COMPENSATION METHOD FOR HUMANOID ROBOT AND APPARATUS AND HUMANOID ROBOT USING THE SAME US - 02.07.2020

Int.Class [B25J 13/08](#) Appl.No 16669551 Applicant UBTECH ROBOTICS CORP LTD Inventor Hao Dong

The present disclosure provides an acceleration compensation method for a humanoid robot as well as an apparatus and a humanoid robot using the same. The method includes: calculating an angular acceleration of each joint and calculating a six-dimensional acceleration of a centroid of a connecting rod corresponding to the joint in an absolute world coordinate system, if the humanoid robot is in a single leg supporting state; calculating a torque required by



the angular acceleration of each joint of the humanoid robot; determining a feedforward current value corresponding to the torque of each joint; and superimposing the feedforward current value on a control signal of each joint to control the humanoid robot. In this manner, the influence of the acceleration can be effectively suppressed, the rigidity of the PID controller of the humanoid robot can be reduced, thereby improving the stability of the entire humanoid robot.

37. [20210200962](#) COMPUTER-IMPLEMENTED METHOD FOR TEXT CONVERSION, COMPUTER DEVICE, AND NON-TRANSITORY COMPUTER READABLE STORAGE MEDIUM US - 01.07.2021

Int.Class [G06F 40/40](#) Appl.No 17133673 Applicant UBTECH ROBOTICS CORP LTD Inventor Zhongfa Feng

A computer-implemented method for text conversion, a computer device, and a non-transitory computer readable storage medium are provided. The method includes: obtaining a text to be converted; performing a non-standard word recognition on the text to be converted, to determine whether the text to be converted includes a non-standard word; recognizing the non-standard word in the text to be converted by using an eXtreme Gradient Boosting model in response to the text to be converted including the non-standard word; and obtaining a target converted text corresponding to the text to be converted, according to a recognition result outputted by the eXtreme Gradient Boosting model. The method has a faster recognition speed and a higher recognition accuracy compared with the deep learning model.

38. [20200198126](#) SERVO AND ROBOT HAVING THE SAME US - 25.06.2020

Int.Class [B25J 9/12](#) Appl.No 16702480 Applicant UBTECH ROBOTICS CORP LTD Inventor Jianli Chen

A servo includes a housing, and a motor, a reduction gear drive mechanism, an output shaft, a position sensor and at least two stages of transmission gear. The reduction gear drive mechanism is connected with motor and the output shaft of the servo, the reduction gear drive mechanism used to transmit power from the motor to the output shaft of the servo. A head stage of the transmission gear is located on a tail end of the output shaft of the servo, and the position sensor is located at an axis of a tail stage of the transmission gear. The at least two stages of transmission gear transmit a rotation angle of the output shaft of the servo to the position sensor by a ratio of 1:1, the position sensor is not arranged coaxially with the output shaft of the servo.

39. [20220068109](#) MASK WEARING STATUS ALARMING METHOD, MOBILE DEVICE AND COMPUTER READABLE STORAGE MEDIUM US - 03.03.2022

Int.Class [G08B 21/18](#) Appl.No 17138944 Applicant UBTECH ROBOTICS CORP LTD Inventor Yusheng Zeng

A mask wearing status alarming method, a mobile device, and a computer readable storage medium are provided. The method includes: performing a face detection on an image to determine face areas each including a target determined as a face; determining a mask wearing status of the target in each face area; confirming the mask wearing status of the target in each face area using a trained face confirmation model to remove the face areas comprising the target being mistakenly determined as the face and determining a face pose in each of the remaining face areas to remove the face areas with the face pose not meeting a preset condition, in response to determining the mask wearing status as a not-masked-well status or a unmasked status; and releasing an alert corresponding to the mask wearing status of the target in each of the remaining face areas.

40. [20210387340](#) ROBOTIC ARM SPACE POSITION ADJUSTMENT METHOD, ROBOTIC ARM CONTROLLER AND COMPUTER READABLE STORAGE MEDIUM US - 16.12.2021

Int.Class [B25J 9/16](#) Appl.No 17137382 Applicant UBTECH ROBOTICS CORP LTD Inventor Xiaoyu Ren

The present disclosure provides a robotic arm space position adjustment method, a robotic arm controller, and a computer readable storage medium. The method includes: calculating a potential energy function of moving a feature point of the robotic arm to a reference point based on an obtained preset acceleration of an artificial gravitational field, first vector of the artificial gravitational field in a preset reference coordinate system, second vector of the feature point of the robotic arm in the preset reference coordinate system, and a third vector of the reference point in the preset reference coordinate system; and calculating a null space virtual moment of moving the feature point of the robotic arm to the reference point based on a preset null space operator and the potential energy function, so as to adjust each joint of the robotic arm.

41. [20210200948](#) CORPUS CLEANING METHOD AND CORPUS ENTRY SYSTEM US - 01.07.2021

Int.Class [G06F 40/242](#) Appl.No 16886826 Applicant UBTECH ROBOTICS CORP LTD Inventor LI MA

The present disclosure provides a corpus cleaning method and a corpus entry system. The method includes: obtaining an input utterance; generating a predicted value of an information amount of each word in the input utterance according to the context of the input utterance using a pre-trained general model; and determining redundant words according to the predicted value of the information amount of each word, and determining whether to remove the redundant words from the input utterance. In such a manner, the objectivity and accuracy of corpus cleaning can be improved.

42. [20200210038](#) ROBOT EYE LAMP CONTROL METHOD AND APPARATUS AND TERMINAL DEVICE USING THE SAME US - 02.07.2020

Int.Class [G06F 3/0488](#) Appl.No 16699744 Applicant UBTECH ROBOTICS CORP LTD Inventor Liming Zhu

The present disclosure provides a robot eye lamp control method as well as an apparatus and a terminal device using the same. The method includes: loading a simulation image corresponding to an cut shape of the eye lamp of the robot onto a display interface of a terminal device remotely connected with the robot; detecting a color setting instruction issued to each color block area in the simulation image by a user, and generating combined parameter information comprising each color value in response to having received a color confirmation instruction issued by the user, and transmitting the combined parameter information to the robot so that the robot performs a light control on the eye lamp based on the combined parameter information. The present disclosure guarantees that the robot will respond to an interactive instruction only when the light display effect and the actual demand of the user matches.

43. [20210347059](#) ROBOTIC ASSISTANT US - 11.11.2021

Int.Class [B25J 11/00](#) Appl.No 16870903 Applicant UBTECH ROBOTICS CORP LTD Inventor Chengkun Zhang

A robotic assistant includes a wheeled base, a storage unit including drawers, a foldable arm connected to a top of the storage unit and including an end of arm tooling [EOAT] connected to a distal end of the foldable arm, an elevation mechanism positioned on the wheeled base and used to move the storage unit up and down, and a control system that receives command instructions. In response to the command instructions, the control system is configured to move the wheeled base, open or close the one or more drawers, actuate movement of the foldable arm and the EOAT to pick up and place external objects from/to a determined location, and control the storage unit to move up/down.



44. [20200205115](#) WIRELESS POSITIONING METHOD AND SYSTEM USING THE SAME US - 25.06.2020

Int.Class [H04W 64/00](#) Appl.No 16396692 Applicant UBTECH ROBOTICS CORP LTD Inventor Yongsheng Zhao

The present disclosure provides wireless positioning methods and a system using the same. One of the method includes: broadcasting a ranging request frame to at least two of the positioning anchors and recording a first timestamp of broadcasting the ranging request frame, if a positioning request is detected; receiving a ranging reply frame corresponding to the ranging request frame from each of the at least two positioning anchors and recording a second timestamp of receiving the ranging reply frame; calculating a distance between the positioning anchor and the positioning tag transmitting the ranging request frame based on the first timestamp, the second timestamp, and the time difference; and determining position information of the positioning tag based on the anchor information and the distance. In the above-mentioned manner, the tag can determine the position information of the tag by broadcasting once.

45. [20200200323](#) CONNECTION ASSEMBLY AND ROBOT HAVING THE SAME US - 25.06.2020

Int.Class [F16M 11/16](#) Appl.No 16435575 Applicant UBTECH ROBOTICS CORP LTD Inventor Kunlei Zhao

A connection assembly for holding a support member in position includes: a base defining a receiving hole to receive an end portion of the support member, and a guiding hole in a lateral surface thereof, which communicates with the receiving hole; a fixing block; a locking member slidably received in the guiding hole and slidable between a first position where the locking member is engaged with the support member so as to hold the support member in position, and a second position where the locking member is disengaged from the support member; and an actuating member connected to the fixing block and the locking member, the actuating member being configured to drive the locking member to move between the first position and the second position.

46. [20220036065](#) LOOP CLOSURE DETECTION METHOD, MOBILE DEVICE AND COMPUTER READABLE STORAGE MEDIUM US - 03.02.2022

Int.Class [G06K 9/00](#) Appl.No 16953378 Applicant UBTECH ROBOTICS CORP LTD Inventor Rui Guo

The present disclosure provides a loop closure detection method, a mobile device, and a computer readable storage medium. The method includes: collecting images in different detection directions simultaneously through CO cameras installed on the mobile device to obtain an image data group comprising CO images; calculating feature information of each image in the image data group; performing a loop closure detection in CO sub-threads respectively based on the feature information to obtain a loop closure detection result of each sub-thread; and determining a loop closure detection result of the mobile device based on the loop closure detection result of each sub-thread. In this manner, cross detections in a plurality of detection directions can be realized, which breaks through the limitation of loop closure detection in the prior art with respect to path direction, avoids repeated paths in the same direction, and greatly improves the mapping efficiency.

47. [20220044438](#) OBJECT DETECTION MODEL GENERATION METHOD AND ELECTRONIC DEVICE AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME US - 10.02.2022

Int.Class [G06T 7/73](#) Appl.No 17403902 Applicant UBTECH ROBOTICS CORP LTD Inventor Yepeng Liu

An object detection model generation method as well as an electronic device and a computer readable storage medium using the same are provided. The method includes: during the iterative training of the to-be-trained object detection model, the detection accuracy of the iteration nodes of the object detection model is sequentially determined according to the node order, and the mis-detected negative samples of the object detection model at the iteration nodes with the detection accuracy less than or equal to a preset threshold are enhanced. Then the object detection model is trained at the iteration node based on the enhanced negative samples and a first amount of preset training samples. After the training at the iteration nodes are completed, it returns to the step of sequentially determining the detection accuracy of the iteration nodes of the object detection model until the training of the object detection model is completed.

48. [20220043453](#) GAIT PLANNING METHOD, COMPUTER-READABLE STORAGE MEDIUM AND ROBOT US - 10.02.2022

Int.Class [G05D 1/02](#) Appl.No 17137429 Applicant UBTECH ROBOTICS CORP LTD Inventor Jie Bai

A gait planning method includes: performing a gait planning in each center of mass [CoM] timing period of the robot based on a variable-height linear inverted pendulum model, which includes: acquiring a first step length and a second step length at a beginning of each CoM timing period; calculating a first height reduction amplitude and a first fluctuation amplitude of the CoM of the robot according to the first step length; calculating a second height reduction amplitude and a second fluctuation amplitude of the CoM of the robot according to the second step length; and performing a planning to the height of the CoM of the robot in the current CoM timing period, based on the first height reduction amplitude, the first fluctuation amplitude, the second height reduction amplitude, and the second fluctuation amplitude.

49. [20210331753](#) STAIR CLIMBING GAIT PLANNING METHOD AND APPARATUS AND ROBOT USING THE SAME US - 28.10.2021

Int.Class [B62D 57/02](#) Appl.No 16885227 Applicant UBTECH ROBOTICS CORP LTD Inventor JIE BAI

The present disclosure provides a stair climbing gait planning method and an apparatus and a robot using the same. The method includes: obtaining first visual measurement data through a visual sensor of the robot; converting the first visual measurement data to second visual measurement data; and performing a staged gait planning on a process of the robot to climb the staircase based on the second visual measurement data. Through the method, the visual measurement data is used as a reference to perform the staged gait planning on the process of the robot to climb the staircase, which greatly improves the adaptability of the robot in the complex scene of stair climbing.

50. [20200206914](#) SERVO CONTROL METHOD AND APPARATUS AND ROBOT USING THE SAME US - 02.07.2020

Int.Class [B25J 19/00](#) Appl.No 16671164 Applicant UBTECH ROBOTICS CORP LTD Inventor Yongping Zeng

The present disclosure is provides a servo control method as well as an apparatus and a robot using the same. The method includes: obtaining a teeth force reduction multiple of a gear of a servo; creating a voltage queue based on the teeth force reduction multiple; calculating a target loading voltage corresponding to a current moment based on a voltage queue; and applying the target loading voltage on a motor of the servo, wherein the target loading voltage is for driving the motor of the servo to rotate. Through the above-mentioned method, the loading voltage can be effectively reduced when the servo is started, thereby protecting teeth of the gear of the servo and increasing the service life of the servo.



51. [20210107147](#) LOCALIZATION CORRECTION METHOD FOR ROBOT, COMPUTER READABLE STORAGE MEDIUM, AND ROBOT US - 15.04.2021

Int.Class [B25J 9/16](#) Appl.No 16726196 Applicant UBTECH ROBOTICS CORP LTD Inventor Wenzhi Xu

An localization correction method for a robot, comprising acquiring first position information of the robot in a first coordinate system; acquiring second position information of the robot in a second coordinate system after the robot executes a motion command; establishing a transformation model between the first position information and the second position information based on the first coordinate system and the second coordinate system; calculating a compensation value according to the transformation model; and generating a reset command according to the compensation value, and adjusting the localization of the robot according to the reset command.

52. [20220009096](#) INVERSE KINEMATICS SOLVING METHOD FOR REDUNDANT ROBOT AND REDUNDANT ROBOT AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME US - 13.01.2022

Int.Class [B25J 9/16](#) Appl.No 17138942 Applicant UBTECH ROBOTICS CORP LTD Inventor Yuesong Wang

An inverse kinematics solving method for redundant robot as well as a redundant robot using the same are provided. The method includes: obtaining an expression of a Jacobian matrix null space of a current configuration of each robotic arm of the redundant robot corresponding to a preset end pose of the robotic arm according to the preset end pose, and obtaining a relation between an angular velocity of the joints of the redundant robot in the Jacobian matrix null space of the current configuration based on the obtained expression; traversing the Jacobian matrix null space using the relation, and building an energy cost function of the redundant robot based on the relation; obtaining a target joint angle of each joint of the redundant robot based on the optimal inverse kinematics solution to transmit to the servo of the joint so as to control the joint.

53. [20220203522](#) CONTROL METHOD FOR ROBOT, COMPUTER-READABLE STORAGE MEDIUM AND ROBOT US - 30.06.2022

Int.Class [B25J 9/16](#) Appl.No 17561629 Applicant UBTECH ROBOTICS CORP LTD Inventor Ligang Ge

A robot control method includes: determining a planned capture point and a measured capture point of the robot so as to calculate a capture point error of the robot; obtaining positions of a left foot and a right foot of the robot, and a planned zero moment point (ZMP) of the robot so as to calculate desired support forces of the left foot and the right foot; calculating desired torques of the left foot and the right foot according to the capture point error, the desired support forces of the left foot and the right foot; obtaining measured torques of the left foot and the right foot so as to calculate desired poses of the left foot and the right foot; and controlling the robot to walk according to the desired poses of the left foot and the desired pose of the right foot.

54. [20210178587](#) ROBOT CONTROL METHOD, COMPUTER-READABLE STORAGE MEDIUM AND ROBOT US - 17.06.2021

Int.Class [B25J 9/16](#) Appl.No 17120225 Applicant UBTECH ROBOTICS CORP LTD Inventor Chunyu Chen

A robot control method includes: obtaining force information associated with a left foot and a right foot of the robot; calculating a zero moment point of a COM of a body of the robot based on the force information; updating a motion trajectory of the robot according to the zero moment point of the COM of the body to obtain an updated position of the COM of the body; performing inverse kinematics analysis on the updated position of the COM of the body to obtain joint angles of a left leg and a right leg of the robot; and controlling the robot to move according to the joint angles.

55. [20210183116](#) MAP BUILDING METHOD, COMPUTER-READABLE STORAGE MEDIUM AND ROBOT US - 17.06.2021

Int.Class [G06T 11/00](#) Appl.No 17075727 Applicant UBTECH ROBOTICS CORP LTD Inventor Rui Guo

A method for building a map includes: acquiring an original grayscale map, preprocessing the original grayscale map to obtain a preprocessed map, binarizing the preprocessed map to obtain a binarized map, performing a boundary filling to the preprocessed map and the binarized map to obtain a boundary-filled preprocessed map and a boundary-filled binarized map, performing a boundary thinning to the boundary-filled binarized map to obtain a thinned binarized map, and performing a boundary thinning to the boundary-filled preprocessed map, according to the thinned binarized map, to obtain a thinned preprocessed map.

56. [20210331310](#) NECK MECHANISM FOR ROBOT US - 28.10.2021

Int.Class [B25J 9/12](#) Appl.No 16861201 Applicant UBTECH ROBOTICS CORP LTD Inventor Mohammad Iman Mokhlespour Esfahani

A neck mechanism for a robot includes a first linear actuator, a second linear actuator in parallel with the first actuator, a rotary stage, and a support shaft positioned behind and between the first linear actuator and the second linear actuator. The first linear actuator and the second linear actuator are both connected between a platform and the rotary stage via joints, and the support shaft is connected between the upper platform and the rotary stage via a joint. The rotary motor is configured to rotate the rotary stage to yaw the platform and the first linear actuator and the second linear actuator are configured to pitch/roll the platform.

57. [20220019196](#) FEEDFORWARD CONTROL METHOD FOR FLOATING BASE DYNAMICS, COMPUTER-READABLE STORAGE MEDIUM AND ROBOT US - 20.01.2022

Int.Class [G05B 19/4155](#) Appl.No 17088596 Applicant UBTECH ROBOTICS CORP LTD Inventor YUESONG WANG

A feedforward control method comprising steps of: acquiring kinematic parameters of each joint of a robot based on inverse kinematics according to a pre-planned robot motion trajectory, and setting a center of a body of the robot as a floating base; determining a six-dimensional acceleration of a center of mass of each joint of the robot in a base coordinate system using a forward kinematics algorithm, based on the kinematic parameters of each joint of the robot, and converting the six-dimensional acceleration of the center of mass of each joint of the robot in the base coordinate system to a six-dimensional acceleration in a world coordinate system; and calculating a torque required by a motor of each joint of the robot using an inverse dynamic algorithm, and controlling the motors of corresponding joints of the robot.

58. [20210046647](#) POSITION CONTROL METHOD FOR SERVO, COMPUTER READABLE STORAGE MEDIUM, AND ROBOT US - 18.02.2021

Int.Class [B25J 9/16](#) Appl.No 16713012 Applicant UBTECH ROBOTICS CORP LTD Inventor Lifu Zhang

A position control method for a servo, includes: receiving, from a control terminal, a motion control command that comprises a motion planning parameter about position of an output shaft of the servo; acquiring speed information or time information indicated by the motion planning parameter, and determining a constant parameter control duration according to the speed information or time information; determining a control parameter corresponding to a constant parameter control stage according to the constant parameter control duration and a preset constant parameter; performing a transient adjustment to the

servo when the constant parameter control stage ends, and changing the control parameter to an adaptive operation parameter when the transient adjustment ends; and controlling a rotation angle of the output shaft of the servo to perform a position control of the servo, based on duration values and control parameters corresponding to each of a plurality of control stages.

59. [20210334534](#) METHOD AND SYSTEM FOR TRACKING AND DISPLAYING OBJECT TRAJECTORY

US - 28.10.2021

Int.Class [G06K 9/00](#) Appl.No 16611476 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

The present disclosure relates to an object trajectory tracking and displaying method, comprising the following steps of: creating a mapping relationship database of image features and WIFI information for objects in a distributed search server, where each WIFI information includes position information; receiving a trajectory query request for a monitored object; searching the mapping relationship database of image features and WIFI information for objects according to an image feature of the monitored object to produce a WIFI information set, and producing a corresponding position information set based on the WIFI information set; and generating real-time trajectory information of the monitored object based on the position information set. The object trajectory tracking and displaying method and system of the present disclosure make the position of the sampling data points more accurate and improve the accuracy of trajectory querying.

60. [20220044370](#) IMAGE PROCESSING METHODS

US - 10.02.2022

Int.Class [G06T 5/20](#) Appl.No 17388043 Applicant UBTECH ROBOTICS CORP LTD Inventor Bin Sun

Image processing methods are provided. One of the method includes: obtaining a to-be-processed multi-channel feature maps; obtaining multi-channel first output feature maps and multi-channel second output feature maps by processing the multi-channel feature maps through a parallel pointwise convolution and non-pointwise operation, where the non-pointwise convolution is for describing a spatial feature of each channel and an information exchange between the feature maps; and fusing the multi-channel first output feature maps and the multi-channel second output feature maps to obtain a multi-channel third output feature map.

61. [20200005487](#) POSITIONING METHOD AND ROBOT USING THE SAME

US - 02.01.2020

Int.Class [G06T 7/73](#) Appl.No 16416281 Applicant UBTECH ROBOTICS CORP LTD Inventor Chenchen Jiang

The present disclosure provides a positioning method and a robot using the same. The method includes: obtaining, through the visual sensor, a current frame image; obtaining, through the ultra-wideband tag, distance of a robot from an ultra-wideband anchor; performing a feature matching on the current frame image and an adjacent frame image to generate partial map point[s]; determining whether the current frame image is a key frame image; and optimizing a pose of the visual sensor corresponding to the key frame image through a joint objective function in response to the current frame image being the key frame image, where the joint objective function at least comprises a distance cost function of the ultra-wideband anchor and a visual residual cost function. Through the above-mentioned method, the accuracy of the positioning of the robot can be improved.

62. [20200096343](#) POSITIONING METHOD AND ROBOT WITH THE SAME

US - 26.03.2020

Int.Class [G01C 21/20](#) Appl.No 16396690 Applicant UBTECH ROBOTICS CORP LTD Inventor Yongsheng Zhao

The present disclosure provides a positioning method and a robot with the same. The method is applied to a robot having a camera, the method includes: taking a photo of a predetermined area, wherein the predetermined area comprises a marker pattern area; identifying at least two marker points of the marker pattern area and obtaining first coordinate data of each marker point; calculating second coordinate data of the robot in a world coordinate based on parameters of the camera and the first coordinate data of the marker points; and calculating angle data of the robot in the world coordinate based on the first coordinate data of the marker points and the second coordinate data of the robot in the world coordinate. Through the above-mentioned positioning method, the robot can quickly perform monocular visual positioning and reduce the calculation amount of positioning.

63. [20200195004](#) CURRENT PROTECTION CIRCUIT AND METHOD FOR HIGH VOLTAGE SYSTEM

US - 18.06.2020

Int.Class [H02H 9/02](#) Appl.No 16535112 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

A current protection circuit for a high voltage system includes: a power supply module to supply power to a load through a high voltage bus and a low voltage bus; a detection module connected to the high voltage bus and used to detect a value of current flowing through the high voltage bus; a signal processing module electrically connected to the detection module and used to amplify the current flowing through the high voltage bus; and a control module electrically connected to the signal processing module, the power supply module, and the load, and used to disconnect the load from the power supply module or perform current limiting for the load when the value of the amplified current exceeds a preset threshold.

64. [20200204688](#) PICTURE BOOK SHARING METHOD AND APPARATUS AND SYSTEM USING THE SAME

US - 25.06.2020

Int.Class [H04N 1/00](#) Appl.No 16669549 Applicant UBTECH ROBOTICS CORP LTD Inventor LIANGLIANG JIA

The present disclosure provides a picture book sharing method as well as an apparatus and a system using the same. The method includes: receiving, through a server node, an upload request for data of the picture book from a first client; storing the pictures and the audios in the data of the picture book to a file storage server, and obtaining storage addresses of the pictures and the audios; creating an index for the storage addresses and the texts in the data of the picture book, and storing the index and the texts in the data of the picture book to a search server; and searching for the texts corresponding to the picture book requested by a search request from a second client, obtaining the pictures and the audios corresponding to the texts according to the index, and transmitting the obtained texts, pictures and audios to the second client.

65. [20220139027](#) SCENE DATA OBTAINING METHOD AND MODEL TRAINING METHOD, APPARATUS AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME

US - 05.05.2022

Int.Class [G06T 15/20](#) Appl.No 17216719 Applicant UBTECH ROBOTICS CORP LTD Inventor Xi Luo

A scene data obtaining method as well as a model training method and a computer readable storage medium using the same are provided. The method includes: building a virtual simulation scene corresponding to an actual scene, where the virtual simulation scene is three-dimensional; determining a view frustum corresponding to preset view angles in the virtual simulation scene; collecting one or more two-dimensional images in the virtual simulation scene and ground truth object data associated with the one or more two-dimensional images using the view frustum corresponding to the preset view angles; and using all the two-dimensional images and the ground truth object data associated with the one or more two-dimensional images as scene data corresponding to the actual scene. In this manner, the data collection does not require manual annotation, and the obtained data can be used for training deep learning-based perceptual models.



66. [20210162595](#) FOOT-WAIST COORDINATED GAIT PLANNING METHOD AND APPARATUS AND ROBOT USING THE SAME US - 03.06.2021

Int.Class [B25J 9/16](#) Appl.No 16932872 Applicant UBTECH ROBOTICS CORP LTD Inventor Jie Bai

The present disclosure provides a foot-waist coordinated gait planning method and an apparatus and a robot using the same. The method includes: obtaining an orientation of each foot of the legged robot, and calculating a positional compensation amount of each ankle of the legged robot based on the orientation of the foot; obtaining an orientation of a waist of the legged robot, and calculating a positional compensation amount of each hip of the legged robot based on the orientation of the waist; calculating a hip-ankle positional vector of the legged robot; compensating the hip-ankle positional vector based on the positional compensation amount of the ankle and the positional compensation amount of the hip to obtain the compensated hip-ankle positional vector; and performing an inverse kinematics analysis on the compensated hip-ankle positional vector to obtain joint angles of the legged robot.

67. [20220156534](#) TARGET OBJECT DETECTION MODEL US - 19.05.2022

Int.Class [G06K 9/68](#) Appl.No 17389380 Applicant UBTECH ROBOTICS CORP LTD Inventor Yonghui Cai

A target object detection model is provided. The target object detection model includes a YOLOv3-Tiny model. Through the target object detection model, low-level information in the YOLOv3-Tiny sub-model can be merged with high-level information therein, so as to fuse the low-level information and the high-level information. Since the low-level information can be further used, the comprehensiveness of target detection is effectively improved, and the detection effect of small targets is improved.

68. [20210192184](#) FACE IMAGE QUALITY EVALUATING METHOD AND APPARATUS AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME US - 24.06.2021

Int.Class [G06K 9/40](#) Appl.No 16805827 Applicant UBTECH ROBOTICS CORP LTD Inventor Yusheng Zeng

The present disclosure provides a face image quality evaluating method as well as an apparatus and a computer-readable storage medium using the same. The method includes: obtaining a face image; determining a local bright area in the face image, wherein the local bright area is formed by an illumination source in the face image, and the brightness of the local bright area is greater than the brightness of a face area in the face image; removing the local bright area from the face image; and evaluating a quality of the face image based on the face image having removed the local bright area. In the above-mentioned manner, the present disclosure improves the accuracy of the quality evaluation of the face image.

69. [20220009095](#) IMPEDANCE CONTROL METHOD, AND CONTROLLER AND ROBOT USING THE SAME US - 13.01.2022

Int.Class [B25J 9/16](#) Appl.No 17408512 Applicant UBTECH ROBOTICS CORP LTD Inventor Liqun Huang

An impedance control method as well as a controller and a robot using the same are provided. The method includes: obtaining joint motion information and joint force information in the joint space of a robotic arm and an actual interaction force acting on an end-effector, and calculating actual motion information of the end-effector in the task space based on the joint motion information; calculating a corrected desired trajectory using environment information and a desired end-effector interaction force, and calculating the impedance control torque based on the joint force information, the actual interaction force, the actual motion information, and desired end-effector information including the corrected desired trajectory and determining a compensation torque based on a nonlinear term in a constructed dynamics equation so as to perform a joint torque control on the robotic arm based on the impedance control torque and the compensation torque.

70. [20220194500](#) STEPPING DOWN TRAJECTORY PLANNING METHOD, ROBOT USING THE SAME, AND COMPUTER READABLE STORAGE MEDIUM US - 23.06.2022

Int.Class [B62D 57/032](#) Appl.No 17562985 Applicant UBTECH ROBOTICS CORP LTD Inventor Hongge Wang

A stepping down trajectory planning method as well as a robot using the same and a computer readable storage medium are provided. The method includes: dividing a stepping down process of the robot into a plurality of planned stages; adjusting a start position of a swing leg of the robot according to an ankle-to-heel distance, where the ankle-to-heel distance is a horizontal distance between an ankle joint of the swing leg of the robot and a heel of the swing leg of the robot; determining an initial state and an end state of the swing leg in each of the planned stages according to the start position; and obtaining a planned trajectory of the swing leg by performing a curve fitting on the swing leg in each of the planned stages the initial state and the end state.

71. [20210193113](#) SPEECH SYNTHESIS METHOD AND APPARATUS AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME US - 24.06.2021

Int.Class [G10L 13/08](#) Appl.No 17115729 Applicant UBTECH ROBOTICS CORP LTD Inventor Dongyan Huang

The present disclosure provides a speech synthesis method as well as an apparatus and a computer readable storage medium using the same. The method includes: obtaining a to-be-synthesized text, and extracting to-be-processed Mel spectrum features of the to-be-synthesized text through a preset speech feature extraction algorithm; inputting the to-be-processed Mel spectrum features into a preset ResUnet network model to obtain first intermediate features; performing an average pooling and a first down sampling on the to-be-processed Mel spectrum features to obtain second intermediate features; taking the second intermediate features and the first intermediate features output by the ResUnet network model as an input to perform a deconvolution and a first up sampling so as to obtain target Mel spectrum features corresponding to the to-be-processed Mel spectrum features; and converting the target Mel spectrum features into a target speech corresponding to the to-be-synthesized text.

72. [20210197379](#) METHOD AND DEVICE FOR CONTROLLING ARM OF ROBOT US - 01.07.2021

Int.Class [B25J 9/16](#) Appl.No 17115712 Applicant UBTECH ROBOTICS CORP LTD Inventor Dake Zheng

The present disclosure provides a method for controlling an arm of a robot, including obtaining obstacle information relating to the arm of the robot by at least one sensor, obtaining current posture information of the arm of the robot by at least one detector and obtaining an expected posture information of an end-portion of the arm of the robot, determining an expected trajectory of the end-portion of the arm of the robot, determining an expected speed of the end-portion of the arm of the robot in accordance with the expected trajectory of the end-portion, determining a virtual speed of a target point on the arm of the robot, and configuring a target joint speed corresponding to a joint of the arm of the robot. Such that the redundant arm of the robot may be configured to prevent from contacting the obstacles in the complex environment while performing corresponding tasks.



73. [20210008730](#) POSE DETERMINING METHOD FOR MOBILE ROBOT AND APPARATUS AND MOBILE ROBOT THEREOF US - 14.01.2021

Int.Class [B25J 13/08](#) Appl.No 16561033 Applicant UBTECH ROBOTICS CORP LTD Inventor Xu Hu

The present disclosure provides a pose determining method for a mobile robot as well as an apparatus and a mobile robot thereof. The method includes: obtaining a first position of a mobile robot in each local map after building an initial local map corresponding to a current environment and rotating; determining first environmental contour points of each of the local maps and corresponding first gradient directions, and obtaining a relative position of each of the first environmental contour points and the corresponding first position; building an angle histogram in each of the local maps; determining a second position of second environmental contour points of a global map and corresponding second gradient directions; and predicting a third position in the global map of the mobile robot, counting an appearance amount of the third positions, and determining a target pose of the mobile robot in the global map.

74. [20210056266](#) SENTENCE GENERATION METHOD, SENTENCE GENERATION APPARATUS, AND SMART DEVICE US - 25.02.2021

Int.Class [G06F 40/30](#) Appl.No 16734389 Applicant UBTECH ROBOTICS CORP LTD Inventor Li Ma

The present disclosure provides a sentence generation method as well as a sentence generation apparatus and a smart device. The method includes: obtaining an input sentence; searching for structurally similar sentence(s) of each input sentence, where the structurally similar sentence(s) are structurally similar to the input sentence; finding semantically similar sentence(s) of the structurally similar sentence(s); parsing the input sentence and the structurally similar sentence(s) to obtain a subject block, a predicate block, and an object block to rewrite the semantically similar sentences to generate a new sentence; filtering the new sentence based on a preset filtering condition; and labeling the filtered new sentence as a semantically similar sentence of the input sentence. In this manner, a plurality of new sentences with different sentence patterns can be generated based on the same input sentence, which improves the controllability in generating the sentences and saves the labor cost therein.

75. [3557361](#) CHARGING STATION IDENTIFYING METHOD AND DEVICE EP - 23.10.2019

Int.Class [G01S 13/88](#) Appl.No 19169469 Applicant UBTECH ROBOTICS CORP LTD Inventor XIONG YOUJUN

The present disclosure relates to robot technology, and particularly to a method, a device, and a robot (6) for identifying charging station. The method includes: first, obtaining scanning data produced by a radar (63) of the robot; then, determining whether an arc-shaped object exists in a scanning range of the radar of the robot based on the scanning data; finally, in response to determining that the arc-shaped object exists in the scanning range of the robot, determining that the arc-shaped object is a charging station. Compared with the prior art, the present disclosure substitutes the arc identification for the conventional concave-convex structure identification. Since the surface of the arc is relatively smooth, the data jumps at the intersection of the cross-section will not occur, hence the accuracy of charging station identification can be greatly improved.

76. [20210124925](#) PICTURE BOOK IDENTIFICATION METHOD AND APPARATUS AND TERMINAL DEVICE USING THE SAME US - 29.04.2021

Int.Class [G06K 9/62](#) Appl.No 16726833 Applicant UBTECH ROBOTICS CORP LTD Inventor Yang Li

The present disclosure provides a picture book identification method as well as an apparatus and a terminal device using the same. The method includes: determining geometric parameter(s) of an identification object based on image(s) collected by a camera and internal parameter(s) of the camera; comparing the geometric parameters of the identification object with geometric parameter(s) of a target picture book; and determining the identification object as the target picture book, if a difference between the geometric parameters of the identification object and the geometric parameters of the target picture book is within a preset range. In this manner, the target picture book is further filtered by matching the geometric parameters, which can reduce misidentification to improve the accuracy of identifying the picture book.

77. [20200198135](#) VIRTUAL RAIL BASED CRUISE METHOD AND APPARATUS AND ROBOT USING THE SAME US - 25.06.2020

Int.Class [G05B 19/23](#) Appl.No 16584968 Applicant UBTECH ROBOTICS CORP LTD Inventor Jian Zhang

The present disclosure provides a virtual rail based cruise method as well as an apparatus and a robot using the same. The method includes: obtaining a digital map including a virtual rail; performing a path planning based on the virtual rail, a current position of the robot, and a cruise end point to obtain a cruise path; and obtaining parameter(s) of the robot by calculating through a preset path tracking algorithm based on the cruise path and the current position of the robot, and controlling the robot based on the control parameter(s). In this manner, the problems of the prior art that needs to lay a rail or set an auxiliary device which causes high cost and inconvenience in usage as well as the rail needs to be re-laid or the auxiliary device needs to be reinstalled when the route is to be changed can be solved.

78. [20220180609](#) MAP DATABASE CREATION METHOD, MOBILE MACHINE USING THE SAME, AND COMPUTER READABLE STORAGE MEDIUM US - 09.06.2022

Int.Class [G06T 19/00](#) Appl.No 17482450 Applicant UBTECH ROBOTICS CORP LTD Inventor Mingqiang Huang

A map database creation method is provided. The method includes: obtaining a factor set including factors; dividing a map database into levels based on the factors, and taking each interval of the last level as one sub-database; creating an initial map based on a factor value of each factor corresponding to each sub-database, and creating the sub-database as an initial map database by storing the corresponding initial map in the sub-database; finding the initial map matching a current lighting condition from the initial map database based on the current lighting condition, and taking the found initial map as a positioning map; and performing a visual positioning based on the positioning map, creating an expanded map corresponding to the current lighting condition based on the visual positioning, and creating the sub-database corresponding to the current lighting condition as an expanded map database by storing the corresponding expanded map in the sub-database.

79. [20220193899](#) POSE CONTROL METHOD, ROBOT AND COMPUTER-READABLE STORAGE MEDIUM US - 23.06.2022

Int.Class [B25J 9/16](#) Appl.No 17488341 Applicant UBTECH ROBOTICS CORP LTD Inventor Hongge Wang

A pose control method for a robot includes: estimating a first set of joint angular velocities of all joints of the robot according to a balance control algorithm; estimating a second set of joint angular velocities of all joints of the robot according to a momentum planning algorithm; estimating a third set of joint angular velocities of all joints of the robot according to a pose return-to-zero algorithm; and performing pose control on the robot according to the first set of joint angular velocities, the second set of joint angular velocities, and the third set of joint angular velocities.

80. [20220184799](#) DUAL-OUTPUT-SHAFT SERVO AND ROBOT US - 16.06.2022



Int.Class [B25J 9/10](#) Appl.No 17547274 Applicant Ubtech Robotics Corp Ltd Inventor Hongyu Ding

A dual-output-shaft servo includes a housing including two first sensors and two actuating mechanisms. Each actuating mechanism includes a motor assembly, a speed reduction mechanism opposite the motor assembly, and a transmission mechanism arranged between the motor assembly and the speed reduction mechanism. The speed reduction mechanism includes an output component, and a connection shaft is fixed to the output component. A first sensor counterpart is attached to an end of the connection shaft which faces the motor assembly. The transmission mechanism is to transmit mechanical power from the motor assembly to the speed reduction mechanism. The axes of rotation of the output components of the speed reduction mechanisms are skew or intersected with each other.

81. [20210200961](#) CONTEXT-BASED MULTI-TURN DIALOGUE METHOD AND STORAGE MEDIUM

US - 01.07.2021

Int.Class [G06F 40/35](#) Appl.No 17102395 Applicant UBTECH ROBOTICS CORP LTD Inventor Chi Shao

The present disclosure discloses a context-based multi-turn dialogue method. The method includes: obtaining to-be-matched historical dialogue information; performing a word feature extraction based on the to-be-matched historical dialogue information to obtain a historical dialogue word embedding; obtaining candidate answer information; performing the word feature extraction based on the candidate answer information to obtain a candidate answer word embedding; obtaining a historical dialogue partial matching vector and a candidate answer partial matching vector by performing partial semantic relationship matching based on the historical dialogue word embedding and the candidate answer word embedding; obtaining a candidate answer matching probability by performing a matching probability calculation based on the historical dialogue partial matching vector and the candidate answer partial matching vector; and determining matched answer information based on the candidate answer information and the candidate answer matching probability.

82. [20210200224](#) METHOD FOR CONTROLLING A ROBOT AND ITS END-PORCTIONS AND DEVICE THEREOF

US - 01.07.2021

Int.Class [G05D 1/02](#) Appl.No 17109099 Applicant UBTECH ROBOTICS CORP LTD Inventor Dake Zheng

The present disclosure provides a method for controlling end-positions of a robot. The method includes obtaining joint information of a robot by at least one sensor and determining a first posture of an end-portion of the robot in accordance with the joint information, obtaining end-portion information of the robot by the sensor and obtaining the second posture of the end-portion of the robot including the interference information in accordance with the end-portion information of the robot and the first posture of the end-portion of the robot, and conducting a closed-loop control on the robot in accordance with an error between the second posture of the end-portion of the robot and a predetermined expected posture of the end-portion of the robot.

83. [20210154853](#) ROBOT MOTION CONTROL METHOD AND APPARATUS AND ROBOT USING THE SAME

US - 27.05.2021

Int.Class [B25J 9/16](#) Appl.No 16734400 Applicant UBTECH ROBOTICS CORP LTD Inventor HONGGE WANG

The present disclosure provides a robot motion control method as well as an apparatus and a robot using the same. The method includes: obtaining geometric parameter(s) of a target step, where the geometric parameters comprise a step width and a step height of the target step; determining at least two time-displacement coordinates and a velocity vector corresponding to each time-displacement coordinate based on the geometric parameters; generating a motion trajectory by fitting the at least two time-displacement coordinates and the corresponding velocity vectors; and controlling feet of the robot to move based on the motion trajectory. In this manner, the feet of the robot can be prevented from colliding violently with the step during going up the step so as to improve the safety and stability.

84. [20200206929](#) DUPLICATE SERVO ID DETECTION METHODS AND SERVO FOR ROBOT

US - 02.07.2020

Int.Class [B25J 9/16](#) Appl.No 16727956 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun XIONG

The present disclosure provides duplicate servo ID detection methods and a servo for a robot. One of the method includes: transmitting, by the main controller, a query instruction including a specific servo ID to at least two of the servos of the robot through a bus; differentiating feedback information replied by at least two of the servos corresponding to the specific servo ID; and determining, by the main controller, there being at least two of the servos with the same servo ID, if the feedback information not meeting a predetermined verification rule is received. Through the technical solution provided by this embodiment, the detection of duplicate servo ID can be realized, and the servos on the bus that have the same servo ID can be found so as to remind the user of the robot, thereby guaranteeing the normal operation of the robot.

85. [20200212897](#) TRANSMISSION HYSTERESIS DETECTING METHOD AND APPARATUS

US - 02.07.2020

Int.Class [H03K 3/00](#) Appl.No 16509515 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

The present disclosure provides a transmission hysteresis detecting method and apparatus. The method includes: transmitting a forward rotational instruction and a reverse rotational instruction to a motor of the servo; storing motor end positions of the motor and output shaft end positions of an output shaft corresponding to the motor in a forward rotational cycle and a reverse rotational cycle, respectively; generating first position data based on the motor end positions and the corresponding output shaft end positions in the forward rotational cycle; generating second position data based on the motor end positions and the corresponding output shaft end positions in the reverse rotational cycle; and calculating a transmission hysteresis of the servo based on the first position data and the second position data. The technical solutions of the present disclosure only needs to obtain the position data of one forward rotational cycle and one reverse rotational cycle.

86. [20210387334](#) DIRECT FORCE FEEDBACK CONTROL METHOD, AND CONTROLLER AND ROBOT USING THE SAME

US - 16.12.2021

Int.Class [B25J 9/16](#) Appl.No 17198167 Applicant UBTECH ROBOTICS CORP LTD Inventor Xiaoyu Ren

A direct force feedback control method as well as a controller and a robot using the same are provided. The method includes: obtaining an actual position and an actual speed of an end of the robotic arm and an actual external force acting on the end in a Cartesian space; calculating an impedance control component of the end in the Cartesian space based on the obtained actual position, the obtained actual speed, the obtained actual external force, an expected position, an expected speed, and an expected acceleration of the end; calculating a force control component of the end in the Cartesian space based on an expected interaction force acting on the end, the actual external force, and the actual speed; determining whether the actual external force is larger than a preset threshold, and obtaining a total force control quantity of the end of the robotic arm in the Cartesian space.

87. [20200206646](#) BUILDING ELEMENT FOR MODULAR DEVICE, HOT-SWAP DETECTION CIRCUIT AND ORIENTATION DETECTION CIRCUIT

US - 02.07.2020

Int.Class [H01R 11/30](#) Appl.No 16727969 Applicant UBTECH ROBOTICS CORP LTD Inventor Yongping Zeng



A building element for a modular device includes a male connector comprising M first magnets, a first ground terminal, a first detection terminal, a first power terminal, and a first signal terminal; and a female connector comprising M second magnets that are magnetically attractable to the first magnets, N second ground terminals, O second detection terminals, P second power terminals, and a second signal terminal. When the male connector of one building element is mechanically connected to the female connector of another building element, the first ground terminal, the first detection terminal, the first power terminal and the first signal terminal of the male connector of the one of two building elements respectively come into contact with one of the second ground terminals, one of the second detection terminals, one of the second power terminals, and the second signal terminal of the other one of the two building elements.

88. [20210178588](#) ROBOT CONTROL METHOD, COMPUTER-READABLE STORAGE MEDIUM AND ROBOT

US - 17.06.2021

Int.Class [B25J 9/16](#) Appl.No 17120229 Applicant UBTECH ROBOTICS CORP LTD Inventor Chunyu Chen

A robot control method includes: obtaining force information associated with feet of the robot; calculating a zero moment point of a COM of a body of the robot based on the force information; updating a position trajectory of the robot according to the zero moment point of the COM of the body to obtain an updated position of the COM of the body; obtaining posture information of the robot; updating a posture trajectory of the robot according to the posture information to obtain an updated pose angle; performing inverse kinematics analysis on the updated position of the COM of the body and the updated pose angle to obtain joint angles of legs of the robot; and controlling the robot to move according to the joint angles.

89. [20210063577](#) ROBOT RELOCALIZATION METHOD AND APPARATUS AND ROBOT USING THE SAME

US - 04.03.2021

Int.Class [G01S 17/89](#) Appl.No 16699750 Applicant UBTECH ROBOTICS CORP LTD Inventor ZHICHAO LIU

The present disclosure provides a robot relocalization method including: obtaining a level feature of an object in a laser map and calculating a first pose list; matching a laser subgraph point cloud collected by the robot with the first pose list to obtain a second pose list, if a distance between the level feature of the object and an initial position of a relocation of the robot is smaller than a threshold; splicing the laser subgraph point cloud into subgraphs, and performing a multi-target template matching to obtain a first matching candidate result; filtering the first matching candidate result based on the second pose list to obtain a second matching candidate result; determining an overlapping area of the second matching candidate result and the subgraph, and matching boundary points in the overlapping area with the laser subgraph point cloud to obtain the result of the relocation of the robot.

90. [20200098158](#) EYE ANIMATED EXPRESSION DISPLAY METHOD AND ROBOT USING THE SAME

US - 26.03.2020

Int.Class [G06T 11/00](#) Appl.No 16528645 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

The present disclosure provides an eye animated expression display method. The method includes: receiving an instruction for displaying an eye animated expression; parsing a JSON file storing the eye animated emoticon to obtain a parsing result; and displaying the eye animated emoticon on the eye display screen based on the parsing result. The present disclosure further provides a robot. In the above-mentioned manner, the present disclosure is capable of improving the interactive performance of the eyes of the robot while reducing the space for storing eye animated expressions.

91. [20210107577](#) ZERO MOMENT POINT JITTER PROCESSING METHOD AND APPARATUS AND ROBOT USING THE SAME

US - 15.04.2021

Int.Class [B62D 57/02](#) Appl.No 16724413 Applicant UBTECH ROBOTICS CORP LTD Inventor Chunyu Chen

The present disclosure provides a zero moment point jitter processing method as well as an apparatus and a robot using the same. The method includes: obtaining left foot force information and right foot force information collected by sensors; calculating a first zero moment point and a second zero moment point of soles of two feet of a robot based on the left foot force information and the right foot force information; calculating a third zero moment point of the robot according to the first zero moment point and the second zero moment point; calculating a jitter amplitude of the third zero moment point within a preset period; and adjusting a position of the third zero moment point in response to the jitter amplitude being not larger than a predetermined jitter amplitude threshold. In this manner, the robot can eliminate zero moment point jitters within a certain amplitude.

92. [20210200190](#) ACTION IMITATION METHOD AND ROBOT AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME

US - 01.07.2021

Int.Class [G05B 19/4155](#) Appl.No 17115735 Applicant UBTECH ROBOTICS CORP LTD Inventor Miaochen Guo

The present disclosure provides action imitation method as well as a robot and a computer readable storage medium using the same. The method includes: collecting at least a two-dimensional image of a to-be-imitated object; obtaining two-dimensional coordinates of each key point of the to-be-imitated object in the two-dimensional image and a pairing relationship between the key points of the to-be-imitated object; converting the two-dimensional coordinates of the key points of the to-be-imitated object in the two-dimensional image into space three-dimensional coordinates corresponding to the key points of the to-be-imitated object through a pre-trained first neural network model, and generating an action control instruction of a robot based on the space three-dimensional coordinates corresponding to the key points of the to-be-imitated object and the pairing relationship between the key points, where the action control instruction is for controlling the robot to imitate an action of the to-be-imitated object.

93. [10771925](#) LOCALIZATION METHODS AND SYSTEM USING THE SAME

US - 08.09.2020

Int.Class [H04W 4/02](#) Appl.No 16699763 Applicant UBTECH ROBOTICS CORP LTD Inventor Yongsheng Zhao

The present disclosure provides localization methods and a system using the same. One of the methods includes: broadcasting a ranging frame in an awake state of a localization tag; obtaining a response frame returned by the first anchor according to the ranging frame; updating the ranging anchor list according to the response frame; and calculating a distance between the localization tag and the first anchor based on a time of broadcasting the ranging frame, a time of receiving the response frame, the time of the first anchor receiving the ranging frame, and the time of the first anchor transmitting the response frame. In such a manner, the localization tag is enabled to switch the anchor for ranging in time according to the updated ranging anchor list during movement, thereby automatically ranging with the nearby anchor.

94. [20210347060](#) WHEELED BASE

US - 11.11.2021

Int.Class [B25J 11/00](#) Appl.No 16923069 Applicant UBTECH ROBOTICS CORP LTD Inventor Marten Byl

A robotic assistant includes a wheeled base, a storage unit including drawers, a foldable arm connected to a top of the storage unit and including an end of arm tooling (EOAT) connected to a distal end of the foldable arm, an elevation mechanism positioned on the wheeled base and used to move the storage unit up and down, and a control system that receives command instructions. In response to the command instructions, the control system is configured to move

the wheeled base, open or close the one or more drawers, actuate movement of the foldable arm and the EOAT to pick up and place external objects from/to a determined location, and control the storage unit to move up/down.

95. [20200198149](#) ROBOT VISION IMAGE FEATURE EXTRACTION METHOD AND APPARATUS AND ROBOT USING THE SAME US - 25.06.2020

Int.Class [G06T 7/73](#) Appl.No 16699132 Applicant UBTECH ROBOTICS CORP LTD Inventor Chenchen Jiang

The present disclosure provides a robot visual image feature extraction method as well as an apparatus and a robot using the same. The method includes: collecting image data through visual sensor(s) of the robot, and collecting angular velocity data through inertial sensor(s) of the robot; calculating a relative pose between image frames in the image data based on the angular velocity data; extracting feature points of the first image frame in the image data; calculating a projection position of each feature point of the k-th image frame in the k+1-th image frame based on a relative pose between the k-th image frame and the k+1-th image frame; and searching for each feature point in the projection position in the k+1-th image frame, and performing a synchronous positioning and a mapping based on the searched feature point. In this manner, the feature points of dynamic objects are eliminated.

96. [20210201890](#) VOICE CONVERSION TRAINING METHOD AND SERVER AND COMPUTER READABLE STORAGE MEDIUM US - 01.07.2021

Int.Class [G10L 15/06](#) Appl.No 17095751 Applicant UBTECH ROBOTICS CORP LTD Inventor Ruotong Wang

The present disclosure discloses a voice conversion training method. The method includes: forming a first training data set including a plurality of training voice data groups; selecting two of the training voice data groups from the first training data set to input into a voice conversion neural network for training; forming a second training data set including the first training data set and a first source speaker voice data group; inputting one of the training voice data groups selected from the first training data set and the first source speaker voice data group into the network for training; forming the third training data set including the second source speaker voice data group and the personalized voice data group that are parallel corpus with respect to each other; and inputting the second source speaker voice data group and the personalized voice data group into the network for training.

97. [20210086096](#) BUILDING BLOCK AND BUILDING BLOCK KIT US - 25.03.2021

Int.Class [A63H 33/08](#) Appl.No 16727949 Applicant UBTECH ROBOTICS CORP LTD Inventor Xiongyuan Fang

A building block includes at least one of a plug portion and a socket portion. The plug portion has two cantilevered tongues deflectable toward each other. Each cantilevered tongue includes a first engaging portion. The socket portion defines a chamber and has two second engaging portions. The plug portion and the socket portion are configured in such a way that the plug portion of one building block is insertable into the chamber of the socket portion of another building block, and the two cantilevered tongues of the building block deflect toward each other after insertion of the plug portion of the building block into the chamber of the socket portion of the other building block, which allows the first engaging portions of the building block to be engaged with the second engaging portions of the other building block, thereby connecting the two building blocks together.

98. [20220193896](#) ROBOT BALANCE CONTROL METHOD, ROBOT USING THE SAME, AND COMPUTER READABLE STORAGE MEDIUM US - 23.06.2022

Int.Class [B25J 9/16](#) Appl.No 17557076 Applicant UBTECH ROBOTICS CORP LTD Inventor Hongge Wang

A robot balance control method as well as a robot using the same and a computer readable storage medium are provided. In the method, a brand new flywheel model different from the existing flywheel model is created. In this flywheel model, the foot of the support leg of the robot is equivalent to the massless link of the flywheel model, while rest parts of the robot are equivalent to the flywheel of the flywheel model. Compared with the various models in the prior art, this flywheel model is more in line with the actual situation of the robot during the monopod supporting period. By controlling the posture of the foot of the support leg based on this flywheel model, a better balance effect can be achieved, which avoids the overturning of the robot.

99. [20220193902](#) TOTAL CENTROID STATE ESTIMATION METHOD, HUMANOID ROBOT AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME US - 23.06.2022

Int.Class [B25J 9/16](#) Appl.No 17485412 Applicant UBTECH ROBOTICS CORP LTD. Inventor Xiaozhu Ju

A total centroid state estimation method as well as a humanoid robot and a computer readable storage medium using the same are provided. The method includes: obtaining a motion state of each real joint of the humanoid robot and a motion state of its floating base, where the floating base is equivalent to a plurality of sequent-connected virtual joints; calculating a joint position, a centroid position, and a rotation matrix of each link in the world coordinate system in sequence using the chain rule of homogeneous multiplication according to the position of the joint corresponding to the link to solve a Jacobian matrix of the centroid of the link; solving a total centroid Jacobian matrix based on the Jacobian matrix of the centroid of each link and the total mass; and calculating the total centroid velocity based on the total centroid Jacobian matrix and other parameters.

100. [20210181748](#) ROBOT BALANCE CONTROL METHOD, COMPUTER-READABLE STORAGE MEDIUM AND ROBOT US - 17.06.2021

Int.Class [G05D 1/02](#) Appl.No 17120232 Applicant UBTECH ROBOTICS CORP LTD Inventor Chunyu Chen

A robot balance control method includes: obtaining force information associated with a left foot and a right foot of the robot; calculating a zero moment point of a center of mass (COM) of a body of the robot based on the force information; calculating a first position offset and a second position offset of the robot according to the zero moment point of the COM of the body; updating a position trajectory of the robot according to the first position offset and the second offset to obtain an updated position of the COM of the body; performing inverse kinematics analysis on the updated position of the COM of the body to obtain joint angles of the left leg and the right leg of the robot; and controlling the robot to move according to the joint angles.

101. [20210197909](#) LEG MECHANISM AND HUMANOID ROBOT US - 01.07.2021

Int.Class [B62D 57/032](#) Appl.No 17134202 Applicant UBTECH ROBOTICS CORP LTD. Inventor Liang Huang

A leg mechanism of a humanoid robot includes: an upper leg, a lower leg rotatably coupled to the upper leg, a knee module actuator mounted to the upper leg, a foot rotatably connected to the lower leg, a knee transmission mechanism connected to the knee module actuator and the lower leg and configured to transmit rotary motion from the knee module actuator to the lower leg, at least one ankle module actuator mounted to the upper leg, at least one ankle transmission mechanism connected to the at least one ankle module actuator and the foot and configured to transmit rotary motion from the at least one ankle module actuator to the foot.



102. [20210197367](#) HUMANOID ROBOT AND ITS CONTROL METHOD AND COMPUTER READABLE STORAGE MEDIUM US - 01.07.2021

Int.Class [B25J 9/16](#) Appl.No 17133656 Applicant UBTECH ROBOTICS CORP LTD Inventor Yan Xie

The present disclosure provides a humanoid robot and its control method and computer readable storage medium. The method includes: obtaining a current torque of a sole of the humanoid robot, an inclination angle of the sole, an inclination angle of a first joint of the humanoid robot, and an inclination angle of a second joint of the humanoid robot; calculating current feedforward angular velocities of motors of the first and second joints through the obtained information; calculating feedback angular velocities of the motors of the first and second joints; and obtaining inclination angles of the joints based on the feedforward angular velocities of the motors and the feedback angular velocities of the motors, and performing, through the motor of the second joint, a deviation control on the joints according to the inclination angles of the joints.

103. [20200210776](#) QUESTION ANSWERING METHOD, TERMINAL, AND NON-TRANSITORY COMPUTER READABLE STORAGE MEDIUM US - 02.07.2020

Int.Class [G06K 9/62](#) Appl.No 16727946 Applicant UBTECH ROBOTICS CORP LTD Inventor Weixing XIONG

The present invention discloses a question answering method including obtaining a first question and a first category of the first question, combining the first question with each of preset second questions corresponding to the first category to form question groups, inputting the question groups into a trained deep retrieval matching classification model to obtain a first probability of a first classification label of each of the question groups, inputting the first question into a gradient boosting decision model to obtain a second category of the first question, obtaining a second category of the second questions, adjusting the first probability of the first classification label of each of the question groups, according to the second category of the second questions and the second category of the first question in each of the question groups, and outputting a reply according to adjusted first probabilities for solving a problem of low reply accuracy.

104. [20210221455](#) LEGGED ROBOT CONTINUOUS HOPPING CONTROL METHOD AND LEGGED ROBOT AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME US - 22.07.2021

Int.Class [B62D 57/032](#) Appl.No 17092347 Applicant UBTECH ROBOTICS CORP LTD Inventor Yuesong Wang

The present disclosure provides a legged robot continuous hopping control method as well as a legged robot and a computer readable storage medium using the same. The method includes: dividing each of the phases into a desired entry stage, an actual entry stage, a during stage, and an exit and state transiting stage; detecting a transiting between the stages of the acceleration phase, the flight phase, and the deceleration phase to obtain a corresponding state detecting result; updating state information of the robot based on the state detecting result; and controlling the robot to continuously hop by transiting between the stages of the acceleration phase, the flight phase, and the deceleration phase according to the updated state information. In this manner, the stability of the continuous hopping of the legged robot can be greatly improved.

105. [20210060802](#) ROBOT POSE DETERMINATION METHOD AND APPARATUS AND ROBOT USING THE SAME US - 04.03.2021

Int.Class [B25J 19/02](#) Appl.No 16709931 Applicant UBTECH ROBOTICS CORP LTD Inventor Yongsheng Zhao

The present disclosure provides a robot pose determination method including: collecting laser frames; calculating a current pose of the robot in a map pointed by a first pointer based on the laser frames, and obtaining an amount of the laser frames having been inserted into the map pointed by the first pointer; inserting the laser frames into a map pointed by the first pointer, if less than a first threshold; inserting the laser frames into the map pointed by the first pointer and a map pointed by a second pointer, if greater than or equal to the first threshold and less than a second threshold; and pointing the first pointer to the map pointed by the second pointer, pointing the second pointer to a newly created empty map, and inserting the laser frames into the map pointed by the first pointer, if equal to the second threshold.

106. [20200191263](#) SERVO US - 18.06.2020

Int.Class [F16H 61/32](#) Appl.No 16447982 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

A servo includes a motor having a rotating shaft, an output shaft disposed apart from the rotating shaft, a transmission mechanism to transmit mechanical power from the motor to the output shaft, a circuit board, a first detected member fixed to an end of the rotating shaft, a second detected member fixed to an end of the output shaft adjacent to the circuit board; and a first detecting member and a second detecting member mounted on the circuit board and configured to respectively detect rotational angles of the rotating shaft and the output shaft, based on changes caused by rotation of the first detected member and the second detected member.

107. [20200193027](#) FIRMWARE UPGRADE METHOD, SLAVE STATION OF ROBOT, AND MACHINE READABLE STORAGE MEDIUM US - 18.06.2020

Int.Class [G06F 8/654](#) Appl.No 16576807 Applicant UBTECH ROBOTICS CORP LTD Inventor Malin Wang

A firmware upgrade method for a slave station of a robot communicates with a master station of the robot via an EtherCAT bus of the robot, includes: switching a work mode of the slave station to an upgrade mode in response to a firmware upgrade instruction, receiving a new firmware corresponding to this firmware upgrade via the EtherCAT bus, storing the new firmware in a second storage area of a flash memory of the slave station, restarting the slave station after the new firmware is received, and copying the new firmware stored in the second storage area to a first storage area of the flash memory and executing the new firmware in the first storage area when the slave station is started. A slave station of the robot and a machine readable storage medium are also provided.

108. [20210341099](#) ELEVATION DEVICE AND ROBOT US - 04.11.2021

Int.Class [F16M 13/02](#) Appl.No 17243523 Applicant UBTECH ROBOTICS CORP LTD Inventor Yongjin Zhao

An elevation device includes a mounting frame, a rotary actuator fixed to the mounting frame, a shaft connected to the rotary actuator and rotatable with respect to the mounting frame, a drive bar slidably connected to the mounting frame, and a connecting member fixed to the shaft. The shaft defines a helical groove in a lateral surface thereof. The drive bar includes a post that is movably fit in the helical groove. The mounting frame, the shaft and the drive bar constitute a conversion mechanism that converts rotation of the shaft into linear motion of the drive bar. The drive bar is slidable with respect to the mounting frame along a direction that is parallel to an axis of rotation of the shaft.



109. [20210370522](#) THUMB STRUCTURE AND ROBOT

US - 02.12.2021

Int.Class [B25J 15/00](#) Appl.No 17216716 Applicant UBTECH ROBOTICS CORP LTD Inventor Kunlei Zhao

A thumb structure includes a proximal phalanx, a distal phalanx rotatably connected to one end of the proximal phalanx, a fixing member connected to the proximal phalanx through a first ball joint, a linking member having opposite ends that are connected to the distal phalanx and the fixing member through a second ball joint and a third ball joint, a first actuating assembly to drive the proximal phalanx to swing in a direction of a first degree of freedom, and a second actuating assembly to drive the proximal phalanx to swing in a direction of a second degree of freedom.

110. [20210370523](#) ROBOTIC FINGER STRUCTURE AND ROBOT

US - 02.12.2021

Int.Class [B25J 15/00](#) Appl.No 17326259 Applicant UBTECH ROBOTICS CORP LTD Inventor Kunlei Zhao

A robotic finger structure includes a proximal phalanx; a middle phalanx rotatably connected to one end of the proximal phalanx; a distal phalanx rotatably connected to one end of the middle phalanx and defining a distal phalanx opening in a front side thereof and at one end adjacent to the middle phalanx; a connecting rod having opposite ends that are rotatably connected to the proximal phalanx and the distal phalanx, and an actuating assembly to drive the middle phalanx to rotate with respect to the proximal phalanx. The connecting rod includes a first angled segment having a first recess facing a back side of the middle phalanx. When the distal phalanx is flush with the middle phalanx, the first angled segment passes through the distal phalanx opening, and a first end of the distal phalanx opening extends into the first recess.

111. [20220203534](#) PATH PLANNING METHOD AND BIPED ROBOT USING THE SAME

US - 30.06.2022

Int.Class [B25J 9/16](#) Appl.No 17516729 Applicant UBTECH ROBOTICS CORP LTD Inventor Xingxing Ma

A path planning method and a biped robot using the same are provided. The method includes: generating a candidate node set for a next foot placement based on a biped robot's own parameters and joint information of a current node, adding valid candidate nodes in the candidate node set to a priority queue so as to select optimal nodes for realizing next node expansion. These optimal nodes are output to generate a foot placement sequence from an initial node to a target node, which can greatly reduce the search amount for path nodes when the robot's legs intersect and touch the ground, thereby improving the efficiency of path planning.

112. [20210056295](#) FACE IDENTIFICATION METHOD AND TERMINAL DEVICE USING THE SAME

US - 25.02.2021

Int.Class [G06K 9/00](#) Appl.No 16817554 Applicant UBTECH ROBOTICS CORP LTD Inventor Jun Cheng

The present disclosure provides a face identification method and a terminal device using the same. The method includes: obtaining a to-be-detected image; performing a brightness enhancement process on the to-be-detected image based on a preset second calculation method to generate a to-be-identified face image; obtaining a first channel value of each channel corresponding to each pixel in the to-be-identified face image; performing another brightness enhancement process on the to-be-identified face image based on each first channel value and a preset first calculation method to obtain a target to-be-identified face image; and performing a face identification process on the target to-be-identified face image to obtain an identification result. Through the above-mentioned scheme, an enhanced face identification manner for the images of low brightness is provided.

113. [20200206959](#) ROBOTIC ARM AND ROBOT HAVING THE SAME

US - 02.07.2020

Int.Class [B25J 18/00](#) Appl.No 16709927 Applicant UBTECH ROBOTICS CORP LTD Inventor Youpeng Li

A robotic arm assembly includes a main body, a number of servos arranged within the main body, each of which has an output shaft, and a rotary connection member connected to the output shaft of one of the servos at a first end of the main body. The rotary connection member defines a through hole allows cables to pass therethrough.

114. [20200211413](#) METHOD, APPARATUS AND TERMINAL DEVICE FOR CONSTRUCTING PARTS TOGETHER

US - 02.07.2020

Int.Class [G09B 19/00](#) Appl.No 16677698 Applicant UBTECH ROBOTICS CORP LTD Inventor Yanhui Zhang

The present disclosure is provides a method, an apparatus and a terminal device for constructing parts together. The method includes: determining an assembly progress of an object constructed of parts; determining a currently required part according to the assembly progress; identifying, in a part photo of the object, the currently required part using a pre-trained first neural network model and marking the one or more identified currently required parts in the part photo; and displaying, via a display, a 3D demonstration animation with the marked part photo as a background image. The method is based on the existing 3D demonstration animation, which identifies the currently required part in the captured part photo and marks the identified currently required part in the part photo, and then displays the marked part photo as the background image of the 3D demonstration animation, thereby adding a prompt for the real part.

115. [20200206925](#) IMPEDANCE CONTROL METHOD FOR BIPED ROBOT AND APPARATUS AND BIPED ROBOT USING THE SAME

US - 02.07.2020

Int.Class [G01F 23/26](#) Appl.No 16660822 Applicant UBTECH ROBOTICS CORP LTD Inventor Yuesong Wang

The present disclosure provides an impedance control method for a biped robot as well as an apparatus and a biped robot using the same. The method includes: correcting an impact force on a landing leg in the two legs of the biped robot using a natural attenuation function, and taking the corrected impact force as an input of an impedance control; obtaining an impedance model of the biped robot; determining a transfer function of the impedance control based on the impedance model; calculating an output of the impedance control based on the input of the impedance control and the transfer function of the impedance control; determining a joint angle of each joint based on the output of the impedance control and a planned pose of the biped robot; and transmitting joint angle information of each joint to motor(s) of the joint to perform the impedance control.

116. [20220040857](#) HUMANOID ROBOT AND ITS BALANCE CONTROL METHOD AND COMPUTER READABLE STORAGE MEDIUM

US - 10.02.2022

Int.Class [B25J 9/16](#) Appl.No 17138948 Applicant UBTECH ROBOTICS CORP LTD Inventor Yan Xie

A humanoid robot and its balance control method and computer readable storage medium are provided. Expected accelerations of each of a sole and centroid of a humanoid robot corresponding to a current expected balance trajectory and an expected angular acceleration of the waist corresponding to the current expected balance trajectory are obtained based on current motion data of the sole, the centroid, and the waist, respectively first, then an expected angular acceleration of each joint meeting control requirements of the sole, the centroid, and the waist while the robot corresponds to the current

expected balance trajectory is calculated based on an angular velocity of the joint, the expected accelerations of the waist, the sole, and the centroid, respectively, and then each joint of the robot is controlled to move at the obtained expected angular acceleration of the joint based on the angular displacement of the joint.

117. [20220009093](#) TASK HIERARCHICAL CONTROL METHOD, AND ROBOT AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME US - 13.01.2022

Int.Class [B25J 9/16](#) Appl.No 17192906 Applicant UBTECH ROBOTICS CORP LTD Inventor Xiaoyu Ren

A task hierarchical control method as well as a robot and a storage medium using the same are provided. The method includes: obtaining a task instruction for a robot, where the task instruction is for determining a target task card including an amount of selection matrices for dividing a target task into the amount of hierarchical subtasks and a controller name for executing each of the hierarchical subtasks; obtaining a null space projection matrix of each of the hierarchical subtasks based on the corresponding selection matrix; generating control links of the amount according to the corresponding controller of each of the hierarchical subtasks and the corresponding null space projection matrix; calculating a control torque of each of the control links and obtaining a hierarchical control output quantity by adding all the control torques; and controlling the robot to perform the target task using the hierarchical control output quantity.

118. [20210146793](#) CHARGING MODULE AND ROBOT HAVING THE SAME US - 20.05.2021

Int.Class [B60L 53/36](#) Appl.No 16870902 Applicant UBTECH ROBOTICS CORP LTD Inventor Defu Liu

A charging module for use with a charging station that includes a first connector, includes a housing, a second connector, and a guide structure configured to guide the first connector in a vertical direction. The guide structure includes a guiding member fixed to the second connector, or a guiding mechanism that elastically connects the second connector to the housing and allows the second connector to move with respect to the housing in the vertical direction.

119. [3248735](#) ROBOT JOINT STRUCTURE EP - 29.11.2017

Int.Class [B25J 17/00](#) Appl.No 16196949 Applicant UBTECH ROBOTICS CORP LTD Inventor WANG YANG

The present invention discloses a robot joint structure that includes a servo and a connection part. The servo includes a servo main body and an output shaft, and one end of the output protruding out of the servo main body. The servo main body includes a servo plate at one side surface thereof. The servo plate is fixed to the output shaft and capable of rotating together with the output shaft. The connection part includes a first connection arm, and the first connection arm defines at least one connection chamber allowing the servo plate to be inserted therein and mating with the servo plate, to fix the connection part to the servo plate. The servo and the connection part of the robot joint structure mate with each other, which avoids the disengagement during rotation. The assembling process is simple, which enhances the user experience.

120. [20220044006](#) METHOD AND APPRATUS FOR FACE RECOGNITION AND COMPUTER READABLE STORAGE MEDIUM US - 10.02.2022

Int.Class [G06V 40/16](#) Appl.No 17105667 Applicant UBTECH ROBOTICS CORP LTD Inventor Yue Wang

The present disclosure provides a method and an apparatus for face recognition and a computer readable storage medium. The method includes: inputting a to-be-recognized blurry face image into a generator of a trained generative adversarial network to obtain a to-be-recognized clear face image; inputting the to-be-recognized clear face image to the feature extraction network to obtain a facial feature of the to-be-recognized clear face image; matching the facial feature of the to-be-recognized clear face image with each user facial feature in a preset facial feature database to determine the user facial feature best matching the to-be-recognized clear face image as a target user facial feature; and determining a user associated with the target user facial feature as a recognition result. Through this solution, the accuracy of the recognition of blurry faces can be improved.

121. [20220206501](#) DYNAMIC FOOTPRINT SET GENERATION METHOD, BIPED ROBOT USING THE SAME, AND COMPUTER READABLE STORAGE MEDIUM US - 30.06.2022

Int.Class [G05D 1/02](#) Appl.No 17462019 Applicant UBTECH ROBOTICS CORP LTD Inventor Xingxing Ma

A dynamic footprint set generation method, a biped robot using die same, and a computer readable storage medium are provided. The method includes: obtaining preset footprint calculation parameters; calculating a landing point position based on the preset footprint calculation parameters; determining a landing point range based on a landing point position, and performing a collision detection on the landing point range; recording the corresponding landing point position in a footprint set in response to the detection result representing there being no collision; obtaining a preset adjustment amplitude to update a preset displacement angle after the recording is completed; and returning to the calculating the landing point position until the footprint set is generated. By continuously adjusting the preset displacement angle, each landing point position is calculated accordingly, and the valid landing point positions are recorded in the footprint set, which provides more feasible landing points for navigation planning.

122. [20210193160](#) METHOD AND APPARATUS FOR VOICE CONVERSION AND STORAGE MEDIUM US - 24.06.2021

Int.Class [G10L 21/013](#) Appl.No 17084672 Applicant UBTECH ROBOTICS CORP LTD. Inventor RUOTONG WANG

The present disclosure discloses a voice conversion method. The method includes: obtaining a to-be-converted voice, and extracting acoustic features of the to-be-converted voice; obtaining a source vector corresponding to the to-be-converted voice from a source vector pool, and selecting a target vector corresponding to the target voice from the target vector pool; obtaining acoustic features of the target voice output by the voice conversion model by using the acoustic features of the to-be-converted voice, the source vector corresponding to the to-be-converted voice, and the target vector corresponding to the target voice as an input of the voice conversion model; and obtaining the target voice by converting the acoustic features of the target voice using a vocoder. In addition, a voice conversion apparatus and a storage medium are also provided.

123. [20210200223](#) ROBOTIC MOTION CONTROL METHOD AND APPARATUS AND ROBOT USING THE SAME US - 01.07.2021

Int.Class [G05D 1/02](#) Appl.No 16817565 Applicant UBTECH ROBOTICS CORP LTD Inventor Xiangbin Huang

A robotic motion control method provided by the present disclosure includes: obtaining a position and orientation of a starting point where the robot is currently located through a positioning sensor, and obtaining a position and orientation of a preset target point where the robot is moved to; determining an arc path and a straight path of the robot according to the position and orientation of the starting point, the position and orientation of the preset target point, and a preset arc radius; and moving the robot to the preset target point according to the determined arc path and straight path. Because there are only pure circular motion and pure linear motion which are simple during the movement of the robot, it is beneficial to improve the precision of the motion control of the robot and enable the robot to reach the target position in a reliable manner.



124. [20220198224](#) FACE RECOGNITION METHOD, TERMINAL DEVICE USING THE SAME, AND COMPUTER READABLE STORAGE MEDIUM US - 23.06.2022

Int.Class [G06K 9/62](#) Appl.No 17510415 Applicant UBTECH ROBOTICS CORP LTD Inventor Hanliu Wang

A backlight face recognition method, a terminal device using the same, and a computer readable storage medium are provided. The method includes: performing a face detection on each original face image in an original face image sample set to obtain a face frame corresponding to the original face image; capturing the corresponding original face images from the original face image sample set, and obtaining a new face image containing background pixels corresponding to the captured original face images from the original face image sample set; preprocessing all the obtained new face images to obtain a backlight sample set and a normal lighting sample set; and training a convolutional neural network using the backlight sample set and the normal lighting sample set until the convolutional neural network reaches a preset stopping condition. The trained convolutional neural network will improve the accuracy of face recognition in complex background and strong light.

125. [20200361101](#) LINEAR JOINT AND LEGGED ROBOT HAVING THE SAME US - 19.11.2020

Int.Class [B25J 17/02](#) Appl.No 16566908 Applicant UBTECH ROBOTICS CORP LTD Inventor ZHIHUA ZHANG

A linear joint includes a motor assembly includes a rotating shaft for outputting motion; a transmission mechanism including a screw and a nut threadedly connected to the screw, the nut being coaxial with respect to and securely connected to the rotating shaft so as to be rotatable together with the rotating shaft; and a rod connected to a first end of the screw so as to move together with the screw along a lengthwise direction of the screw.

126. [20210334524](#) GESTURE RECOGNITION METHOD AND TERMINAL DEVICE AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME US - 28.10.2021

Int.Class [G06K 9/00](#) Appl.No 17118578 Applicant UBTECH ROBOTICS CORP LTD Inventor Miao Chen Guo

The present disclosure provides a gesture recognition method as well as a terminal device and a computer-readable storage medium using the same. The method includes: obtaining a video stream collected by an image recording device in real time; performing a hand recognition on the video stream to determine static gesture information of a recognized hand in each video frame of the video stream; encoding the static gesture information in the video frames of the video stream in sequence to obtain an encoded information sequence of the recognized hands; and performing a slide detection on the encoded information sequence using a preset sliding window to determine a dynamic gesture category of each recognized hand. In this manner, static gesture recognition and dynamic gesture recognition are effectively integrated in the same process. The dynamic gesture recognition is realized through the slide detection of the sliding window without complex network calculations.

127. [20200133289](#) PATH TRACKING METHOD AND MOBILE ROBOT USING THE SAME US - 30.04.2020

Int.Class [G05D 1/02](#) Appl.No 16576794 Applicant UBTECH ROBOTICS CORP LTD Inventor Zhichao Liu

The present disclosure provides a path tracking method as well as a mobile robot using the same. The method includes: obtaining a preset path and a current position of the mobile device; determining a forward-looking path point corresponding to the current position on the preset path; obtaining a path curvature corresponding to the forward-looking path point; and determining an adjustment velocity of the mobile device at the current position based on the path curvature corresponding to the forward-looking path point. In this manner, the adjustment velocity of the mobile device can be determined based on the curvature of the path, so as to adjust the velocity of the mobile device and improve the stability of path tracking of the mobile device at different path curvatures.

128. [20220067354](#) DYNAMIC GESTURE RECOGNITION METHOD, DEVICE AND COMPUTER-READABLE STORAGE MEDIUM US - 03.03.2022

Int.Class [G06K 9/00](#) Appl.No 17463500 Applicant UBTECH Robotics Corp Ltd Inventor Chi Shao

A dynamic gesture recognition method includes: performing detection on each frame of image of a video stream using a preset static gesture detection model to obtain a static gesture in each frame of image of the video stream; in response to detection of a change of the static gesture from a preset first gesture to a second gesture, suspending the static gesture detection model and activating a preset dynamic gesture detection model; and performing detection on multiple frames of images that are pre-stored in a storage medium using the dynamic gesture detection model to obtain a dynamic gesture recognition result.

129. [20210187731](#) ROBOTIC ARM CONTROL METHOD AND APPARATUS AND TERMINAL DEVICE USING THE SAME US - 24.06.2021

Int.Class [B25J 9/16](#) Appl.No 16817576 Applicant UBTECH ROBOTICS CORP LTD Inventor Zecai Lin

The present disclosure provides a robotic arm control method as well as an apparatus and a terminal device using the same. The method includes: obtaining a current joint angle of each of M joints of the robotic arm; obtaining a reference included angle based on the current joint angle of each of the M joints of the robotic arm; determining an expected included angle corresponding to the robotic arm within a target angle range based on the reference included angle and the preset included angle related evaluation function; and controlling the robotic arm based on the target joint angles of the M joints.

130. [20210154835](#) ROBOT PATH PLANNING METHOD AND APPARATUS AND ROBOT USING THE SAME US - 27.05.2021

Int.Class [B25J 9/16](#) Appl.No 16734402 Applicant UBTECH ROBOTICS CORP LTD Inventor Hongjian Liu

The present disclosure provides a robot path planning method as well as an apparatus and a robot using the same. The method includes: obtaining a grid map and obtaining a position of obstacle and a position of track in the grid map; determining a cost of grids of the grid map based on the position of obstacle and the position of track; generating a grid cost map based on the cost of the grids and the grid map; and planning a global path of the robot from a current position to a destination position based on the grid cost map. In this manner, it effectively integrates free navigation and track navigation, thereby improving the flexibility of obstacle avoidance and ensuring the safety of obstacle avoidance of the robot.

131. [20200206935](#) SERVO CALIBRATION METHOD AND APPARATUS AND ROBOT USING THE SAME US - 02.07.2020

Int.Class [B25J 19/02](#) Appl.No 16508335 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong



A servo calibration method as well as an apparatus and a robot using the same are provided. The method includes: obtaining data of a position sensor on a motor shaft of the servo; obtaining data of a position sensor on an output shaft of the servo; determining whether a clutch protection has been performed on the servo based on data of the position sensor on the motor shaft and data of the position sensor on the output shaft; and calibrating a position of the motor shaft based on the data of the position sensor on the output shaft, if the clutch protection has been performed on the servo. Hence, the problem in the prior art that the process of the calibration is cumbersome can be solved.

132. [20210197404](#) ROBOT JOINT AND ROBOT HAVING THE SAME

US - 01.07.2021

Int.Class [B25J 17/00](#) Appl.No 16854856 Applicant UBTECH ROBOTICS CORP LTD Inventor Jian Li

A robot joint includes a casing, a motor assembly including a stator and a rotor that are arranged within the casing, and a harmonic drive received, at least in part, in the rotor. The harmonic drive includes a circular spline, a wave generator fixed to the rotor, and a flex spline. The circular spline is arranged around and engaged with the flex spline. The wave generator is received in the flex spline and configured to drive the flex spline to rotate with respect to the circular spline. The robot joint further includes an output shaft fixed to the flex spline.

133. [10667045](#) ROBOT AND AUTO DATA PROCESSING METHOD THEREOF

US - 26.05.2020

Int.Class [H04R 1/40](#) Appl.No 16447986 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

The present disclosure provides a robot and an audio data processing method thereof. The robot includes a body part, a main control module, and a sound pickup module electrically coupled to the main control module. The sound pickup module includes N microphones distributed around the body part to collect audio data. The main control module is configured to obtain the audio data of a sound source from a part of the N microphones collecting the audio data of the sound source without blocked by the body part, and perform a sound source localization and a sound pickup based on the obtained audio data. The 360-degree wake-up and sound source localization of the robot and the beam-forming of directional beams are realized. In addition, the sound pickup is realized without forming microphone holes on the head of the robot, hence the aesthetics of the robot will not be affected.

134. [20200209890](#) ROBOT CENTROID POSITION ADJUSTMENT METHOD AND APPARATUS AND ROBOT USING THE SAME

US - 02.07.2020

Int.Class [G05D 1/08](#) Appl.No 16587069 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

The present disclosure provides a robot centroid position adjustment method as well as an apparatus and a robot using the same. The method includes: obtaining initial values; obtaining a waist velocity adjustment value; calculating a current value of the centroid position; and determining whether a current value of the centroid position is equal to the planning value of the centroid position; if the current value of the centroid position is not equal to the planning value of the centroid position, obtaining the current value of the centroid position to take as the initial value of the centroid position and returning to the step of obtaining the waist velocity adjustment value until the current value of the centroid position is equal to the planning value of the centroid position. In such a manner, the balance ability of the robot can be improved.

135. [20200133285](#) CHASSIS STRUCTURE FOR ROBOT AND ROBOT WITH THE SAME

US - 30.04.2020

Int.Class [G05D 1/02](#) Appl.No 16436923 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

The present disclosure provides a chassis structure for a robot and a robot with the same. The low speed motor provided with an extra encoder is used to compose a driving wheel so as to drive a driven wheel and a chassis to move; a driver module is used to drive the driving wheel through a low speed motor in response to the control of a control processing module, and obtain rotational parameters of the low speed motor through the encoder to output to the control processing module; the control processing module is used to control the driving wheel to rotate through the driver module so as to drive the chassis to move, calculate a movement path of the chassis based on the rotational parameters of the low speed motor, thereby adjusting the movement path of the chassis. In the present disclosure, since there is no transmission mechanism, the efficiency of transmission is improved.

136. [20220134581](#) ENERGY STORING ASSISTIVE MECHANISM, ROBOTIC JOINT AND ROBOT

US - 05.05.2022

Int.Class [B25J 19/00](#) Appl.No 17499890 Applicant UBTECH ROBOTICS CORP LTD Inventor Zhongkui Huang

An energy storing assistive mechanism includes a barrel having a first pivot end and an open end, a rod having a first end that passes through the open end and is received in the barrel, an elastic structure including two ends that abut against the first end of the rod and the first pivot end, a uni-directional gear rack having a second pivot end away from the barrel, and a locking mechanism fixed to the rod, the locking mechanism comprising a locking member and an actuator assembly that is to drive the locking member to move between a first position where the locking member is engaged with the gear rack, and a second position where the locking member is disengaged from the gear rack.

137. [20220040851](#) ROBOT POSTURE CONTROL METHOD AND ROBOT AND COMPUTER READABLE STORAGE MEDIUM USING THE SAME

US - 10.02.2022

Int.Class [B25J 9/16](#) Appl.No 17107966 Applicant UBTECH ROBOTICS CORP LTD Inventor Xiaozhu Ju

The present disclosure provides a robot posture control method as well as a robot and a computer readable storage medium using the same. The method includes: constructing a virtual model of the robot, wherein the virtual model comprises a momentum wheel inverted pendulum model of the robot and an angle between a sole surface of the robot and a horizontal plane; and performing a posture control based on outer-loop feedback control, inner loop compensation for the external disturbance rejection in position level, inner loop external disturbance rejection via null-space in velocity level, and inner loop external disturbance rejection in force/acceleration level on the robot. In this manner, a brand-new virtual model is provided, which can fully reflect the upper body posture, centroid, foot posture, and the like of the robot which are extremely critical elements for the balance and posture control of the robot.

138. [20210190513](#) NAVIGATION MAP UPDATING METHOD AND APPARATUS AND ROBOT USING THE SAME

US - 24.06.2021

Int.Class [G01C 21/32](#) Appl.No 16843923 Applicant UBTECH ROBOTICS CORP LTD Inventor Yongsheng Zhao

The present disclosure discloses a navigation map updating method as well as an apparatus, and a robot using the same. The method includes: controlling a robot to move along a designated path after a successful relocation of the robot, and recording key frame data of each frame on the designated path and a corresponding pose; creating a new navigation map, and copying information in an original navigation map into the new navigation map; and covering the key frame data of each frame on the designated path onto the new navigation map to obtain an updated navigation map. In this manner, there is no need for the user to manipulate the robot to recreate the map at the environment where the robot is operated, which saves a lot of time and manpower.



139. [20200206898](#) BIPED ROBOT GAIT CONTROL METHOD AND BIPED ROBOT

US - 02.07.2020

Int.Class [B25J 9/00](#) Appl.No 16572637 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

There are a biped robot gait control method and a biped robot, where the method includes: obtaining six-dimensional force information, and determining a motion state of two legs of the biped robot; calculating a ZMP position of each of two legs of the biped robot; determining a ZMP expected value of each of the two legs in real time; obtaining a compensation angle of an ankle joint of each of the two legs of the biped robot by inputting the ZMP position, a change rate of the ZMP position, the ZMP expected value, and a change rate of the ZMP expected value to an ankle joint smoothing controller so as to perform a close-loop ZMP tracking control on each of the two legs; adjusting a current angle of the ankle joint of each of the two legs of the biped robot in real time; and repeating the foregoing steps.

140. [20210129341](#) ROBOT LOCALIZATION METHOD AND APPARATUS AND ROBOT USING THE SAME

US - 06.05.2021

Int.Class [B25J 9/16](#) Appl.No 16727948 Applicant UBTECH ROBOTICS CORP LTD Inventor Hongjian Liu

The present disclosure relates to robot technology, and particularly to a robot localization method as well as an apparatus and a robot using the same. The method includes: obtaining a set of particles for localizing the robot; updating a position of each particle in the set of particles based on a preset motion model to obtain the updated position of the particle; obtaining laser measurement data and UWB measurement data; calculating a matching probability of each particle based on the laser measurement data, the UWB measurement data, and the updated position of the particle; and localizing the robot based on the matching probability of each particle. In such a manner, the UWB measurement data is applied to the traditional particle filtering localization algorithm based on laser measurement data so as to enhance the localization precision in large indoor scenes.

141. [3165267](#) ENTERTAINMENT ROBOT SERVO

EP - 10.05.2017

Int.Class [A63H 11/00](#) Appl.No 15897911 Applicant UBTECH ROBOTICS CORP LTD Inventor WU YUMIAO

The present invention discloses a servo of an entertainment robot that includes a servo main body and a servo plate. The servo main body includes a casing and an output shaft. The casing is a hexahedron. The servo plate is fixed to the output shaft of the servo main body. The servo plate includes a square drive plate. At least one surface of the servo main body includes a T slot having an opening at one end. The size of the T slot matches the size of the drive plate of the servo plate. Tools are not needed for assembling/disassembling during the assembling of entertainment robots, thereby reducing the complexity during assembling, lowering the assembly difficulty, simplifying the assembling process, increasing the joy of DIY, and providing more space for the users to bring into play their imaginations.

142. [20210200952](#) ENTITY RECOGNITION MODEL TRAINING METHOD AND ENTITY RECOGNITION METHOD AND APPARATUS USING THEM

US - 01.07.2021

Int.Class [G06F 40/295](#) Appl.No 17134494 Applicant UBTECH ROBOTICS CORP LTD Inventor Weixing Xiong

The present disclosure discloses an entity recognition model training method and an entity recognition method as well as an apparatus using them. The entity recognition model training method includes: obtaining a training text and matching the training text with a database to obtain a plurality of matching results; processing the matching results to obtain a plurality of feature vectors corresponding to the matching results; obtaining a word vector of each word in the training text by processing the training text; and training an initial entity recognition model based on the feature vector and the word vector to obtain an entity recognition model. By using this training manner, the entity recognition model obtained can have an improved accuracy of entity recognition.

143. [20200206936](#) SERVO OUTPUT SHAFT ROTATIONAL ANGLE CALIBRATION METHOD AND SYSTEM AND ROBOT USING THE SAME

US - 02.07.2020

Int.Class [B25J 9/16](#) Appl.No 16535108 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

The present disclosure provides a servo output shaft angle calibration method and a robot using the same. In the method, when a servo output shaft rotational angle calibration instruction is obtained, an output shaft of a servo is controlled to move in a preset rotational direction, a current angle of the output shaft of the servo is obtained when it detects that the output shaft of the servo has rotated to an end point and has a stalling, and then a preset end point angle is updated as the current angle of the output shaft of the servo, so as to take the current angle of the output shaft of the servo as the new end point angle, thereby realizing the calibration of the end point angle of the output shaft of the servo. In this manner, the entire calibration process requires no manual intervention.

144. [20220147754](#) RELOCATION METHOD, MOBILE MACHINE USING THE SAME, AND COMPUTER READABLE STORAGE MEDIUM

US - 12.05.2022

Int.Class [G06K 9/62](#) Appl.No 17463523 Applicant UBTECH ROBOTICS CORP LTD Inventor Rui Guo

A relocation method and a mobile machine using the same are provided. The method includes: obtaining a global map and a current scan map of a target scene where a mobile machine is located, and generating a local sub-map based on the global map; obtaining a black boundary in the local sub-map, determining a length and a curve complexity of the black boundary, and determining a weight of the black boundary based on the length and the curve complexity of the black boundary; determining an estimated pose and a target black boundary based on the local sub-map and the current scan image, and obtaining a matching value between the current scan image and the local sub-map based on a weight of the target black boundary; and determining the estimated pose as a relocated pose of the mobile machine in response to the matching value being larger than a preset threshold.

145. [20220040859](#) FOOTSTEP PLANNING METHOD, ROBOT AND COMPUTER-READABLE STORAGE MEDIUM

US - 10.02.2022

Int.Class [B25J 9/16](#) Appl.No 17383448 Applicant UBTECH ROBOTICS CORP LTD Inventor Zhiping Luo

A footstep planning method includes: obtaining a number of depth images of an environment in a walking direction of a legged robot; creating a three-dimensional model of the environment based on the depth images; determining at least one even region from the three-dimensional model of the environment; and selecting one or more of the at least one even region as one or more candidate footstep locations for the legged robot to step on.

146. [20220152835](#) POSE DETERMINATION METHOD, ROBOT USING THE SAME, AND COMPUTER READABLE STORAGE MEDIUM

US - 19.05.2022

Int.Class [B25J 9/16](#) Appl.No 17483837 Applicant UBTECH ROBOTICS CORP LTD Inventor Youfang Lai

A pose determination method and a robot using the same are provided. The method includes: obtaining a two-dimensional code image collected by the camera of the robot and sensor data collected by the sensor of the robot, and determining mileage information of the robot within a predetermined duration, where the sensor data includes an acceleration and an angular velocity, determining a first pose of the camera based on two-dimensional code information recognized from the two-dimensional code image and a pose estimation function, and determining a second pose of the sensor based on the sensor data; obtaining a third pose by performing a tight coupling optimization based on the first pose and the second pose; and obtaining the pose of the robot by fusing the third pose and the mileage information. In such a manner, the accuracy of determining the pose of the robot in a complex scene can be improved.

147. [20210181765](#) GAIT PLANNING METHOD, COMPUTER-READABLE STORAGE MEDIUM AND ROBOT US - 17.06.2021

Int.Class [G05D 1/08](#) Appl.No 17114526 Applicant Ubtech Robotics Corp Ltd Inventor Jie Bai

A computer-implemented gait planning method includes: determining a pitch angle between a foot of the robot and a support surface where the robot stands; determining a support point on a sole of the foot according to the pitch angle; calculating an ankle-foot position vector according to the support point, wherein the ankle-foot position vector is a position vector from an ankle of the robot to a support point on a sole of the foot; calculating a magnitude of change of an ankle position according to the pitch angle and the ankle-foot position vector; and obtaining a compensated ankle position by compensating the ankle position according to the magnitude of change of the ankle position.

148. [20200209365](#) LASER DATA CALIBRATION METHOD AND ROBOT USING THE SAME US - 02.07.2020

Int.Class [G01S 7/497](#) Appl.No 16396693 Applicant Ubtech Robotics Corp Ltd Inventor Yongsheng Zhao

The present disclosure provides a laser data calibration method and robot using the same. The method includes: obtaining a pose of a movable device; determining a pose of the lidar based on the pose of the movable device and a transformation relationship between the movable device and the lidar; determining an instantaneous speed of the lidar based on the pose of the lidar at two adjacent time points; determining a delay time of an collection time of one frame of raw laser data obtained through the lidar by scanning for one round with respect to an collection time of a first raw laser data; and obtaining a calibration data of the raw laser data based on the instantaneous speed, tire delay time, and the raw laser data. Through the above-mentioned method, the calibration of the raw laser data can be realized.

149. [20200213724](#) ROBOT AND AUDIO DATA PROCESSING METHOD THEREOF US - 02.07.2020

Int.Class [H04R 1/40](#) Appl.No 16447978 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

The present disclosure provides a robot and an audio data processing method thereof. The robot includes a body, a main control module, and a sound pickup module. The sound pickup module includes microphones divided into a first microphone array and a second microphone array; the first microphone array includes N microphones disposed around the body; the second microphone array includes M microphones disposed on the body and located on a line connecting two of the microphones in the first microphone array; the main control module is configured to obtain N channels of audio data through the first microphone array, obtain M channels of audio data through the second microphone array, and perform a sound source localization and a sound pickup based on the N channels of audio data and the M channels of audio data.

150. [20210055739](#) ROBOT RECHARGING LOCALIZATION METHOD AND ROBOT USING THE SAME US - 25.02.2021

Int.Class [G05D 1/02](#) Appl.No 16718212 Applicant UBTECH ROBOTICS CORP LTD Inventor Xiangbin Huang

The present disclosure provides a robot recharging localization method including: calculating a directional angle of a first identification line based on identification points near a radar zero point of the first recognition line collected by a radar of the robot; determining a sequence of the identification points in an identification area according to the calculated directional angle of the first identification line, and finding two endpoints of the sequence of the identification points; determining dividing point(s) in the sequence of the identification points; fitting the sequence of the identification points to obtain a linear equation of the first identification line with respect to a coordinate system of a mobile robot; and determining a central positional coordinate of the first identification line based on the dividing point(s) and a linear equation, and determining a relative position of the robot based on the central positional coordinate and the linear equation.

151. [20210166416](#) ROBERT CLIMBING CONTROL METHOD AND DEVICE AND STORAGE MEDIUM AND ROBOT US - 03.06.2021

Int.Class [G06T 7/73](#) Appl.No 17107860 Applicant UBTECH ROBOTICS CORP LTD Inventor Shuping Hu

A robot climbing control method is disclosed. The method obtains an RGB color image and a depth image of stairs, extracts an outline of a target object of a target step on the stairs from the RGB color image, determines relative position information of the robot and the target step according to the depth image and the outline of the target object, and controls the robot to climb the target step according to the relative position information. The embodiment of the present disclosure allows the robot to effectively adjust postures and forward directions on any size of and non-standardized stairs and avoids the deviation of the walking direction, thereby improving the effectiveness and safety of the stair climbing of the robot.

152. [20200184682](#) OBJECT POSE TRACKING METHOD AND APPARATUS US - 11.06.2020

Int.Class [G06T 7/73](#) Appl.No 16548868 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

The present disclosure relates to robot technology, which provides an object pose tracking method and apparatus. The method includes: obtaining an initial pose of the object, and determining a first viewing angle of an object with respect to a camera based on the initial pose; searching for a first 3D model corresponding to the first viewing angle; calculating a projected contour of an initial pose using the searched first 3D model, and obtaining feature point(s) of the projected contour; calculating a pose change amount based on the feature point(s) of the projected contour and feature point(s) of a real contour; and performing an iterative calculation on the pose change amount to obtain a pose correction amount, and obtaining a corrected pose of the object based on the pose correction amount. In the calculation process, the 3D model can be selected to improve the calculation speed by fewer feature points.

153. [20200206945](#) ROBOT POSE ESTIMATION METHOD AND APPARATUS AND ROBOT USING THE SAME US - 02.07.2020

Int.Class [B25J 9/16](#) Appl.No 16556233 Applicant UBTECH ROBOTICS CORP LTD Inventor Youjun Xiong

The present disclosure relates to robot technology, which provides a robot pose estimation method as well as an apparatus and a robot using the same. The method includes: obtaining, through an inertial measurement unit, initial 6DoF pose data; performing a first correction on the initial 6DoF pose data based on pose data obtained through an auxiliary sensor to obtain corrected 6DoF pose data; obtaining, through a 2D lidar sensor disposed on a stable platform, 3DoF pose data; and performing a second correction on the corrected 6DoF pose data based on the 3DoF pose data to obtain target 6DoF pose data. In this manner, the accuracy of the pose data of the robot is improved, and the accurate pose estimation of the robot is realized.



154. [20220203521](#) CONTROL METHOD FOR ROBOT, COMPUTER-READABLE STORAGE MEDIUM AND ROBOT US - 30.06.2022

Int.Class [B25J 9/16](#) Appl.No 17561609 Applicant UBTECH ROBOTICS CORP LTD Inventor Ligang Ge

A control method for a robot includes: determining a desired zero moment point (ZMP) of the robot; obtaining a position of a left foot and a position of a right foot of the robot, and calculating desired support forces of the left foot and the right foot according to the desired ZMP, the positions of the left foot and the right foot; obtaining measured support forces of the left foot and the right foot, and calculating an amount of change in length of the left leg and an amount of change in length of the right leg according to the desired support forces of the left foot and the right foot, the measured support forces of the left foot and the right foot; and controlling the robot to walk according to the amount of change in length of the left leg and the right leg.

155. [3783390](#) ROBOT RECHARGING LOCALIZATION METHOD AND MOBILE ROBOT USING THE SAME EP - 24.02.2021

Int.Class [G01S 17/42](#) Appl.No 19219915 Applicant UBTECH ROBOTICS CORP LTD Inventor HUANG XIANGBIN

The present disclosure provides a robot recharging localization method including: calculating a directional angle of a first identification line based on identification points near a radar zero point of the first recognition line collected by a radar of the robot; determining a sequence of the identification points in an identification area according to the calculated directional angle of the first identification line, and finding two endpoints of the sequence of the identification points; determining dividing point(s) in the sequence of the identification points; fitting the sequence of the identification points to obtain a linear equation of the first identification line with respect to a coordinate system of a mobile robot; and determining a certain positional coordinate of the first identification line as a charging station position, based on the dividing point(s) and a linear equation, and determining a relative position of the robot accordingly.

156. [20220175609](#) ROBOTIC ASSISTANT AND METHOD FOR CONTROLLING THE SAME US - 09.06.2022

Int.Class [A61H 3/04](#) Appl.No 17467461 Applicant UBTECH NORTH AMERICA RESEARCH AND DEVELOPMENT CENTER CORP  
Inventor Houzhu Ding

A robotic assistant includes a base; an elevation mechanism positioned on the base; a display rotatably mounted on the elevation mechanism; a camera positioned on the display; and a control system that receives command instructions. In response to the command instructions, the control system is to detect movement of a face of the user in a vertical direction based on the images captured by the camera. In response to detection of the movement of the face of the user in the vertical direction, the control system is to rotate the display and actuate the elevation mechanism to move the display up and down to allow the camera to face the face of the user during the movement of the face of the user in the vertical direction.

157. [11320088](#) DISPLAY STAND WITH HEIGHT ADJUSTMENT AND TILT ADJUSTMENT US - 03.05.2022

Int.Class [F16M 11/00](#) Appl.No 17113127 Applicant UBTECH NORTH AMERICA RESEARCH AND DEVELOPMENT CENTER CORP  
Inventor Houzhu Ding

A display stand includes a frame, an actuated rotary mechanism coupled to the frame, a counterweight coupled to the actuated rotary mechanism and movable in a vertical direction during rotation of the display about the axis of rotation, and an elevation mechanism. The actuated rotary mechanism includes a display holder that is configured to mount a display to the frame and rotate the display about an axis of rotation. The counterweight and the display are located at opposite sides of a vertical plane that passes through the axis of rotation such that a combined center of mass of the display, the display holder, and the counterweight lies on the vertical plane. The frame is coupled to the elevation mechanism, and the elevation mechanism is configured to move the frame up and down.

158. [11406185](#) ARTICULATED RACK FOR ACTUATION OF A ROBOTIC DRAWER US - 09.08.2022

Int.Class [A47B 88/457](#) Appl.No 17358038 Applicant UBTECH NORTH AMERICA RESEARCH AND DEVELOPMENT CENTER CORP  
Inventor Luis Alfredo Mateos Guzman

According to one aspect, an actuator of a robotic drawer is disclosed. The actuator may include a plurality of articulation components that form an articulated rack. The actuator may include a plurality of pins each coupled to an exterior of one of the plurality of articulation components. The actuator may include a transformer box coupled to a pinion and configured to move along an exterior of the articulated rack as the pinion moves along the surface. The transformer box may include a first guide configured to apply a first force to an arm of each of the pins as the transformer box moves in a first direction. The first force may cause the pin to rotate in a first rotational direction until the arm is fitted into a cam of the articulated rack such that adjacent articulation components are held in a fixed position, causing the articulated rack to extend.

159. [20220236071](#) ESTIMATED TIME OF ARRIVAL CALCULATING METHOD AND SYSTEM AND MOBILE MACHINE USING THE SAME US - 28.07.2022

Int.Class [G01C 21/36](#) Appl.No 17158032 Applicant UBTECH NORTH AMERICA RESEARCH AND DEVELOPMENT CENTER CORP  
Inventor Kang-Hao Peng

ETA [estimated time of arrival] calculation for a mobile machine is disclosed. The ETA of the mobile machine to a destination is calculated by obtaining a current pose of the mobile machine, obtaining a global path from the current pose of the mobile machine to the destination, obtaining a local path, calculating a dynamic ETA for each pair of the consecutive poses in the local path and summing the calculated dynamic ETAs, calculating a baseline ETA for each pair of consecutive poses from a pose in the global path that is closest to the last pose in the local path to the last pose in the global path and summing the calculated baseline ETAs, and obtaining a total ETA to the destination based on the dynamic ETA and the baseline ETA.

160. [20220143841](#) ROBOTIC HAND US - 12.05.2022

Int.Class [B25J 15/00](#) Appl.No 17095758 Applicant UBTECH NORTH AMERICA RESEARCH AND DEVELOPMENT CENTER CORP  
Inventor Won Suk You

A robotic hand includes a baseplate, a finger having multiple phalanges that are rotatably coupled to one another, a first of the phalanges having a first end rotatably coupled to the baseplate and a second end and a second of the phalanges rotatably coupled to the second end about an axis of rotation, an actuating mechanism mounted on the baseplate, the actuating mechanism configured to actuate rotation of the plurality of phalanges, and a tendon having opposite ends that are respectively attached to the second of the phalanges and the baseplate. The second of the phalanges has an engagement portion arranged around the axis of rotation, and the tendon is wrapped around a portion of the engagement portion to generate a force acting on the second end of the first of the phalanges, causing the first of the phalanges to rotate from a flexed state to an extended state.



161. [20220206499](#) COLLISION AVOIDANCE METHOD AND MOBILE MACHINE USING THE SAME US - 30.06.2022

Int.Class [G05D 1/02](#) Appl.No 17134219 Applicant UBTECH NORTH AMERICA RESEARCH AND DEVELOPMENT CENTER CORP Inventor Dejun Guo

Collision avoidance for a mobile machine having a plurality of sensors is disclosed. The mobile machine is avoided from colliding with a collision object by fusing sensor data received from the plurality of sensors to obtain a plurality of data points corresponding to the collision object, calculating a closed-form solution of a distance between the mobile machine and each of the plurality of data points, calculating a maximum allowed velocity of the mobile machine based on the shortest distance between the mobile machine and the plurality of data points and a current velocity of the mobile machine, and controlling the mobile machine to move according to the maximum allowed velocity.

162. [20220206509](#) MOBILE ROBOT CONTROL METHOD, COMPUTER-IMPLEMENTED STORAGE MEDIUM AND MOBILE ROBOT US - 30.06.2022

Int.Class [G05D 1/02](#) Appl.No 17138946 Applicant UBTECH NORTH AMERICA RESEARCH AND DEVELOPMENT CENTER CORP Inventor Dejun Guo

A mobile robot control method includes: acquiring a first image that is captured by a camera on a robot when the robot is in a desired pose; acquiring a second image that is captured by the camera on the robot when the robot is in a current pose; extracting multiple pairs of matching feature points from the first image and the second image, and projecting the extracted feature points onto a virtual unitary sphere to obtain multiple projection feature points, wherein a center of the virtual unitary sphere is coincident with an optical center of coordinates of the camera; acquiring an invariant image feature and a rotation vector feature based on the multiple projection feature points, and controlling the robot to move until the robot is in the desired pose according to the invariant image feature and the rotation vector feature.

163. [WO/2022/161045](#) ESTIMATED TIME OF ARRIVAL CALCULATION METHOD, AND SYSTEM AND MOBILE MACHINE USING SAME WO - 04.08.2022

Int.Class [G05D 1/00](#) Appl.No PCT/CN2021/140646 Applicant UBTECH ROBOTICS CORP LTD Inventor PENG, Kang-Hao

An estimated time of arrival (ETA) calculation method for a mobile machine [100], and a system and mobile machine [100] using the method, applied to the technical field of ETA calculation. The ETA from the mobile machine [100] to a destination is calculated by means of the following steps: obtaining the current attitude [S0] of the mobile machine [100]; obtaining a global path [Pg] from the current attitude [S0] of the mobile machine [100] to the destination; obtaining a local path [P1]; calculating the dynamic ETA (etad) of each pair of consecutive attitudes in the local path [P1], and summing the calculated dynamic ETA (etad); calculating the baseline ETA (etab) of each pair of consecutive attitudes from one attitude, closest to the last attitude [S11] in the local path [P1], of the attitudes of the global path [Pg] to the last attitude [Sq1] in the global path [Pg], and summing the calculated baseline ETA (etab); and obtaining the total ETA (eta) to the destination on the basis of the dynamic ETA (etad) and the baseline ETA (etab).

164. [WO/2021/227900](#) ROBOTIC ASSISTANT WO - 18.11.2021

Int.Class [B25J 5/00](#) Appl.No PCT/CN2021/091582 Applicant UBTECH ROBOTICS CORP LTD Inventor ZHANG, Chengkun

Disclosed is a robotic assistant [100], comprising: a wheeled base [10]; a storage unit [20] comprising one or more drawers [21]; a foldable arm [30] comprising an end-of-arm tool [50] connected to the distal end of the foldable arm [30], the foldable arm [30] being connected to the top of the storage unit [20]; a lifting mechanism [40] positioned on the wheeled base [10], the lifting mechanism [40] being configured to move the storage unit [20] up and down; and a control system [70] receiving a command instruction, wherein in response to the command instruction, the control system [70] is configured to move the wheeled base [10] to open or close the one or more drawers [21], drive the motion of the foldable arm [30] and the end-of-arm tool [50] to pick up an external object [200] from a determined location and place the external object [200] at a determined location, and control the storage unit [20] to drive the one or more drawers [21]. The foldable arm [30] in conjunction with the lifting mechanism [40] enables the robotic assistant [100] to have a reachable-range-extending mechanism that extends beyond the area of the basic physical footprint of the robotic assistant [100].

165. [WO/2021/219036](#) NECK MECHANISM OF ROBOT WO - 04.11.2021

Int.Class [B25J 11/00](#) Appl.No PCT/CN2021/090703 Applicant UBTECH ROBOTICS CORP LTD Inventor MOKHLESPOUR ESFAHANI, Mohammad Iman

A neck mechanism [1] of a robot [2], comprising a first linear driver [12], a second linear driver [13] parallel to the first linear driver [12], a rotating platform [15], and a support shaft [14] located behind and between the first linear driver [12] and the second linear driver [13]. The first linear driver [12] and the second linear driver [13] are connected between an upper platform [11] and the rotating platform [15] by means of joints, and the support shaft [14] is connected between the upper platform [11] and the rotating platform [15] by means of a joint. A rotating motor [16] is configured to rotate the rotating platform [15] to deflect the upper platform [11], and the first linear driver [12] and the second linear driver [13] are configured to pitch or roll the upper platform [11]. The neck mechanism has a parallel structure of a plurality of drivers, and thus can avoid mutual interference of the movement between the plurality of drivers.

166. [WO/2022/143626](#) METHOD FOR CONTROLLING MOBILE ROBOT, COMPUTER-IMPLEMENTED STORAGE MEDIUM, AND MOBILE ROBOT WO - 07.07.2022

Int.Class [G05D 1/02](#) Appl.No PCT/CN2021/141964 Applicant UBTECH ROBOTICS CORP LTD Inventor GUO, Dejun

A method for controlling a mobile robot, a computer-implemented storage medium, and a mobile robot. Said method comprises: when a robot [11] is in a desired pose, acquiring a first image photographed by a camera on the robot [11] [S41]; when the robot [11] is in the current pose, acquiring a second image photographed by the camera on the robot [11] [S42]; extracting a plurality of pairs of matching feature points from the first image and the second image, and projecting the extracted feature points onto a virtual unit ball, so as to obtain a plurality of projected feature points [S43], the center of the virtual unit ball coinciding with the optical center of the coordinates of the camera; and acquiring an image invariant feature and a rotation vector feature on the basis of the plurality of projected feature points, and controlling, according to the image invariant feature and the rotation vector feature, the robot [11] to move until the robot [11] is in the desired pose [S44]. As the image invariant feature and rotation vector feature are used to determine the desired pose of the robot [11], there is no need to know a target model in advance or estimate the pose of the robot [11] relative to a target.

167. [WO/2022/134863](#) ANTICOLLISION METHOD, MOBILE MACHINE AND STORAGE MEDIUM WO - 30.06.2022

Int.Class [G05D 1/02](#) Appl.No PCT/CN2021/127836 Applicant UBTECH NORTH AMERICA RESEARCH AND DEVELOPMENT CENTER CORP Inventor GUO, Dejun

An anticollision method, a mobile machine and a storage medium, which are applied to the technical field of anticollision. The method is applied to a mobile machine that has a plurality of sensors. The method comprises: fusing sensor data received from a plurality of sensors, so as to obtain a plurality of data



points corresponding to an object; calculating a closed-form solution of the distance between a mobile machine and each data point; calculating the maximum allowed speed of the mobile machine on the basis of the shortest distance between the mobile machine and each of the plurality of data points, and the current speed of the mobile machine, and controlling the mobile machine to move at the maximum allowed speed, thereby avoiding a collision of the mobile machine with a collision object.

168. [WO/2020/133360](#) QUESTION TEXT MATCHING METHOD AND APPARATUS, COMPUTER DEVICE AND STORAGE MEDIUM WO - 02.07.2020

Int.Class [G06F 16/30](#) Appl.No PCT/CN2018/125360 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

A question text matching method and apparatus, a computer device and a storage medium, the method comprising: obtaining a question text to be matched [S102]; combining the question text to be matched with each preset question text in a question text library respectively to obtain a plurality of input question texts [S104]; inputting the plurality of input question texts into a question matching model to obtain similarity labels between the question text to be matched and each preset question text [S106]; and obtaining a target question text having the highest similarity to the question text to be matched according to the similarity labels [S108]. By means of the described method, the question matching accuracy can be improved to a certain extent.

169. [WO/2020/133289](#) COMMUNICATION LINK HANDOVER METHOD AND APPARATUS, TERMINAL, AND COMPUTER READABLE STORAGE MEDIUM WO - 02.07.2020

Int.Class [H04W 36/30](#) Appl.No PCT/CN2018/125105 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

Disclosed in the embodiments of the present invention are a communication link handover method and apparatus, a terminal, and a computer readable storage medium, the method comprising: detecting in real time the signal strength of a first network signal and the signal strength of a second network signal; when the signal strength of the first network signal and/or the signal strength of the second network signal are greater than or equal to a first threshold, selecting on the basis of a preset transmission policy a first communication link and/or a second communication link for transmitting data; and, when the signal strength of the first network signal and the signal strength of the second network signal are less than a second threshold, selecting a third communication link for transmitting data. The present method enables automatic handover of communication links on the basis of the signal strength of different network signals, increasing the stability of the communication system and increasing the robustness of the terminal devices during the communication process.

170. [WO/2020/133471](#) ROTATION ANGLE DETECTION METHOD AND DEVICE WO - 02.07.2020

Int.Class [G01B 5/24](#) Appl.No PCT/CN2018/125770 Applicant UBTECH ROBOTICS CORP Inventor BAI, Xi

A rotation angle detection method and device for a steering engine, said method comprising: calculating a rotation angle estimation value of a motor shaft during rotation according to a second rotation angle [S202]; determining an actual range of a rotation angle of the motor shaft according to the rotation angle estimation value in conjunction with a detection error of a second angle sensor [120] [S204]; on the basis of the correlation between a first rotation angle and the rotation angle estimation value, determining optional values of the rotation angle of the motor shaft [S206]; and on the basis of a value of the optional values of the rotation angle within the actual range of the rotation angle of the motor shaft, determining an actual rotation angle of the motor shaft, and determining an actual rotation angle of an output shaft according to the actual rotation angle of the motor shaft [S208]. Said method can improve the measurement accuracy of the rotation angle of a rotating mechanism output shaft, greatly reducing the influence of an error in accuracy of an angle sensor on the overall system error, making the output control of the rotating mechanism more accurate.

171. [WO/2020/133470](#) CHAT CORPUS CLEANING METHOD AND APPARATUS, COMPUTER DEVICE, AND STORAGE MEDIUM WO - 02.07.2020

Int.Class [G06F 17/27](#) Appl.No PCT/CN2018/125768 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

A chat corpus cleaning method and apparatus, a computer device, and a storage medium. The method comprises: acquiring a chat corpus, wherein the chat corpus comprises a question corpus and an answer corpus [S102]; performing word segmentation processing on the chat corpus, and converting a word segmentation result into a word vector [S104]; inputting the word vector into a preset deep retrieving, matching and sorting model to acquire a matching score corresponding to the chat corpus [S106]; and cleaning the chat corpus according to the matching score [S108]. By means of the method, a chat corpus can be automatically cleaned, thereby improving the quality of the chat corpus, thus improving the accuracy of subsequent model training.

172. [WO/2020/133039](#) ENTITY IDENTIFICATION METHOD AND APPARATUS IN DIALOGUE CORPUS, AND COMPUTER DEVICE WO - 02.07.2020

Int.Class [G06F 17/27](#) Appl.No PCT/CN2018/124239 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

An entity identification method and apparatus in a dialogue corpus, and a computer device. The method comprises: obtaining corpus text of an entity to be identified [S102]; performing word segmentation on the corpus text to obtain a word segmentation result, the word segmentation result comprising multiple words [S104]; obtaining a word vector corresponding to each word in the word segmentation result, and combining the word vector corresponding to each word to obtain a text matrix corresponding to the corpus text [S106]; and inputting the text matrix to an entity identification model, and obtaining the entity in the corpus text output by the entity identification model [S108]. By using the mode above, the accuracy of entity identification is improved.

173. [WO/2020/132924](#) METHOD AND DEVICE FOR CALIBRATING EXTERNAL PARAMETERS OF ROBOT SENSOR, ROBOT AND STORAGE MEDIUM WO - 02.07.2020

Int.Class [B25J 9/16](#) Appl.No PCT/CN2018/123793 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

A method for calibrating an external parameter of a robot sensor, the method comprising: acquiring first sensor data and second sensor data obtained by a first sensor and a second sensor in a robot [110] collecting position information of a calibration reference object [120]; converting said data into a same coordinate system, and correspondingly obtaining first converted sensor data and second converted sensor data; determining a first coordinate position [x0, y0] and a second coordinate position [x'0, y'0] of a reference point in the calibration reference object [120], and using the first coordinate position [x0, y0] and the second coordinate position [x'0, y'0] as a set of coordinate data; and when the relative positional relationship between the robot [110] and the calibration reference object [120] changes, repeating the steps above to obtain N sets of coordinate data, and then calculating external parameters between the first sensor and the second sensor. The present method improves the performance of the robot [110]. In addition, also provided are a device for calibrating the external parameters of the robot sensor, the robot [110] and a storage medium.

174. [WO/2020/133288](#) METHOD FOR CONTROLLING GAIT OF BIPED ROBOT, AND BIPED ROBOT WO - 02.07.2020



Int.Class [B25J 9/06](#) Appl.No PCT/CN2018/125103 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

Provided are a method for controlling the gait of a biped robot, and a biped robot, comprising the following steps: obtaining six-dimensional force information, and, according to the six-dimensional force information, determining the state of support of a biped robot; according to the six-dimensional force information, calculating a ZMP position of each foot of the biped robot; setting a ZMP expected value of each foot according to the state of support and body posture error; determining the ankle joint compensation angle of each foot of the biped robot according to the ZMP position and the ZMP position change rate, the ZMP expected value, and the ZMP expected value change rate; according to the ankle joint compensation angle, tracking and adjusting, in real time, the current ankle joint angle of the biped robot; repeating the above steps at a set frequency until posture control or ankle joint compliance is completed in different states of support.

175. [WO/2020/124491](#) METHOD AND DEVICE FOR SEGMENTING DATA, COMPUTER DEVICE, AND STORAGE MEDIUM WO - 25.06.2020

Int.Class [G06F 16/00](#) Appl.No PCT/CN2018/122380 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

Disclosed are a method and device for segmenting data, a computer device, and a storage medium, comprising: acquiring a dataset and service types of data in the dataset; segmenting the data of the dataset on the basis of the service types to produce multiple data tables; acquiring the number of data entries in each of the data tables; segmenting the data tables on the basis of the corresponding number of data entries to produce multiple data child tables corresponding to each of the data tables. The segmentation of data per the method increases the efficiency of data query when data query is required.

176. [WO/2020/132918](#) METHOD AND DEVICE FOR PHARMACEUTICAL FORECASTING, COMPUTER DEVICE, AND STORAGE MEDIUM WO - 02.07.2020

Int.Class [G16H 20/10](#) Appl.No PCT/CN2018/123761 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

A method and device for pharmaceutical forecasting, a computer device, and a storage medium. The method comprises: acquiring symptom information of medicament to be forecasted, the symptom information comprising at least one symptom [202]; determining a symptom vector corresponding to each symptom [204]; calculating, on the basis of the symptom vector of each symptom, the vector distance between the symptom vector and medicament vectors corresponding to medicaments in a medicament database [206]; and determining, on the basis of the vector distance, a target medicament corresponding to the symptom information [208]. The method for pharmaceutical forecasting greatly increases the efficiency of forecasting.

177. [WO/2020/132890](#) SERVICE ATTRIBUTE DYNAMIC EXPANSION METHOD, APPARATUS, COMPUTER DEVICE, AND STORAGE MEDIUM WO - 02.07.2020

Int.Class [G06F 17/24](#) Appl.No PCT/CN2018/123611 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

Provided is a method for dynamically expanding a service attribute, said method comprising: obtaining service attributes and service attribute data stored in row mode which correspond to a service object [202]; by means of row/column conversion, converting said service attributes and corresponding service attribute data into columns and displaying same in a data table [204]. In the method, it is necessary only to store in row form the service attributes to be expanded, and then achieve dynamic expansion of service attributes by means of row/column conversion, and there is no need to add a new table structure; the method is easy and convenient and greatly reduces development costs, and improves development efficiency. In addition, a service attribute dynamic expansion apparatus, computer device, and storage medium are also provided.

178. [WO/2020/133291](#) TEXT ENTITY RECOGNITION METHOD AND APPARATUS, COMPUTER DEVICE, AND STORAGE MEDIUM WO - 02.07.2020

Int.Class [G06F 17/27](#) Appl.No PCT/CN2018/125107 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

A text entity recognition method, comprising: obtaining a text of an entity to be recognized [S202]; using the text as an input of an entity recognition model to obtain a first predicted entity set output by the entity recognition model [S204]; using a word segmentation mechanism to perform word segmentation on the text, and extracting, according to the word segmentation processing result, a second predicted entity set [S206]; and determining, according to the first predicted entity set and the second predicted entity set, a target entity set obtained through recognition, the target entity set being a set of target entities [S208]. By using the word segmentation mechanism as a supplementary recognition, the accuracy of entity recognition is improved. In addition, also provided are a text entity recognition apparatus, a computer device, and a storage medium.

179. [WO/2020/132933](#) SHORT TEXT FILTERING METHOD AND APPARATUS, MEDIUM AND COMPUTER DEVICE WO - 02.07.2020

Int.Class [G06F 16/335](#) Appl.No PCT/CN2018/123847 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

A short text filtering method and apparatus, a medium and a computer device. The method comprises: acquiring a text to be detected, wherein the text to be detected is a short text [S102]; performing word segmentation on the text to be detected, so as to acquire a word segmentation result including at least one word vector [S104]; and calculating the relevancy between the word segmentation result and a pre-set corpus database, and filtering the text to be detected according to the relevancy [S106]. By means of the short text filtering method and apparatus, the medium and the computer device, the accuracy of short text filtering can be improved.

180. [WO/2020/133358](#) CHAT CORPUS CLEANING METHOD, APPARATUS, COMPUTER DEVICE AND STORAGE MEDIUM WO - 02.07.2020

Int.Class [G06F 17/28](#) Appl.No PCT/CN2018/125358 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

Provided are a chat corpus cleaning method, an apparatus, a computer device and a storage medium, comprising: obtaining chat corpus, the chat corpus comprising question corpus and answer corpus [S102]; performing word segmentation processing on the chat corpus to obtain a word vector converted from the word segmentation result, and obtain a character vector corresponding to the chat corpus [S104]; inputting the word vector and the character vector into a preset chat corpus matching model, to obtain a target matching score corresponding to the chat corpus [S106]; and cleaning the chat corpus according to the target matching score. Through the above manner, the chat corpus can be automatically cleaned to improve the quality of the chat corpus, thereby improving the accuracy of subsequent model training.

181. [WO/2020/133080](#) OBJECT POSITIONING METHOD AND APPARATUS, COMPUTER DEVICE, AND STORAGE MEDIUM WO - 02.07.2020

Int.Class [G01B 11/00](#) Appl.No PCT/CN2018/124409 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

An object positioning method, comprising: obtaining a target image obtained by photographing a target object to be positioned [202]; performing feature extraction on the target object in the target image to obtain a two-dimensional feature corresponding to each feature point [204]; searching a word bag for a target feature matching each two-dimensional feature, and determining three-dimensional point coordinates of the corresponding feature point according



to the target feature, the word bag being established by learning on the basis of a label point and storing a correspondence between the two-dimensional feature and the three-dimensional point coordinates of the feature point in the target object [206]; and obtaining two-dimensional point coordinates of each feature point in a current camera coordinate system, and determining a position relationship of the target object with respect to the current camera coordinate system according to the two-dimensional point coordinates and the three-dimensional point coordinates [208]. The object positioning method is simple in operation and high in stability and accuracy. In addition, also provided are an object positioning apparatus, a computer device, and a storage medium.

182. [WO/2020/132985](#) SELF-TRAINING METHOD AND APPARATUS FOR MODEL, COMPUTER DEVICE, AND STORAGE MEDIUM WO - 02.07.2020

Int.Class [G06F 17/27](#) Appl.No PCT/CN2018/124032 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

A self-training method and apparatus for a model, a computer device, and a storage medium. The method comprises: receiving a self-defined corpus template and an entity [202]; generating a training corpus according to the corpus template and the entity, the training corpus comprising training text and a corresponding text annotation, and the training text being generated by means of combination according to the corpus template and the entity [204]; inputting the training text as a model to be trained, training the model by taking the corresponding text annotation as expected output of the model, and obtaining a target model after the training is completed [206]. According to the self-training method for a model, a training corpus is automatically generated merely according to a user defined corpus template and an entity, and a target model is obtained by automatically training a model according to the training corpus; the method is simple and convenient, and machine corpus identification is easily, conveniently and highly efficiently achieved.

183. [WO/2020/132889](#) METHOD, SYSTEM AND APPARATUS FOR ROBOT TO ACQUIRE RESOURCE FILE WO - 02.07.2020

Int.Class [G06F 9/445](#) Appl.No PCT/CN2018/123610 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

Disclosed in the embodiments of the present invention are a method, a system and an apparatus for a robot to acquire a resource file, a computer device and a storage medium. The method comprises: acquiring a link acquisition request sent by a robot; generating a resource file link according to the link acquisition request; and sending the resource file link to the robot, so that the robot acquires a corresponding resource file from a server according to the resource file link. The method improves the efficiency of robot resource updating.

184. [WO/2020/133290](#) DATA PRESENTATION METHOD AND APPARATUS, COMPUTER DEVICE AND STORAGE MEDIUM WO - 02.07.2020

Int.Class [G06N 5/00](#) Appl.No PCT/CN2018/125106 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

A data presentation method and apparatus, a computer device and a storage medium. The method comprises: acquiring requirement information sent by a terminal, wherein the requirement information is input by means of a requirement information input page of the terminal [S202]; acquiring, according to the requirement information, target data corresponding to the requirement information [S204]; filling, according to the requirement information, the target data into a corresponding position of a data presentation template, so as to generate a target presented data table [S206]; and sending the generated target presented data table to the terminal, so as to display the target presented data table on the terminal [S208]. The method improves table generation efficiency, and facilitates a terminal in checking in a timely manner.

185. [WO/2020/124619](#) DATA PROCESSING METHOD AND DEVICE, COMPUTER APPARATUS, AND STORAGE MEDIUM WO - 25.06.2020

Int.Class [G06F 16/25](#) Appl.No PCT/CN2018/123263 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

A data processing method and device, a computer apparatus, and a storage medium. The method comprises: obtaining a data processing request comprising a database identifier [S102]; determining, according to the database identifier, a target database microservice, wherein the target database microservice provides a data processing interface of a target database corresponding to the data processing request [S104]; and sending the data processing request to the target database microservice, and performing, by means of the data processing interface provided by the target database microservice, a data processing operation corresponding to the data processing request [S106]. The present method can improve the efficiency of data processing.

186. [WO/2020/133079](#) OBJECT PATH TRACKING DISPLAY METHOD AND SYSTEM WO - 02.07.2020

Int.Class [G06K 9/62](#) Appl.No PCT/CN2018/124408 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

Provided are an object path tracking display method and system, comprising the following steps: establishing in a distributed search server a mapping relationship library of image features of an object and Wi-Fi information, each Wi-Fi information comprising location information [step 101]; receiving a path query request based on a monitored object [step 102]; according to the image features of the monitored object, searching the image feature and Wi-Fi information mapping relationship library to form a Wi-Fi information set; forming a corresponding position information set according to the Wi-Fi information set [step 103]; generating real-time path information of the monitored object according to the position information set [step 104]. The present method increases the accuracy of path query.

187. [WO/2020/133028](#) ELECTRONIC PAYMENT TRANSACTION SYSTEM AND METHOD WO - 02.07.2020

Int.Class [G06Q 30/00](#) Appl.No PCT/CN2018/124173 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

An electronic payment transaction system and method. The payment system is used for sending bill collection information to a management system, so that the management system sends the bill collection information to a bill collection system; the payment system is also used for modifying the state of a message in a payment message confirmation table from a first payment state to a second payment state after the bill collection information is successfully sent to the management system [S602]; the bill collection system sending bill collection confirmation information to the management system after a bill collection operation is successfully executed, and modifying the state of a message in a bill collection message confirmation table from a first bill collection state to a second bill collection state after the bill collection confirmation information is sent to the management system [S604]; and the management system is used for sending the bill collection confirmation information to the payment system, so that the payment system modifies the second payment state in the payment message confirmation table to a third payment state according to the bill collection confirmation information [S606]. By means of the method, the consistency of data of both a payee and a payer is guaranteed to a certain extent.

188. [WO/2020/133078](#) ROBOT OPERATION AND CONTROL METHOD, GESTURE RECOGNITION APPARATUS AND ROBOT WO - 02.07.2020

Int.Class [G06F 3/01](#) Appl.No PCT/CN2018/124407 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun



A robot operation and control method, a gesture recognition apparatus and a robot. The method comprises the following steps: when a palm stretches into a first gesture recognition apparatus provided with several ultrasonic sensors, initializing a program and recording original data of the palm; a first control module acquiring, at a set frequency, distance data, measured by the ultrasonic sensors, of the palm; the first control module determining a set of distance change values of all the ultrasonic sensors relative to the palm according to the current distance data of the palm and distance data of the palm after at least a set time interval, and determining a current gesture according to the set of the distance change values; the first control module determining an action of a robot according to the current gesture; and sending the action of the robot to a connected robot to complete first operation and control.

189. [WO/2020/124618](#) VEHICLE QUERY METHOD, SYSTEM AND APPARATUS, COMPUTER DEVICE AND STORAGE MEDIUM WO - 25.06.2020

Int.Class [G08G 1/00](#) Appl.No PCT/CN2018/123229 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

A vehicle query method, system and apparatus, a computer device and a storage medium. The method comprises: receiving a vehicle query request sent by a terminal, the vehicle query request comprising location information of a user [202]; determining a corresponding target microservice according to the location information of the user, and sending the vehicle query request to the target microservice, wherein the target microservice is used to query target vehicle information matching the location information at a corresponding vehicle information storage region [204]; receiving the target vehicle information queried by the target microservice, and returning the target vehicle information to a corresponding terminal [206]. The described vehicle query method queries by means of zoning, which greatly improves the processing efficiency.

190. [WO/2020/132951](#) METHOD AND APPARATUS FOR GENERATING BUILDING BLOCK MODEL, AND TERMINAL AND COMPUTER-READABLE STORAGE MEDIUM WO - 02.07.2020

Int.Class [G06T 17/00](#) Appl.No PCT/CN2018/123935 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

Disclosed are a method and apparatus for generating a building block model, and a terminal and a computer-readable storage medium. The method comprises: scanning a target model based on multiple orientations, so as to acquire a contour image of the target model [S202]; matching the contour image according to building block parts in a pre-set part library, so as to obtain sub-parts matching the contour image [S204]; and assembling a three-dimensional building block model similar to the target model according to the sub-parts [S206]. By means of the method, a real object can be quickly converted into a building block model after the real object is scanned, thereby enhancing a user's abstraction ability for a real object.

191. [WO/2020/133292](#) AUTHORITY SYSTEM AND METHOD FOR SERVICE ACCESS WO - 02.07.2020

Int.Class [H04L 9/32](#) Appl.No PCT/CN2018/125108 Applicant UBTECH ROBOTICS CORP Inventor XIONG, Youjun

Disclosed are an authority system and a method for service access, the system comprising: a user system, a service system, and an identity authentication system. The user system is configured to send a service request to the service system; the service request carries token information; the service system is configured to acquire the token information from the service request and send the obtained token information to the identity authentication system; the identity authentication system determines whether the user system has the authority to access the service system according to the token information and sends the determination result to the service system; the service system receives the determination result returned by the identity authentication system, and executes, if the determination result is that the user system has the authority to access the service system, the service corresponding to the service request. In this way, the efficiency of accessing multiple services by users is improved.

192. [WO/2022/120670](#) MOVEMENT TRAJECTORY PLANNING METHOD AND APPARATUS FOR MECHANICAL ARM, AND MECHANICAL ARM AND STORAGE MEDIUM WO - 16.06.2022

Int.Class [B25J 9/16](#) Appl.No PCT/CN2020/135084 Applicant UBTECH ROBOTICS CORP LTD Inventor ZHENG, Dake

A movement trajectory planning method and apparatus for a mechanical arm, and a mechanical arm and a storage medium. The method comprises: if a mechanical arm receives a task instruction, acquiring environmental data collected by a visual detection system of the mechanical arm [101]; determining an initial DS model movement trajectory of the mechanical arm according to the task instruction, the environmental data and a preset movement teaching DS model library; and correcting the initial DS model movement trajectory, so as to obtain a target movement trajectory of the mechanical arm [103], wherein the target movement trajectory is a movement trajectory that matches the task instruction. In the method, by means of generating a DS model movement trajectory on the basis of a human teaching activity and forming a movement teaching dynamic system (DS) model library, a mechanical arm can determine an initial DS model movement trajectory by using the movement teaching DS model library, and further correct the initial DS model movement trajectory, so as to obtain a target movement trajectory that meets the requirements of a task instruction, thereby realizing the autonomous and flexible planning of a movement trajectory of the mechanical arm.

193. [WO/2021/127979](#) SPEECH SYNTHESIS METHOD AND APPARATUS, COMPUTER DEVICE, AND COMPUTER READABLE STORAGE MEDIUM WO - 01.07.2021

Int.Class [G10L 13/10](#) Appl.No PCT/CN2019/127914 Applicant UBTECH ROBOTICS CORP LTD Inventor HUANG, Dongyan

A speech synthesis method and apparatus, a computer device, and a computer readable storage medium. The method comprises: obtaining a frequency spectrum to be synthesized and a preset frequency spectrum [202]; obtaining a superimposed frequency spectrum according to the frequency spectrum to be synthesized and the preset frequency spectrum [204]; performing emotion semantic feature extraction on the superimposed frequency spectrum to obtain corresponding emotion semantic features [206]; performing fundamental frequency extraction on the preset frequency spectrum to obtain fundamental frequency features corresponding to the preset frequency spectrum [208]; and obtaining an emotion and rhythm frequency spectrum corresponding to the frequency spectrum to be synthesized according to the emotion semantic features corresponding to the superimposed spectrum and the fundamental frequency features corresponding to the preset frequency spectrum, and generating a speech according to the emotion and rhythm frequency spectrum [210]. The speech has the same semantics as the frequency spectrum to be synthesized and is consistent with the emotion features and rhythm features of the preset frequency spectrum. According to the method, the rhythm such as an accent of a speech is controlled, so that the synthesized speech is more real finally.

194. [WO/2022/099889](#) RELOCATION METHOD, ROBOT, AND COMPUTER-READABLE STORAGE MEDIUM WO - 19.05.2022

Int.Class [G06Q 10/06](#) Appl.No PCT/CN2020/140578 Applicant UBTECH ROBOTICS CORP LTD Inventor GUO, Rui

A relocation method, a robot, and a computer-readable storage medium, which relate to the technical field of robots. The method comprises: acquiring a global navigation map and the current scanning image of a target scene where a robot is located, and generating a local matching sub-image according to the global navigation map [101]; acquiring a black border of the local matching sub-image, determining the length of the black border and determining the curve complexity of the black border, and determining the matching weight of the black border according to the length and curve complexity of the black border [102]; according to the local matching sub-image and the current scanning image, determining an estimated pose for relocation and a target black



border, and acquiring, according to the matching weight of the target black border, a matching value between the current scanning image and the local matching sub-image [103]; and when the matching value is greater than a preset matching threshold, determining the estimated pose to be the pose for robot relocation [104], so as to improve the matching influence of small objects or small areas, and reduce the false positive success rate during the relocation.

195. [WO/2021/217619](#) LABEL SMOOTHING-BASED SPEECH RECOGNITION METHOD, TERMINAL, AND MEDIUM WO - 04.11.2021  
Int.Class [G10L 15/06](#) Appl.No PCT/CN2020/088422 Applicant UBTECH ROBOTICS CORP LTD Inventor ZHENG, Yi

A label smoothing-based speech recognition model training method, comprising: obtaining training data, which comprises a plurality of training samples, each training sample comprising a sample speech and a sample recognition label corresponding to the sample speech [S102]; on the basis of a preset homophone dictionary, performing label smoothing processing on the sample recognition label, and obtaining a sample smooth label subjected to label smoothing processing [S104]; training a preset speech recognition model according to the training sample and the sample smooth label, and on the basis of a preset loss function, calculating a loss value corresponding to the training sample [S106]; and performing back propagation according to the loss value so as to complete training of the preset speech recognition model [S108]. The speech recognition accuracy of a speech recognition model trained by using the method is improved.

196. [WO/2021/134591](#) SPEECH SYNTHESIS METHOD, SPEECH SYNTHESIS APPARATUS, SMART TERMINAL AND STORAGE MEDIUM WO - 08.07.2021

Int.Class [G10L 13/047](#) Appl.No PCT/CN2019/130766 Applicant UBTECH ROBOTICS CORP LTD Inventor LI, Xian

A speech synthesis method, a speech synthesis apparatus, a smart terminal and a storage medium. The method comprises: acquiring a text to be synthesized [S102]; acquiring text features of the text to be synthesized, wherein the text features comprise at least one of a word segmentation feature, a polyphone feature and/or a prosodic feature [S104]; inputting the text features into a preset duration prediction model, and acquiring duration features corresponding to the text features [S106]; inputting the text features and the duration features into a preset acoustic model, and acquiring the speech features corresponding to the text to be synthesized [S108]; and converting the speech features to speech, and generating target speech corresponding to the text to be synthesized [S110]. According to the speech synthesis method, the speech features generated by various text features and duration features are considered, such that the synthesized speech is more accurate, thereby improving the speech synthesis accuracy, and improving the user experience.

197. [WO/2022/116156](#) VISUAL POSITIONING METHOD, ROBOT, AND STORAGE MEDIUM WO - 09.06.2022

Int.Class [G01C 21/00](#) Appl.No PCT/CN2020/133919 Applicant UBTECH ROBOTICS CORP LTD Inventor LIU, Zhichao

Provided is a visual positioning method, comprising: obtaining current lighting conditions by means of a light sensor element arranged on a robot [102]; according to the current lighting conditions, searching in a map library for a candidate map set matching said current lighting conditions, said map library storing maps under different lighting conditions [104]; collecting images under the current lighting conditions and matching the images to maps in the candidate map set, and determining a map matching the image and using the matched map as a target map for the current lighting conditions [106]; performing visual positioning on the basis of the target map [108]. The visual positioning method allows accurate positioning even under changing lighting conditions. In addition, also provided are a robot and a storage medium.

198. [WO/2022/141268](#) HUMANOID ROBOT CONTROL METHOD, COMPUTER DEVICE, AND STORAGE MEDIUM WO - 07.07.2022

Int.Class [G05B 19/042](#) Appl.No PCT/CN2020/141705 Applicant UBTECH ROBOTICS CORP LTD Inventor BAI, Jie

The present application relates to a humanoid robot control method, comprising: mapping posture information corresponding to a human leg joint to humanoid robot leg joint servos, the leg joint servos comprising a non-target optimized joint servo and a target optimized joint servo, to obtain a desired rotation angle and a desired rotation angular velocity corresponding to the non-target optimized joint servo, and an expected rotation angle and an expected rotation angular velocity corresponding to the target optimized joint servo; constructing an optimization target function corresponding to the target optimized joint servo; on the basis of the optimization target function, optimizing the expected rotation angle and the expected rotation angular velocity of the target optimization joint servo to obtain a corrected expected rotation angle and a corrected expected rotation angular velocity corresponding to the target optimized joint servo; and on the basis of the expected rotation angle and the expected rotation angular velocity corresponding to the non-target optimized joint servo and the corrected expected rotation angle and the corrected expected rotation angular velocity corresponding to the target optimized joint servo, controlling each joint servo of the leg of the humanoid robot.

199. [WO/2021/120145](#) VOICE CONVERSION METHOD AND APPARATUS, COMPUTER DEVICE AND COMPUTER-READABLE STORAGE MEDIUM WO - 24.06.2021

Int.Class [G10L 13/033](#) Appl.No PCT/CN2019/126865 Applicant UBTECH ROBOTICS CORP LTD Inventor LIU, Yang

A voice conversion method and apparatus, a computer device, and a computer-readable storage medium. The method comprises: acquiring a voice to be converted and an original conversion model, the format of the original conversion model being an online format [202]; performing format conversion on the original conversion model to obtain a target conversion model in an offline format [204]; performing feature extraction on the voice to obtain features to be converted [206]; inputting the features into the target conversion model to obtain target features outputted by the target conversion model [208]; and obtaining a target voice according to the target features outputted by the target conversion model, wherein the target voice has the same voice content as the voice to be converted, and the target voice has a different sound from the voice to be converted [210]. The voice conversion method may not only perform high-quality voice conversion in an offline state, but also has a fast running speed and can achieve real-time voice conversion.

200. [WO/2022/126464](#) FACE RECOGNITION METHOD, ROBOT, AND STORAGE MEDIUM WO - 23.06.2022

Int.Class [G06K 9/00](#) Appl.No PCT/CN2020/137065 Applicant UBTECH ROBOTICS CORP LTD Inventor ZENG, Yusheng

Disclosed in the present application are a face recognition method, a robot, and a storage medium. The face recognition method comprises: acquiring a face image to be recognized; performing face key point recognition on said face image by using a pre-trained face key point model, the face key point model being a lightweight neural network model; aligning said face image according to the face key point obtained by recognition to obtain an aligned face image; extracting a face feature in the aligned face image; and comparing the face feature with a registered face feature in a preset database to recognize a person in the face image to be recognized, the registered face feature being obtained by performing feature extraction on a registered front face image, the registered front face image being obtained by screening by a pre-trained face pose detection model. Embodiments of the present application achieve the effect of accurately completing face recognition under the condition of limited device end computing power.



