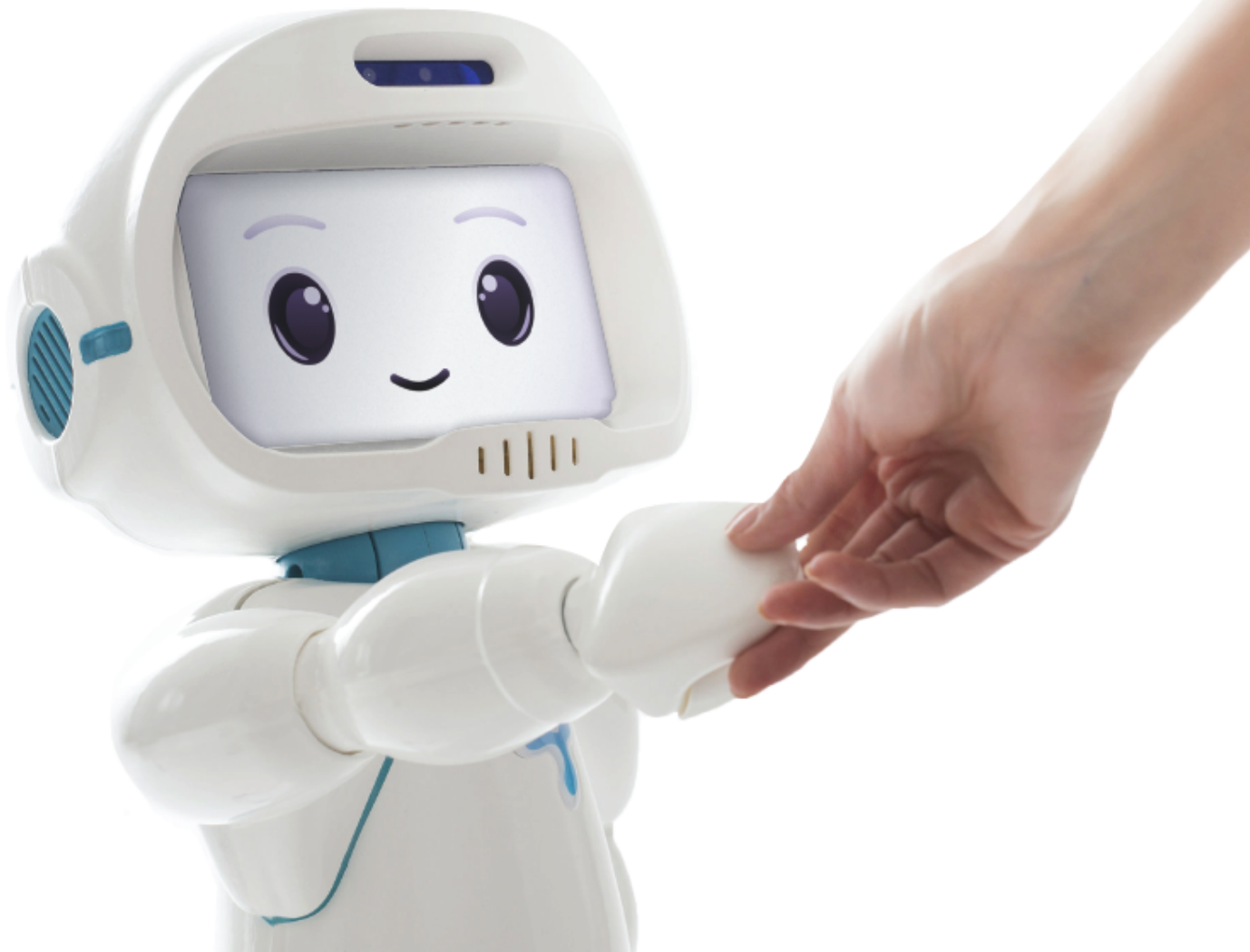




# QTROBOT

Enabling Human-AI Teaching and Research



### Key Values

- Enabling multi-disciplinary projects
- Novel graphical development environment for Non-IT Experts
- Developer-friendly environment using Ubuntu and ROS
- State of the art hardware & software
- Robust platform, suitable for intensive working hours
- Engaging and motivating, for children and for adults
- Multilingual, with +30 languages

### Research & Teaching Use-Cases

- Human-centered AI
- Human-robot interaction
- Children's developmental disorders & interventions
- Geriatrics care
- Coaching and rehabilitation
- STEM education
- Internet of Things

### Computing

- 8th Gen quad-core Intel® Core™ i5/i7 processor
- Up to 4 x 4.5GHz
- Up to 32 GB DDR4 RAM
- Up to 512 GB M.2 SSD

### Vision

- RealSense™ depth camera D435
- Field of view  $\approx 87^\circ \times 58^\circ \times 95^\circ$
- Depth stream resolution: up to 1280 x 720
- Depth stream frame rate: up to 90 fps
- Minimum depth distance  $\approx 0.1$  m
- Maximum depth distance  $\approx 10$  meters
- Shutter type: global shutter
- RGB resolution: 1920 x 1080
- RGB frame rate: 30 fps
- RGB sensor FOV  $\approx 69.4^\circ \times 42.5^\circ \times 77^\circ$

### Microphone

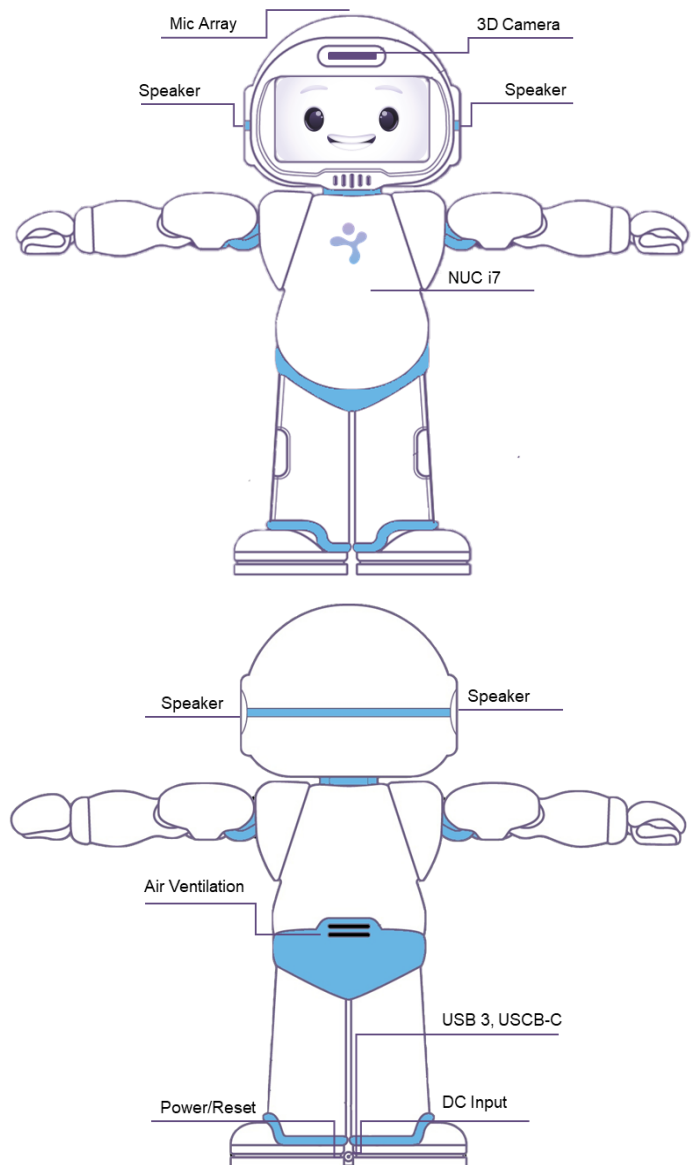
- 4 High-performance digital microphones
- Supports far-field voice capture
- Microphones: ST MP34DT01TR-M
- Sensitivity: -26 dBFS (omnidirectional)
- Acoustic overload point: 120 dB SPL
- SNR: 63 dB

### Audio

- Audio amplifier: stereo 2.8W Class D
- Speaker frequency rate: 800~7000 Hz

### Electrical

- Input: 19 v
- Battery: external (not included)



### Connectivity

- WiFi: 2 x IEEE 802.11 b/g/n
- USB-C
- USB 3.0
- Ethernet & HDMI: usb-c adaptor (not included)

### Display

- 8inch TFT 800x480 LCD as the face



### Physical overview

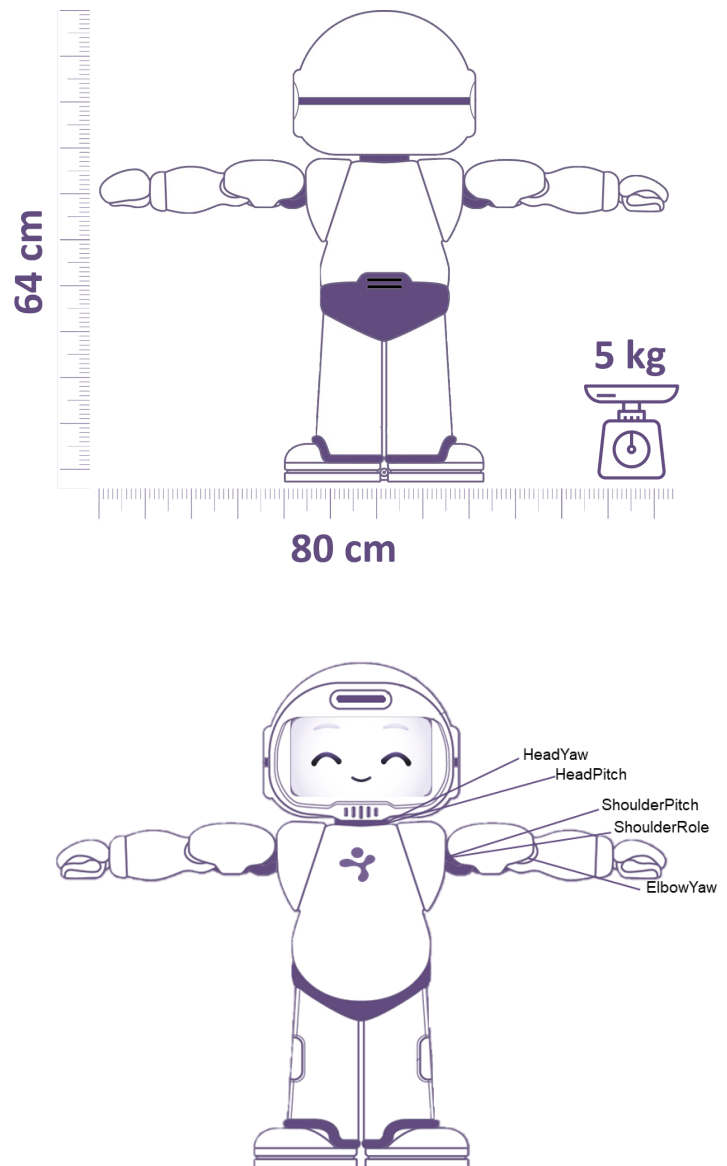
- Dimension: 64cm x 22cm x 36cm [HxDxW]
- Arms open: 80cm
- Weight  $\approx$  5kg
- Material: PU8150
- Surface finish: shiny

### Motor Specifications

- Gear: heavy duty metal
- Stall torque  $\approx$  24kg.cm
- Maximum speed  $\approx$  0.147s/60°
- Communication link: full duplex asynchronous serial, multi servo control
- Maximum baud rate: 0.67Mbps
- Feedback: position, speed, temperature, load and voltage.
- Various control algorithm: PID, feedforward, trapezoidal velocity profile, velocity override, torque saturator & offset, overload protection, neutral calibration, dead zone

### Motor Protection

- In contrast to most social robots in the market, QTrobot's motors have metal gears and thus do not break easily, making QTrobot a very robust platform.
- QTrobot is also equipped with a software protection mechanism which turns off its motors' torque if an external force of more than a certain threshold is applied. This prevents damaging the motors if they are pulled or pushed.



### Degrees of freedom

- Neck: 2DOF
- Shoulder: 2 DOF
- Elbow: 1DOF
- Wrist and hand: 2 DOF (unactuated)



### Programmable by Everyone

- An intuitive drag & drop based graphical interface for developing interactive applications for QTrobot to tell stories, play games and react to people and images. Learning how to use the QTrobot's graphical interface is a matter of an hour or two. No IT knowledge required, it is as easy as using a smartphone!

### Developer friendly with a rich SDK

- Powered by Ubuntu and ROS, QTrobot provides a rich set of APIs for several programming languages such as C++, Python, Lua, Lisp, Java and Android. The QTrobot's SDK offers you the full control over the sensors and actuators including the camera, microphone, LCD on the face and motors, as well as the processing modules such as the text-to-speech image recognition, sound localization and gesture recognition.

### Multi-Lingual

- QTrobot is equipped with the Acapela Text to speech software, enabling it to naturally speak in more than 30 languages and accents such as American English, British English, German, French, Spanish, Chinese, Dutch, Arabic, Russian and many more. For many of the languages, children voices are available, perfectly fitting the look and feel of QTrobot!

### Image Recognition

- QTrobot provides a powerful image recognition software. Teaching QTrobot to recognize new images is as simple as uploading your images to the robot!

### Emotion Detection & Recognition

- QTrobot includes a state of the art module to recognize gender, age group and emotions of people with an industry leading performance, all running embedded on QTrobot!

### Face Detection & Recognition

- QTrobot can detect and recognize faces, so you can program it to react to the people it knows!

### Pose Tracking

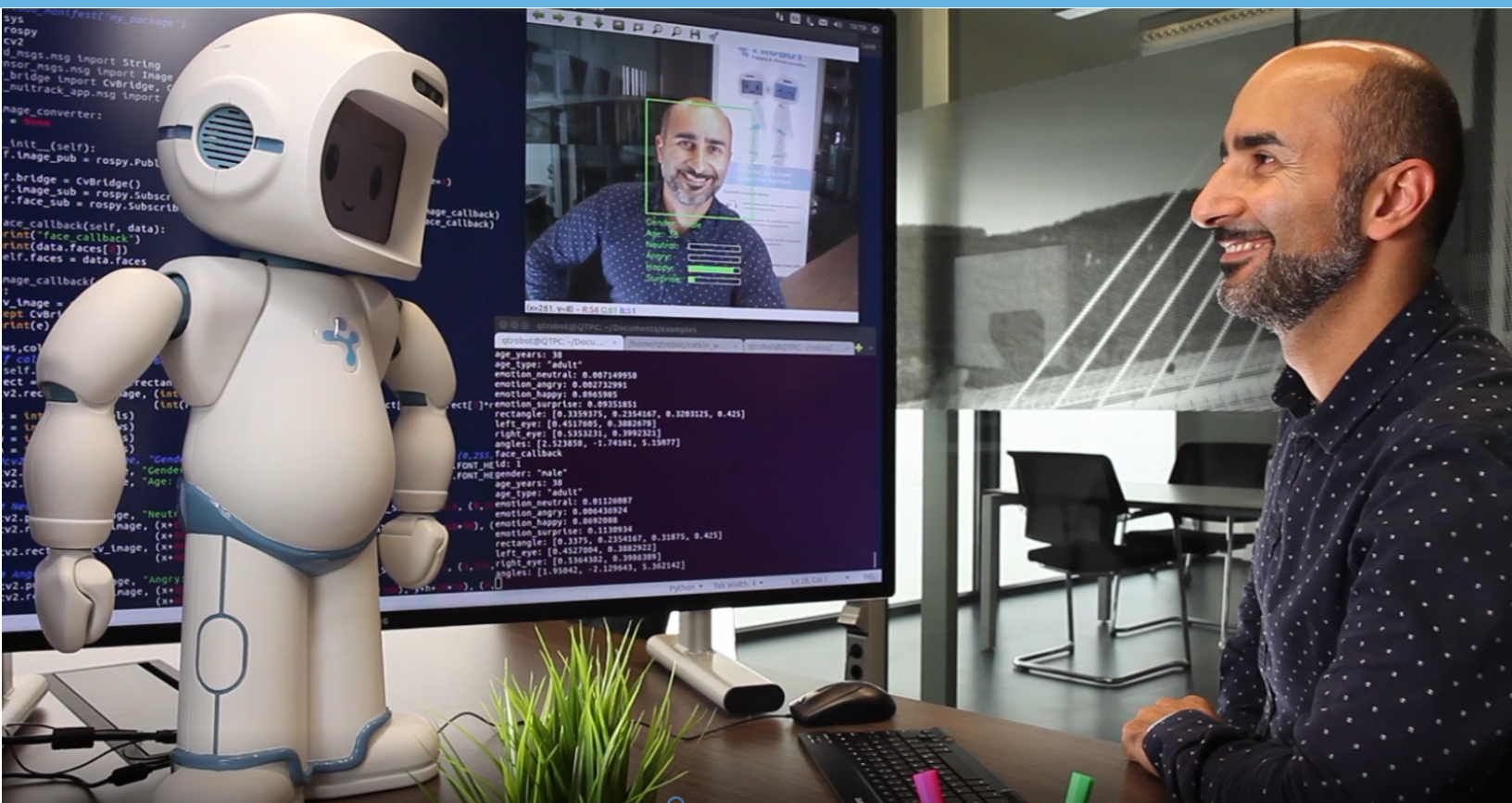
- Thanks to its D435 Intel® RealSense™ 3D camera and a cutting edge pose tracking technology, QTrobot can recognize and track human poses with a high precision, allowing it to react to human gestures in interactive games and physical rehabilitation scenarios.

### Sound Detection & Localization

- A high-performance far-field digital microphone array enables QTrobot to capture and understand voice activities from up to 5m away. QTrobot's embedded voice processing module detects the direction of the voice, filters the background noise, and focuses only on sounds that come from the target direction.

### Speech Recognition

- QTrobot supports various state of the art voice technologies including hot word detection, automatic speech recognition and natural language processing. Our technical team will support you to choose and customize the best technologies for the language and application of your choice.



### Standard Ubuntu system and ROS support on a powerful & extendable robot platform!

#### Ideal platform for Human-Robot Interaction

The QTrobot's operating system is Ubuntu 16.04 LTS, running on a powerful quad-core Intel® Core™ i5 Processor with 8 GB of DDR4 RAM and 128 GB of SSD storage. This makes QTrobot a powerful machine to run CPU and memory intensive applications directly, or in combination with a network of other computers connected to QTrobot through its WiFi hotspot and its developer-friendly software interface.

QTrobot's hardware is extendable with USB-C and USB3 adaptors, to connect it with LCD, keyboard, mouse, and Ethernet, making it a standalone Ubuntu-based robotic system with advanced sensors for research, or teaching AI and Robotics.

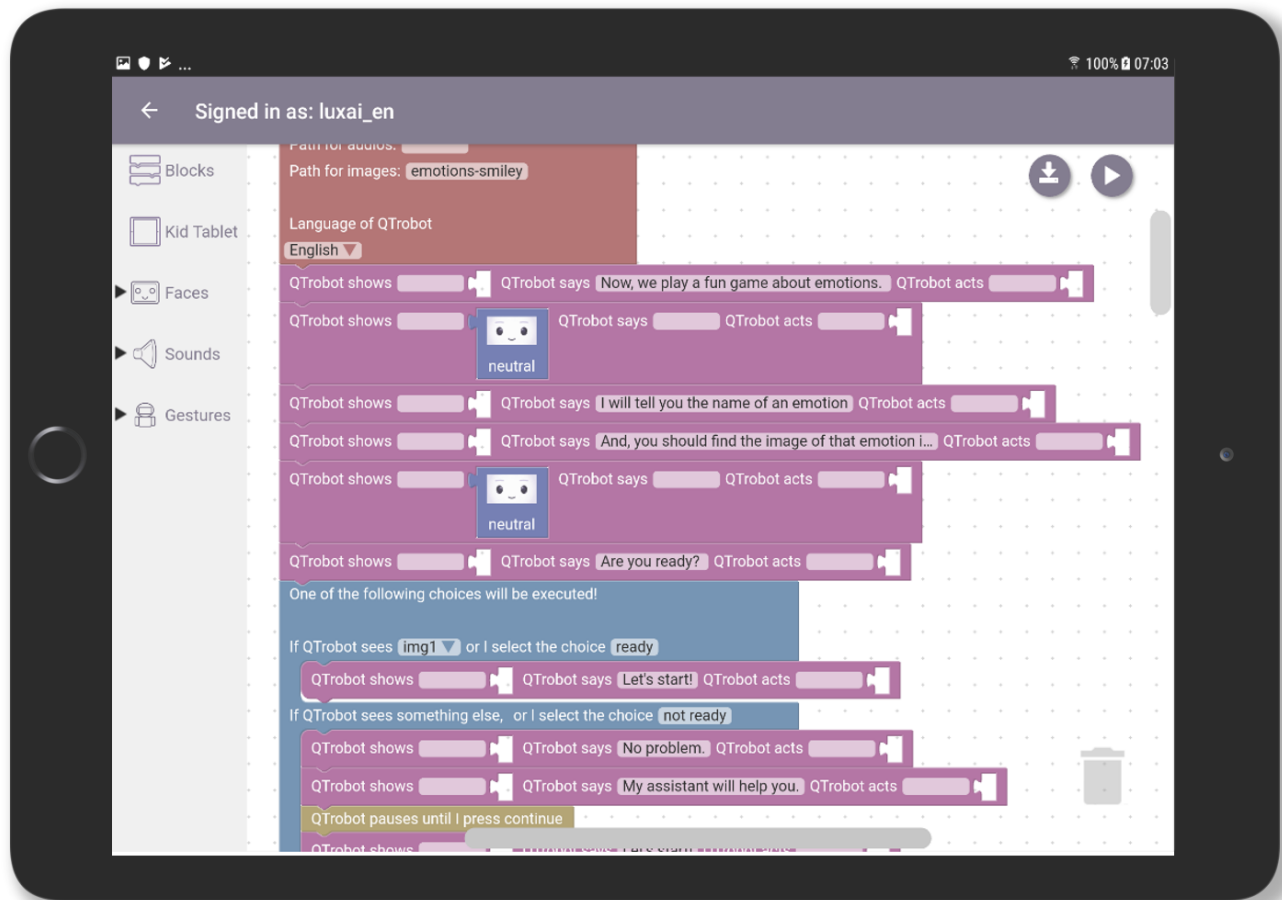
#### Native ROS API:

The QTrobot's ROS support immediately connects you with the largest open source robotics community with an extensive documentation and a great community support. So you can easily extend the QTrobot's embedded software components and functionalities with hundreds of state of the art open source components contributed by the ROS community.

The QTrobot's ROS API allows you to program QTrobot in the programming language of your choice, whether it be the C++, Python, Lisp, Lua or Java!



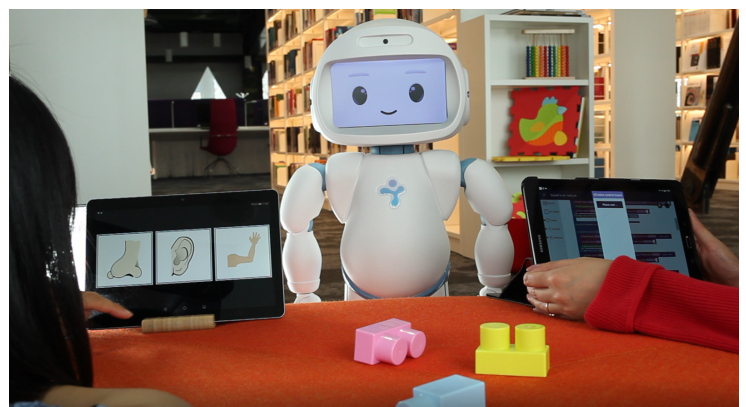
For more information, please see  
<http://wiki.ros.org/Robots/qtrobot>



### Graphical Development Environment on Tablet, as Easy as Using a Smart Phone

The graphical interface app of QTrobot allows everyone, with no IT knowledge, to develop interactive applications for QTrobot. Using the graphical interface of QTrobot is as easy as using a smartphone, you can master it in a matter of an hour or two!

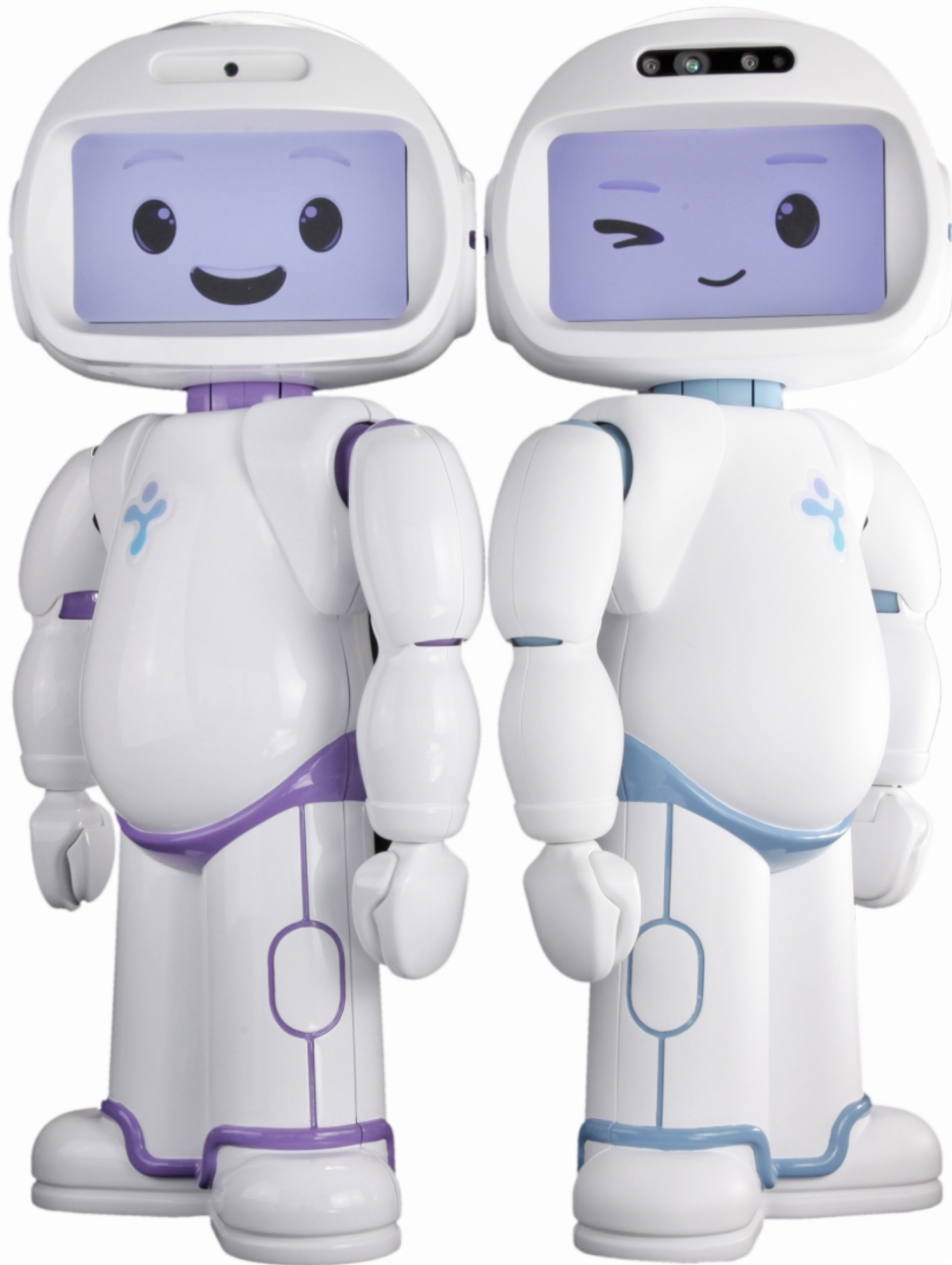
The interface is a codeless tablet/smartphone app using which non technical users can easily script new applications for QTrobot by drag and drop of visual blocks. The interface provides an intuitive way to integrate and customize advanced functionalities such as text-to-speech, animations, gestures and image recognition without writing any code to make QTrobot respond to people, objects and images, tell stories and play games.





# QTROBOT

Powerful, Reliable & Easy to Use



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