QBOT 2 FOR QUARC

The Quanser QBot 2 is a high-performance, open-architecture mobile robot with advanced features for research, and complete courseware support for undergraduate courses.

HIGH-PERFORMANCE ROBOT FOR INDOOR LABS

The Quanser QBot 2 for QUARC is an innovative open-architecture autonomous ground robot, equipped with built-in sensors, and a vision system. Accompanied by extensive courseware, the QBot 2 is ideally suited for teaching undergraduate and advanced robotics and mechatronics courses, surpassing capabilities of hobby-level robotic platforms. The open-architecture control structure allows users to add other off-the-shelf sensors and customize the QBot 2 for their research needs.

HOW IT WORKS

The QBot 2 for QUARC is built on a mobile platform in a differential drive configuration, using 2 wheels with built-in encoders. To measure the on-board sensors and drive motors, the QBot 2 utilizes Quanser's on-board data acquisition card (DAQ) and a wireless embedded computer. The on-board sensors include bump sensors, gyroscope, cliff sensors, and RGBD sensor (for a complete list see page 2). The DAQ also provides several I/O channels for interfacing additional sensors, including digital (SPI, UART, I²C) and analog sensors.

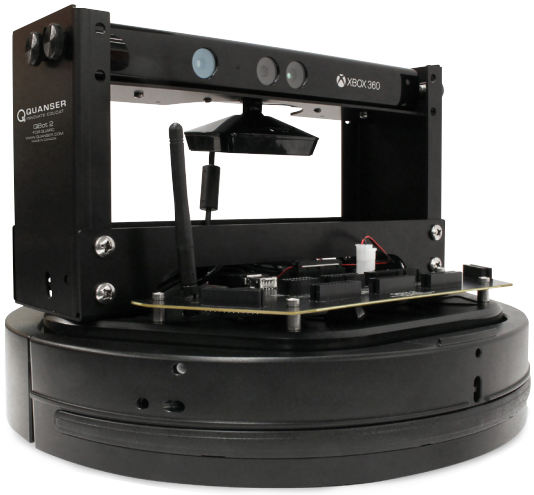
The QBot 2 vision system is an integrated RGB camera and depth sensor capable of capturing RGB image data and 11-bit depth data at several resolutions and frame rates. The mounting structure allows users to change the tilt for various viewing angles.

The QBot 2 operates using a host-target structure. The controllers are developed on the ground station computer (host)* using MATLAB®/Simulink®. The QUARC control software downloads real-time code from the host to the QBot 2 embedded computer (target), and allows users to run, modify and monitor the code remotely from the host. The controllers on-board the QBot 2 are open-architecture and fully modifiable.

RESOURCES FOR ROBOTICS AND MECHATRONICS COURSES

The QBot 2 for QUARC comes with Quanser-developed courseware materials covering standard topics for undergraduate and graduate robotics and mechatronics courses, including differential and inverse kinematics, odometric and probabilistic map-based localization, path planning, mapping and vision-guided control.

The laboratory exercises are organized in a set of independent modules, allowing professors to select and adapt them easily for an existing course, or build a new course.



System specifications on reverse page.

QBOT 2 FOR QUARC SOLUTION COMPONENTS

QBot 2 ground robot

QUARC real-time control software for MATLAB®/Simulink®**

Instructor and Student Workbooks, User Manual, and Quick Start Guide (provided in digital format)

Pre-built controllers

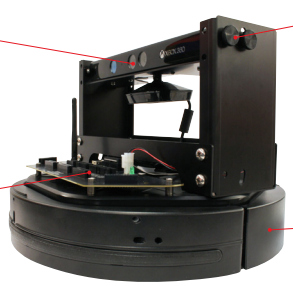
Add QBots, QBalls (Quanser unmanned aerial vehicle), and camera localization system to build an open-architecture, multi-agent unmanned vehicle research platform. For more details on the Quanser UVS Lab, contact info@quanser.com

* ground station computer not included

** MATLAB®/Simulink® not included. Also requires Computer Vision System Toolbox™. All licenses can be purchased from The MathWorks.

SYSTEM SPECIFICATIONS

QBot 2



CURRICULUM TOPICS PROVIDED

- Differential drive kinematics
- Forward and inverse kinematics
- Dead reckoning and odometric localization
- Path planning and obstacle avoidance
- 2D mapping and occupancy grid map
- Image acquisition, processing and reasoning
- Localization and mapping
- High level control architecture of mobile robots
- Vision-guided vehicle control

FEATURES

- Low cost, compact system, no assembly required
- Curriculum with independent exercises for robotics and mechatronics courses included
- Wide range of sensors included (bump sensor, wheel drop sensor, cliff sensor, 3-axis gyroscope, RGBD sensor)
- Customizable with off-the-shelf sensors supported by QUARC, including digital (SPI, UART, I²C) and analog sensors
- Mounting holes for custom sensor-mounting structures or load carrying
- Camera mounting structure with manually adjustible tilt angle for varying viewing angles
- Low power on-board computer with Linux operating system for high-level, real-time decision making and task execution
- Easy integration of additional QBot (QBot 2, Qbot) and QBall (QBall 2, QBall-X4) units
- Fully compatible with MATLAB®/Simulink®
- Fully documented system models and parameters provided for MATLAB®/Simulink®
- Open architecture design allowing users to design their own controllers

DEVICE SPECIFICATIONS

Platform	2-wheeled iClebo Kobuki mobile base from Yujin Robot	
QBot 2 diameter	35 cm	
QBot 2 height (with Kinect mounted)	27 cm	
Maximum linear speed	0.7 m/s	
Available payload	app. 4.5 kg	
Battery life	3 hours	
On-board computer	Gumstix DuoVero Zephyr with integrated 802.11 b/g/n WiFi	
QUARC maximum sample rate	1,000 Hz	
Camera resolution	640 x 480	
Depth sensing	11 bit	
Depth sensor range	0.5 - 6 m	
Sensors	*Sensors included*	*Additional I/O channels available*
	3 digital bump sensors	8 reconfigurable digital I/O channels
	3 digital wheel drop sensors	4 analog input channels
	3 cliff sensors	2 encoder input channels
	3-axis gyroscope	4 PWM output channels
	2 wheel encoders	1 SPI bus channel
	2 programmable LEDs	1 UART serial port *(interface 3.3 V serial device)*
	2 analog motor current sensors	1 I²C serial bus channel
	3 digital buttons	
	2 overcurrent sensors	
	1 Z-axis angle measurement *(heading)*	
	1 battery voltage sensor	
	1 Kinect® RGBD sensor	

About Quanser:
Quanser is the world leader in education and research for real-time control design and implementation. We specialize in outfitting engineering control laboratories to help universities captivate the brightest minds, motivate them to success and produce graduates with industry-relevant skills. Universities worldwide implement Quanser's open architecture control solutions, industry-relevant curriculum and cutting-edge work stations to teach Introductory, Intermediate or Advanced controls to students in Electrical, Mechanical, Mechatronics, Robotics, Aerospace, Civil, and various other engineering disciplines.