e-puck2 is the latest mini mobile robot for teaching purposes developed at the Swiss Federal Institute of Technology in Lausanne (EPFL) in collaboration with GCtronic. This is an evolution of the successful e-puck robot already in use in many research and educational institutes. Now with WiFi and USB connectivity and charge.

While maintaining compatibility in most scenarios with its predecessor (same shape and mechanics), e-puck2 features many improvements. It is powered by an STM32F4 microprocessor and features a large number of sensors in its standard configuration: IR proximity, sound, IMU, camera, ToF distance sensor. It supports BT, BLE and WiFi communication and USB charging. It includes also an onboard programmer and debugger. The e-puck2 hardware and software is fully open source giving low-level access to every electronic device and offering unlimited extension possibilities. A flourishing user community provides software, documentation and discussion groups. Moreover an extensive wiki is available at the GCtronic website (www.gctronic.com).
**Processor**
32-bit STM32F407 @ 168 MHz (210 DMIPS), DSP and FPU, DMA

**Memory**
RAM: 192 KB; Flash: 1024 KB

**Battery, charging**
LiPo rechargeable battery, 1800 mAh, USB charging, recharging time about 2.5h.

**Distance sensors**
8 infra-red sensors measuring ambient light and proximity of objects up to 6 cm. Front real distance sensor, Time of flight (ToF), up to 2 meter.

**IMU**
3D accelerometer, 3D gyro, 3D magnetometer

**Camera**
VGA color camera; typical use: 160x120

**Storage**
Micro SD slot

**LEDs**
4 red LEDs and 4 RGB LEDs around the robot; green light, 1 strong red LED in front

**Programming**
Free C compiler and IDE, Webots simulator, onboard debugger (GDB)

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<th>Feature</th>
<th>Technical information</th>
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<tr>
<td>Processor</td>
<td>32-bit STM32F407 @ 168 MHz (210 DMIPS), DSP and FPU, DMA</td>
<td>Mechanical structure</td>
<td>Transparent plastic body supporting PCBs, battery and motors</td>
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<tr>
<td>Memory</td>
<td>RAM: 192 KB; Flash: 1024 KB</td>
<td>Size, weight</td>
<td>70 mm diameter, 45 mm, 130 g</td>
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<tr>
<td>Battery, charging</td>
<td>LiPo rechargeable battery, 1800 mAh, USB charging, recharging time about 2.5h.</td>
<td>Wheels</td>
<td>Wheels diameter = 41 mm, Distance between wheels = 53 mm</td>
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<tr>
<td>Distance sensors</td>
<td>8 infra-red sensors measuring ambient light and proximity of objects up to 6 cm. Front real distance sensor, Time of flight (ToF), up to 2 meter.</td>
<td>Motors / speed</td>
<td>2 stepper motors with a 50:1 reduction gear; 20 steps per revolution; ~ 0.13 mm resolution Max speed: 1200 steps/s (about 15.4 cm/s)</td>
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<tr>
<td>IMU</td>
<td>3D accelerometer, 3D gyro, 3D magnetometer</td>
<td>Mode selector</td>
<td>16 position rotating switch</td>
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<tr>
<td>Camera</td>
<td>VGA color camera; typical use: 160x120</td>
<td>Audio</td>
<td>4 omni-directional microphones (digital) for sound localization. Speaker capable of playing WAV or tone sounds</td>
</tr>
<tr>
<td>Storage</td>
<td>Micro SD slot</td>
<td>Communication</td>
<td>USB Full-speed, Bluetooth 2.0, BLE, WiFi</td>
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<tr>
<td>LEDs</td>
<td>4 red LEDs and 4 RGB LEDs around the robot; green light, 1 strong red LED in front</td>
<td>Remote control</td>
<td>Infra-red receiver for standard remote control commands</td>
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<tr>
<td>Programming</td>
<td>Free C compiler and IDE, Webots simulator, onboard debugger (GDB)</td>
<td>Extensions</td>
<td>All extension supported</td>
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</table>

*compatibility with e-puck 1*

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**ECONOMICAL:**
Because of the number of sensors and actuators, the embedded processing power and the extension possibilities, the robot covers a large spectrum of educational activities. Potential educational fields are mobile robotics, real-time programming, embedded systems, signal processing, image or sound feature extraction, human-machine interaction and collective systems, Internet of Things, Android and iOS applications.

**ROBUSTNESS AND SIMPLE MAINTENANCE:**
The robot resists to student use and is simple and cheap to repair.

**AFFORDABLE:**
The very competitive price allows using e-puck for education and collective research.

**FLEXIBILITY:**
E-puck2 is based on an open hardware concept, where all documents are distributed and submitted to a license allowing everybody to freely use and contribute to the project.