e-puck Mini Doc (Ver. 1.0)

EPFL educational and research mini mobile robot

GCtronic
Electronics & Mechatronics

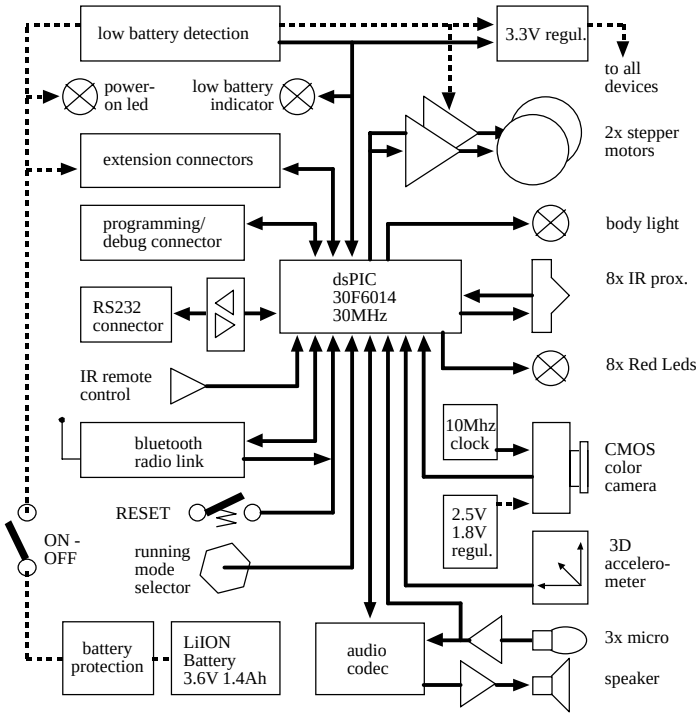
e-puck is the latest mini mobile robot developed at the Swiss Federal Institute of Technology in Lausanne (EPFL) for teaching purposes. Already in use in many research and educational institutes, it is now also commercially available from GCtronic.

e-puck is powered by a dsPIC processor and features a large number of sensors in its standard configuration (IR proximity, sound, accelerometer, camera). The e-puck 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.

The use of e-puck documents coming from EPFL is submitted to a license. The license is reported in the next pages.

Websites where to find documentation and SW:
www.e-puck.org
www.gctronic.com/e-puck.php
https://gna.org/projects/e-puck/

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE



WARNING !
!! Forcing the wheel to spin will damage the motor !!

Important and useful programs to download (also listed in www.gctronic.com/e-puck_links.php) :

PROGRAMMING
To program in C the robot you can use the integrated development environment (IDE) of the microcontroller of e-puck. Basically you need 3 parts: the IDE for editing, the C compiler, and the downloader.
- MPLAB IDE: www.microchip.com ->Design ->Development Tools -> MPLAB IDE
- The **C compiler** related to MPLAB is the MPLAB C30 (free student edition to download): www.microchip.com ->Design ->Development Tools -> MPLAB C Compiler for DSPic
- The tiny **downloader**: www.etc.ugal.ro/cchiculita/software/picbootloader.htm

TUTORIALS
Tutorial to program e-puck using Bootloader via Bluetooth: www.e-puck.org ->Download -> Documentation

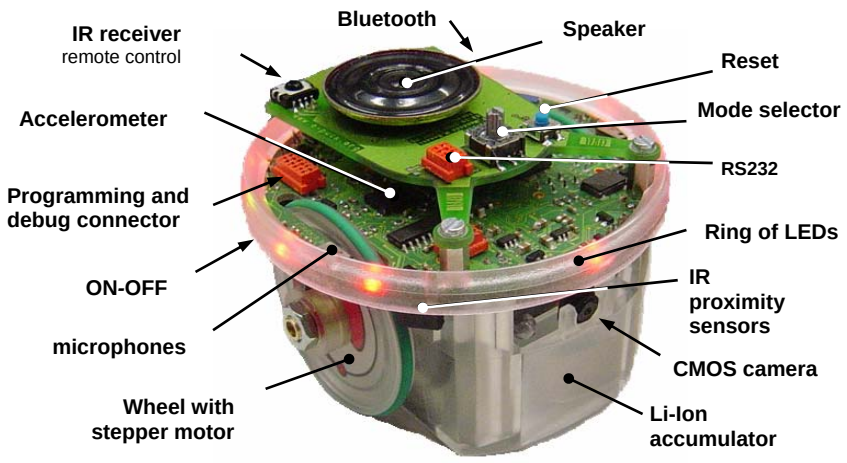
SIMULATION
The simulator Webots is intended to support fully the e-puck: from simulation, to compiling and download. It includes some graphic programming; it is 3D and simulates physics.
For the first demos, you can download the evaluation version (free) of Webots:
www.cyberbotics.com/products/webots/download.html
Purchasing the EDU version (~320 CHF) you can reprogram the simulated robot and remote control the real robot.

EXAMPLE CODE
A nice set of demos to start with is a collection from SWIS, LIS and MOBOTS labs at EPFL assembled by GCtronic: *demoGCtronic* is the software on the robot at delivery and you can download it at www.gctronic.com/e-puck_links.php -> Example.

Move the mode selector and push reset to start several demos, activating reactions from acceleration or sound; run obstacle avoidance or wall follow; communicate with a host PC to show all the sensors data including VGA camera.

The embedded software running on the e-puck is continuously extended and managed under GNA https://gna.org/projects/e-puck/ using Subversion (SVN).

ROBOT VERSIONS
A new production of June 2008 includes a newer camera which is slightly different and need a new driver. The latest software support both old and new camera. There are no other changes influencing the software of the robot.



LICENSE

e-puck Robot
Open Source Hardware License Version 1.0

August 2005

Preamble

This Open Source Hardware License aims at the dissemination of the specifications necessary to build the e-puck robot, a mobile robot developed by the Ecole Polytechnique Fédérale de Lausanne ("EPFL"), Switzerland.

1. Definitions

"License" shall mean this Open Source Hardware License.
"Specifications" shall mean the hardware specifications, printed circuit board designs, drawings, CAO files, list of components and other artwork for building an e-puck mobile robot as released by EPFL and published on its web site (www.e-puck.org), from time to time.
"Robot" or "Robots" shall mean the e-puck mobile robot(s) built using the Specifications or any modification or derivation thereof.
"You" shall mean each licensee under this License.

2. Using the Specifications and Building Robots

You are hereby authorized to use the Specifications for any purpose.

You are further authorized to build Robot(s) based on the Specifications and distribute them, provided that you give to each purchaser of Robot(s) a copy of this License along with a copy of the Specifications under the conditions specified in Section 3.1 herein.

You may design and develop a Robot based on modification you make to the Specifications. If you decide to distribute such a Robot, you shall only do so provided that you give to each purchaser of such a Robot a copy of this License along with a copy of the modified Specifications under the conditions specified in Sections 3.1 and 3.2 herein.

When referring to the Robot in any scientific publication, you shall make a clear reference to the e-puck Robot pages on EPFL's Web site : www.e-puck.org.

You will not be charged any royalties by EPFL for such use of the Specifications and/or building and distributing the Robot(s) or the Specifications.

3. Copying, Distributing and Modifying the Specifications

3.1 You may copy and distribute verbatim copies of the Specifications as you receive them, in any medium. If you choose to do so (or if you choose to distribute Robot(s) based on the Specifications), you shall only do so under the following conditions :

i) conspicuously and appropriately publish on each copy of the Specifications the following copyright notice and disclaimer of warranty :

"Copyright © Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland.

The specifications of the e-puck mobile robot are "open source hardware". You can redistribute them and/or modify them under the terms of the e-puck Robot Open Source Hardware License as published by EPFL. You should have received a copy of the EPFL e-puck Robot Open Source Hardware License along with these specifications; if not, write to the Ecole Polytechnique Fédérale de Lausanne (EPFL), Industrial Relations Office, Station 10, 1015 Lausanne, Switzerland.

These specifications are distributed in the hope that they will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. For more details, see the EPFL e-puck Robot Open Source Hardware License. "

and

ii) give any other recipients of the Specification a copy of this License along with the Specifications

3.2 You may modify your copy of the Specifications or any portion thereof. You are not required under the terms of this License, to distribute any of the modifications that you make to the Specifications. However, if you choose to distribute modified Specifications (or to distribute Robot(s) based on modified Specifications), you shall only do so under the terms of Section 3.1 above and subject to all of the following conditions :

i) you must cause the modified Specifications to carry prominent notices stating that you have changed the Specifications as well as the date and details of such change;

and

ii) you must allow any modified Specifications that you distribute or publish, that in whole or in part contains or is derived from the Specifications or any part, modification or derivation thereof, to be licensed as a whole at no charge by any third party under the terms of this License.

The requirements of this Section 3.2 do not apply to works that are not derivatives of the Specifications (in the sense of the applicable copyright law).

4. General

4.1 Save for the fair use or similar right granted under the applicable copyright law, you may not use copy, modify, sublicense, or distribute the Specifications or Robots except as expressly provided under this License. Any attempt otherwise to use, copy, modify, sublicense or distribute the Specifications is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

4.2 You are not required to accept this License. However, nothing else grants you permission to use, copy, modify or distribute the Specifications or its derivative works or Robots and save for the fair use or similar right granted under the applicable copyright law, these actions are prohibited by law if you do not accept this License. Therefore, by using, copying, modifying or distributing the Specifications (or any work based on the Specifications) or any Robots, you indicate your acceptance of this License to do so, and all its terms and conditions for using, copying, distributing or modifying the Specifications or works based on it.

4.3 Each time you redistribute the Specifications, distributes any modifications of the Specifications, or distribute any Robot, the recipient or purchaser automatically receives a license form EPFL to use, copy, distribute or modify the Specifications subject to the terms and conditions of this Licensee. You may not impose any further restrictions on the recipients' exercise of the rights granted herein.

4.4 EPFL may publish revised and/or new versions of the e-puck Robot Open Source Hardware License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Specifications specify a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by EPFL. If the Specifications do not specify a version number of this License, you may choose any version ever published by EPFL.

5. Disclaimer of Warranty

THE SPECIFICATIONS ARE PROVIDED "AS IS". EPFL DOES NOT MAKE ANY WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ABSENCE OF DEFECT AND NON-INFRINGEMENT OF THIRD PARTIES' RIGHTS IN RESPECT OF THE SPECIFICATIONS OR MODIFIED SPECIFICATIONS OR ANY ROBOT(S) THAT MAY BE BUILD OR MANUFACTURED BASED ON THE SPECIFICATIONS OR ON MODIFIED SPECIFICATIONS. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF ROBOTS BUILT OR MANUFACTURED BASED ON THE SPECIFICATIONS OR ON MODIFIED SPECIFICATIONS SHALL BE WITH YOU. SHOULD THE SPECIFICATIONS OR MODIFIED SPECIFICATIONS PROVE TO BE DEFECTIVE, YOU SHALL ASSUME THE COST OF ALL NECESSARY REPAIR OR CORRECTIONS TO THE ROBOT(S).
IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL EPFL OR ANY PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE SPECIFICATIONS AS PERMITTED HEREIN, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE SPECIFICATIONS AND/OR THE ROBOT(S), EVEN IF EPFL OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. +

END OF LICENSE

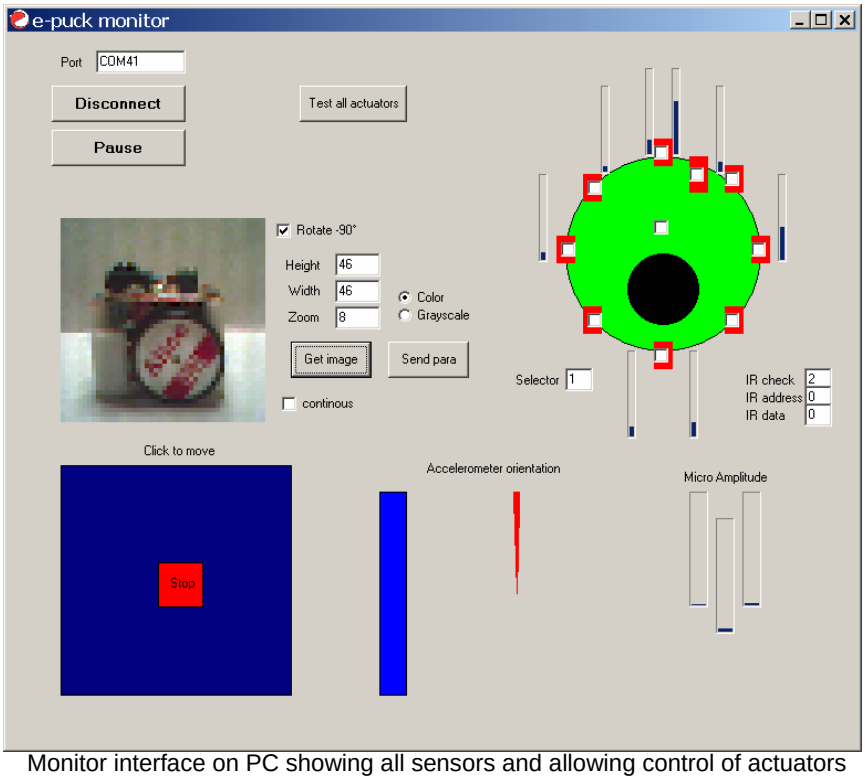
First test after unpacking

The e-puck robot comes with a set of demos preinstalled. It is an adaptation of demos from SWIS, LIS and MOBOTS labs. This is called demoGCtronic and can also be found on the GCtronic web site
www.gctronic.com/e-puck_links.php -> Example
Moving the mode selector and pushing on the blue reset button, it's possible to activate different sub programs:
0) Reactions from acceleration and free fall
1) Turning toward a clapping hand sound
2) Wall following
3) Communicate using Bluetooth with a host PC to show all the sensors data including VGA camera.
4-15) Others including obstacle avoidance and following

The serial number is the same as the BT code

Apart the Bluetooth demo (3), the others do not require any else than the robot itself and make use of most of the sensors and actuators on the robot base.
To communicate via **Bluetooth** the computer and the robot must be "paired". Each e-puck has a name (e-puck_XXXX) and a pin code (XXXX). XXXX is the number written on the back right side under the speaker extension. On the nearby figure XXXX is 0202.
The steps are:
- power on the robot and run a search of new Bluetooth devices from the PC.
- choose the e-puck_XXXX device where XXXX is the number of your e-puck.
- enter the pin code to access to your e-puck (same XXXX number)
- a com virtual serial port is created. You could change the COM port number if needed.
- use that COM port number for any program accessing to e-puck via Bluetooth.

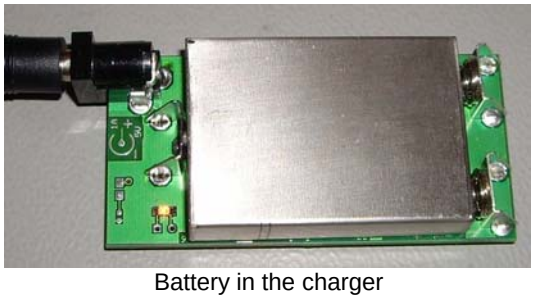
Any terminal program can be used and typing 'H' 'enter' the help menu is written on the screen.
The **e-puck monitor** (also on www.gctronic.com) is an example interface (see snapshot) using the communication protocol to access all the sensors and actuators of the robot.

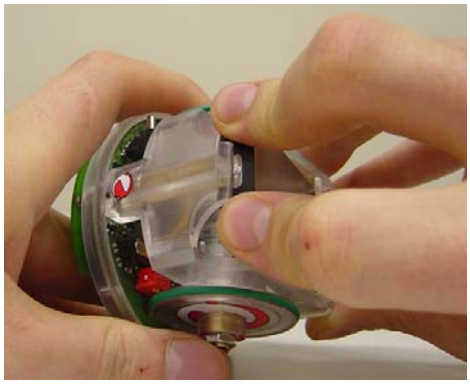


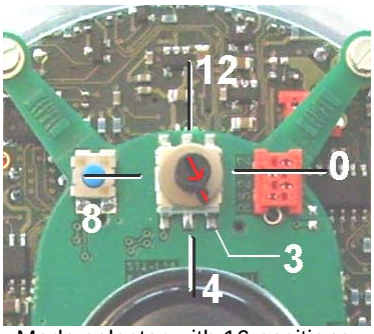
Monitor interface on PC showing all sensors and allowing control of actuators

Charging the battery

To charge the LiIon battery, pull it out from the robot frame and install it on the charger board. During the charge the red LED is on and turns off when the battery is fully charged. A complete charging sequence takes up to 4 hours.
Be careful with the positive terminal of the battery (the one with the black plastic). Avoid scratching it. Instead, fully compress the springs on the opposite side while managing it.


Battery in the charger


Compress the springs managing the battery



Mode selector with 16 positions

Contact Information

GCtronic, Electronics and Mechatronics
via Lavizzari 15, CH-6850 Mendrisio, Switzerland
phone: +41 91 630 21 49
fax: +41 086 078 601 11 13
web: www.gctronic.com
e-mail: info@gctronic.com

GCtronic
Electronics & Mechatronics