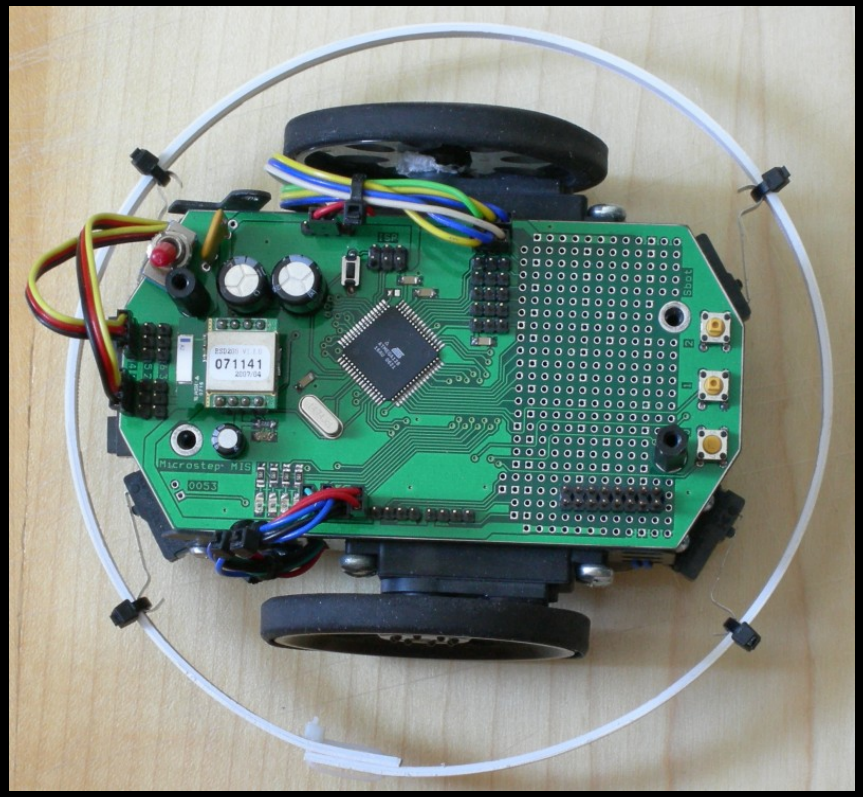
SBot 2.0
Educational robot



David Gustafík, Pavol Krasňanský, in cooperation with

MicroStep-MIS

Aims of the project

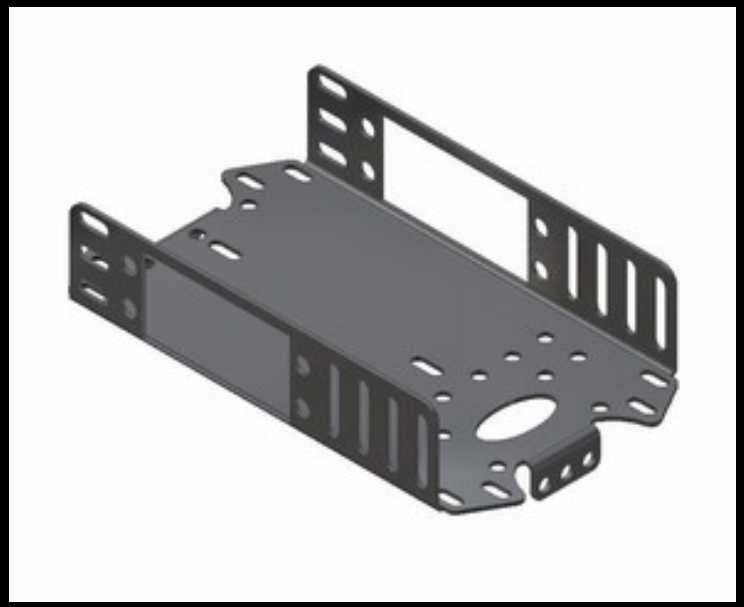
- To have a new system in a RoboticLab at the FEI STU in cooperation with the MicroStep-MIS company
- To have an expandable education kit from the widely available components
- To play with ☺

Concept

- Standalone device for experiments with algorithms, learning of the basic robotics principles – detection and obstacle avoidance, linefollowing
- The mobile base for more advanced system – it is possible to add a Linux SBC with a camera for more advanced principles – image processing, artificial intelligence...
- BlueTooth remote controlled robot for the Robotic Lab at the FEI STU

Mechanics

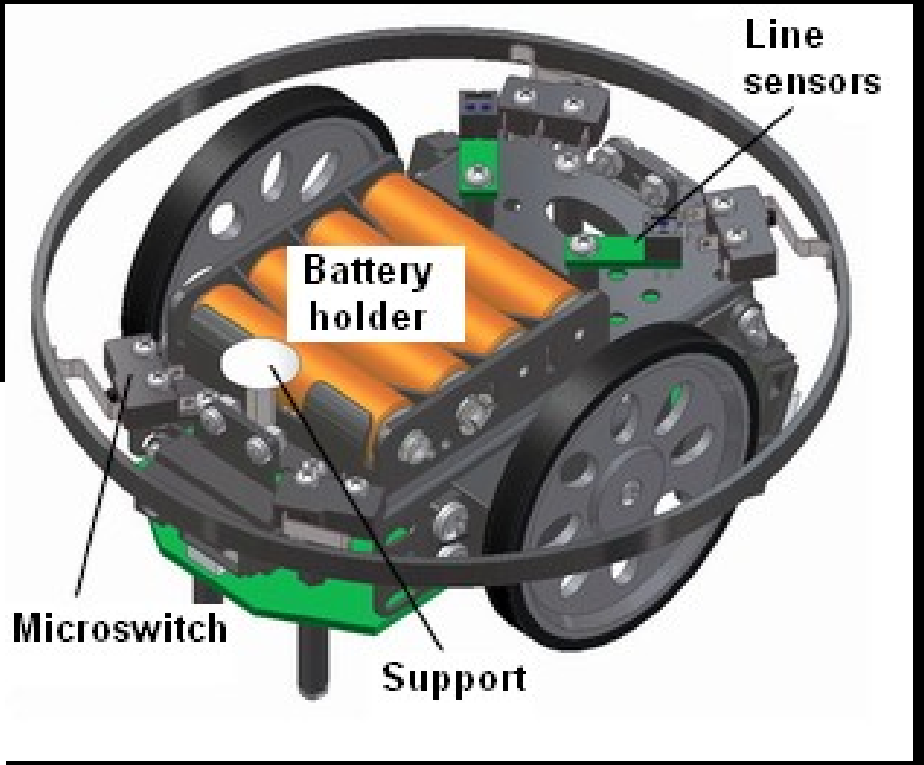
- The main body is from single piece of aluminium – easy and cheap production using just 2 operations, everything else are standard components
- Enough mounting holes for extensions (sensors, other mechanics)

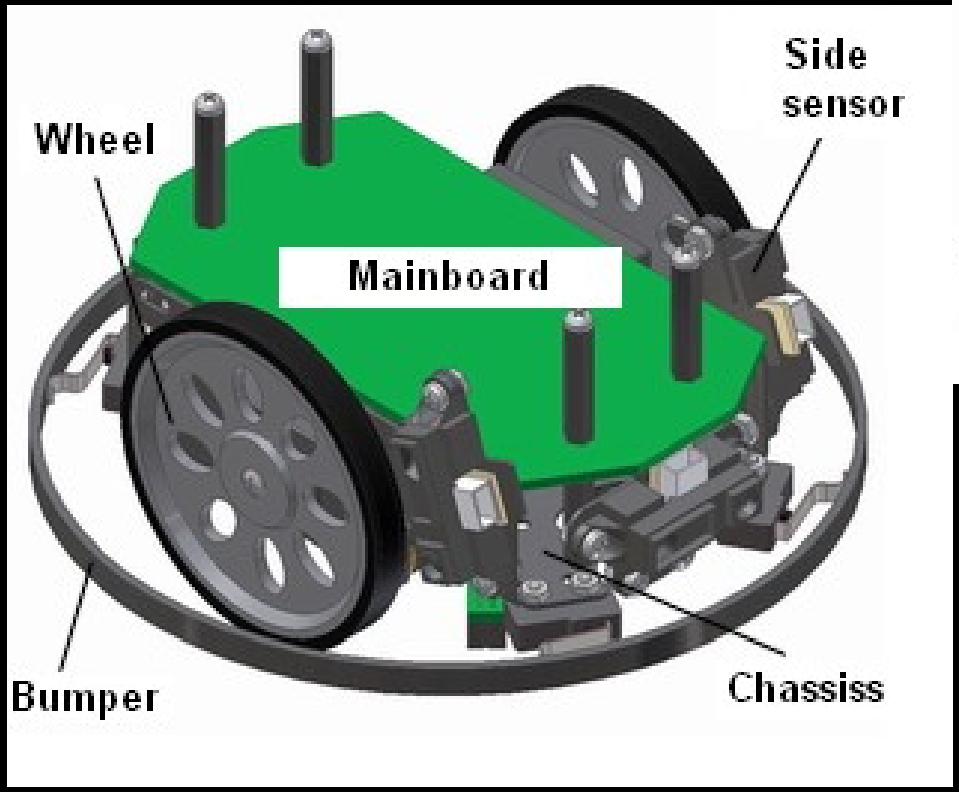


Easy building up – just using a screwdriver!

Example

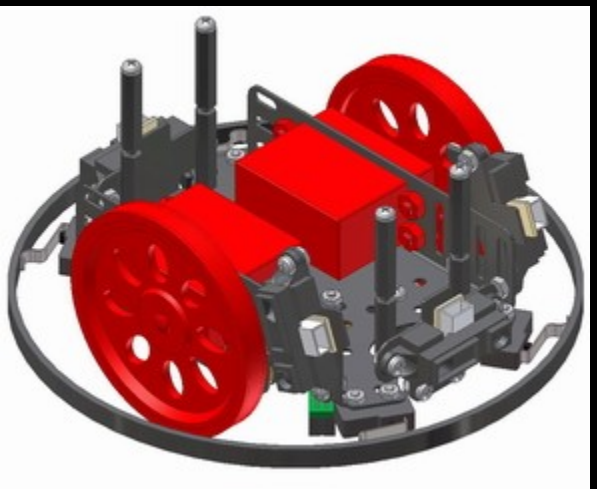
Main parts

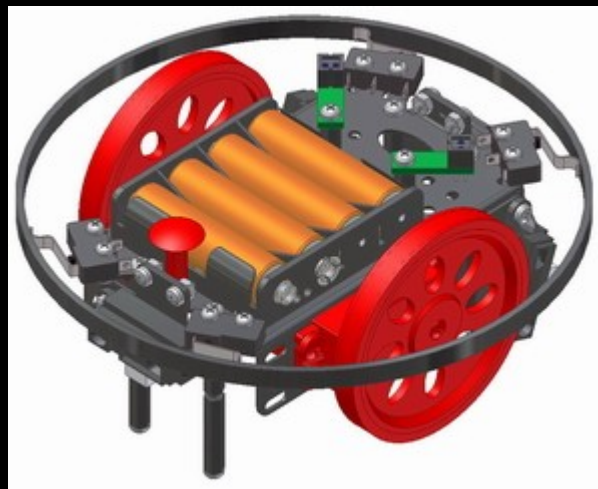

Line
sensors
Battery
holder
Microswitch
Support


Side
sensor
Wheel
Mainboard
Bumper
Chassiss

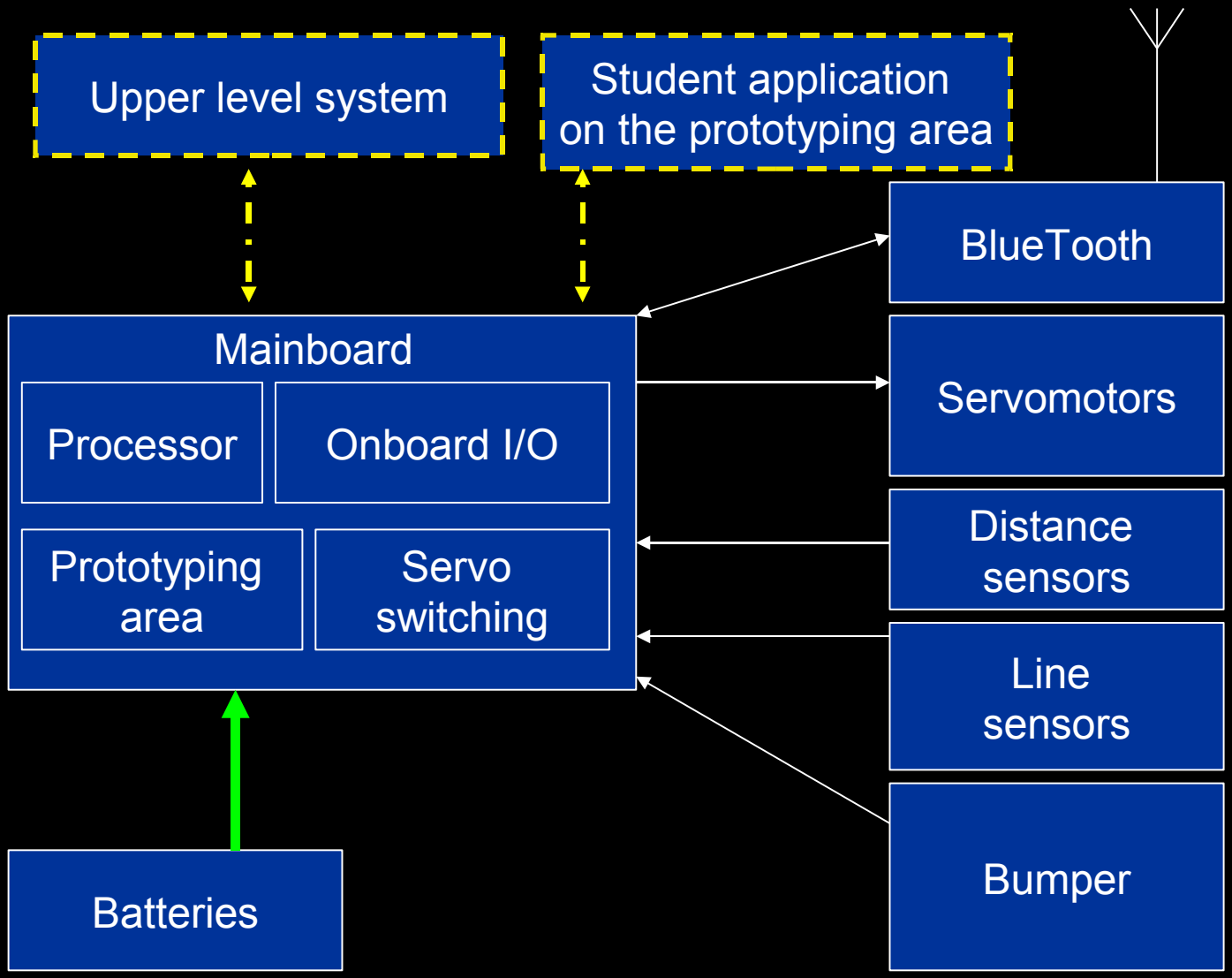
Drive

- Differential drive with third fixed support
- Motors – modified hobby RC servos
- Third touch point – screw blind flange



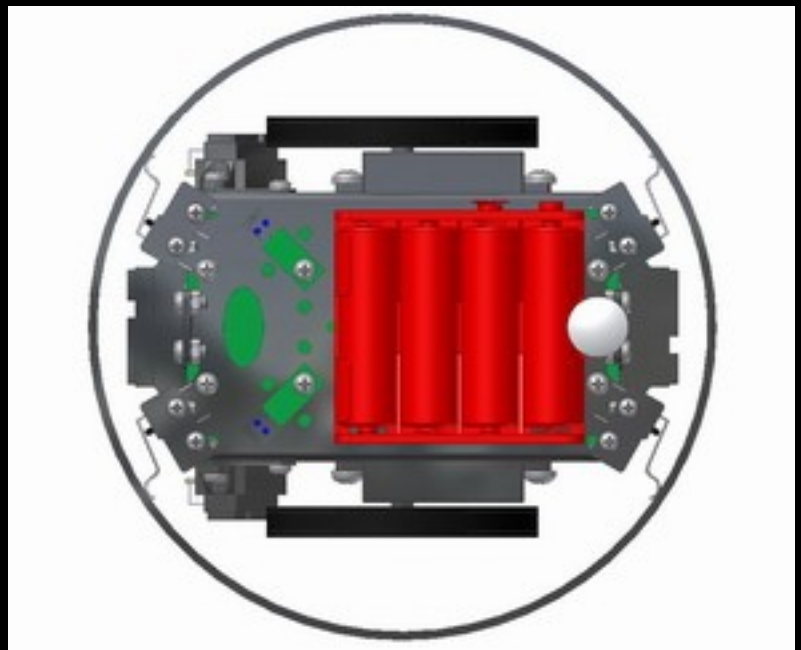


Block diagram



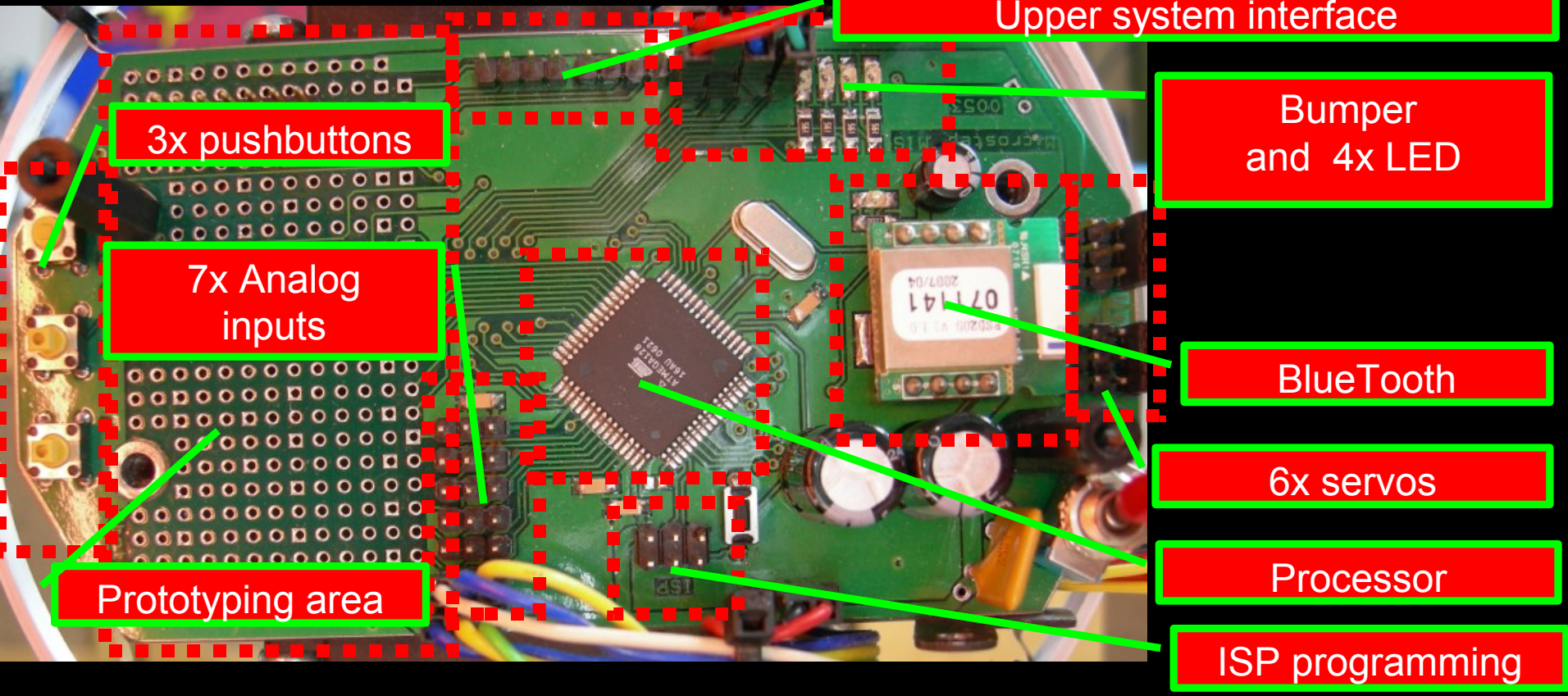
Power

- 4 x AA batteries, possible to use an accumulators NiMH, NiCD
- Placed at the bottom of the robot, improving the ballance



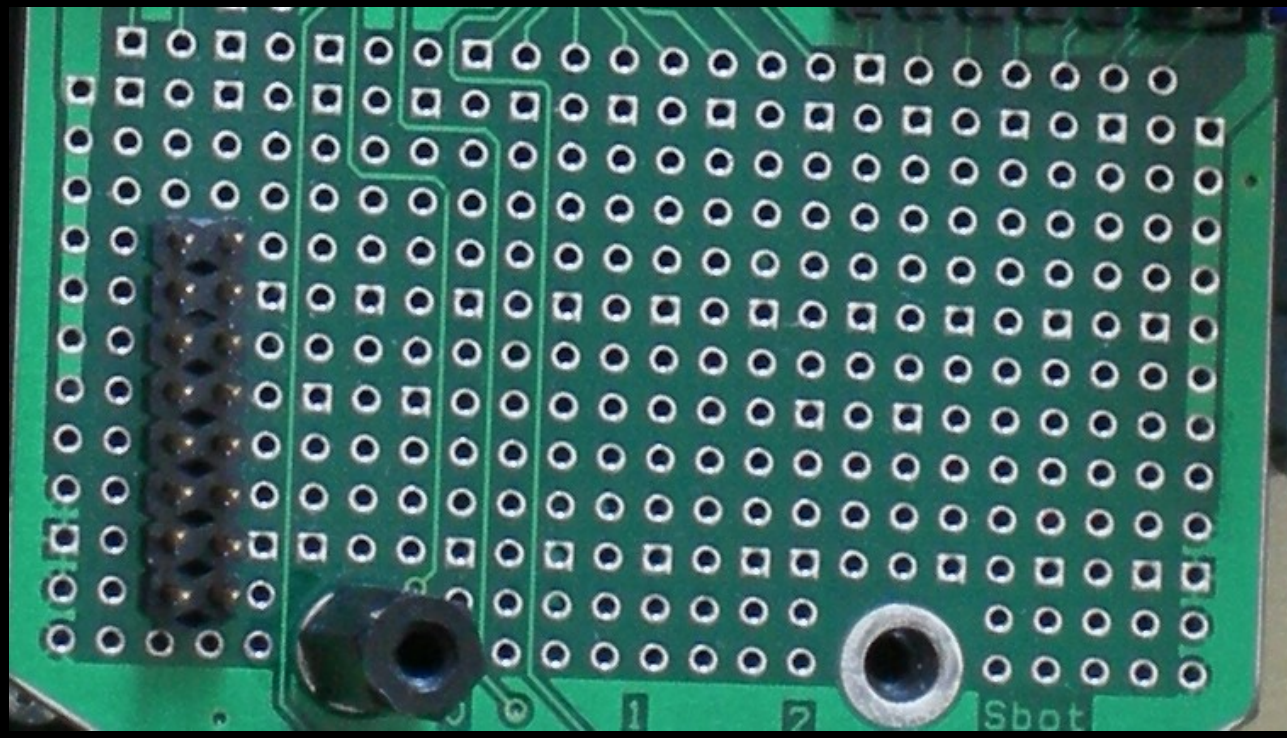
Control electronics

- The Brain of the robot
- Small compact board with a AVR Atmega128
- Contains also a prototyping area, BlueTooth interface, servo control, connectors for more sensors and for master controller...



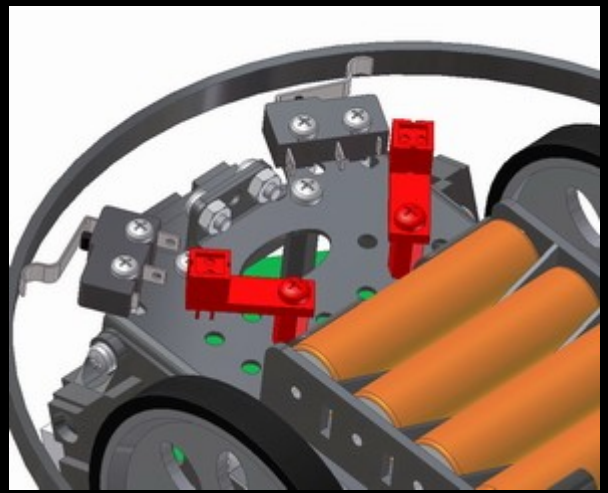
Prototyping area

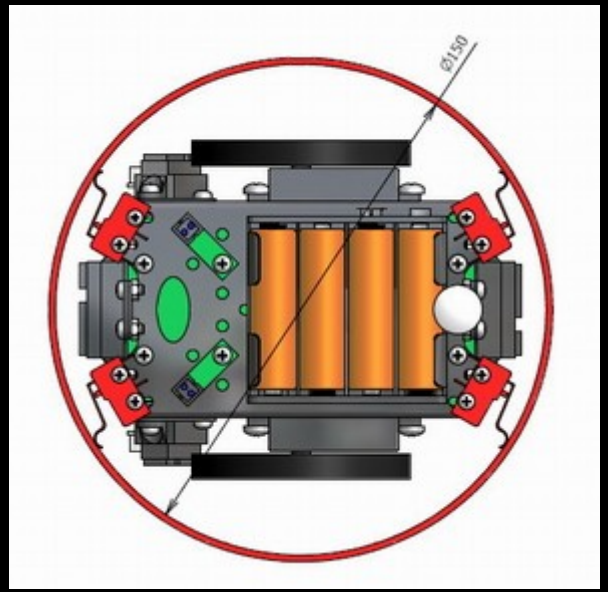
- Important part – enables to create students projects, own cirtuits, new sensors (gas, light, pressure), extensions, etc..
- Prepared for
  - 8x digital I/O
  - 7x analog input
  - 1x SPI
  - 1x I2C
  - 1x UART
  - 2x interrupt
  - +5V, 3.3V, GND

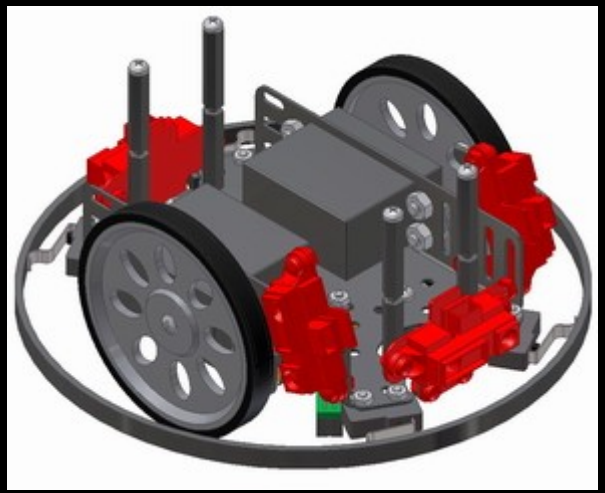


Sensors

- Line following: 2x CNY70 on separate boards for an easy mounting
- Bumper: 4x microswitch connected with a circle around the robot – possibility to detect the crash direction
- Area mapping: mechanically prepared for 4 distance sensors Sharp GP2Dxx







Communication

- BlueTooth – 30m range
- From the PC side it is a standard serial port (COM) connected using a terminal or a use application
- Serial line
- Protocol compatible with a Robotic Lab at the FEI STU.

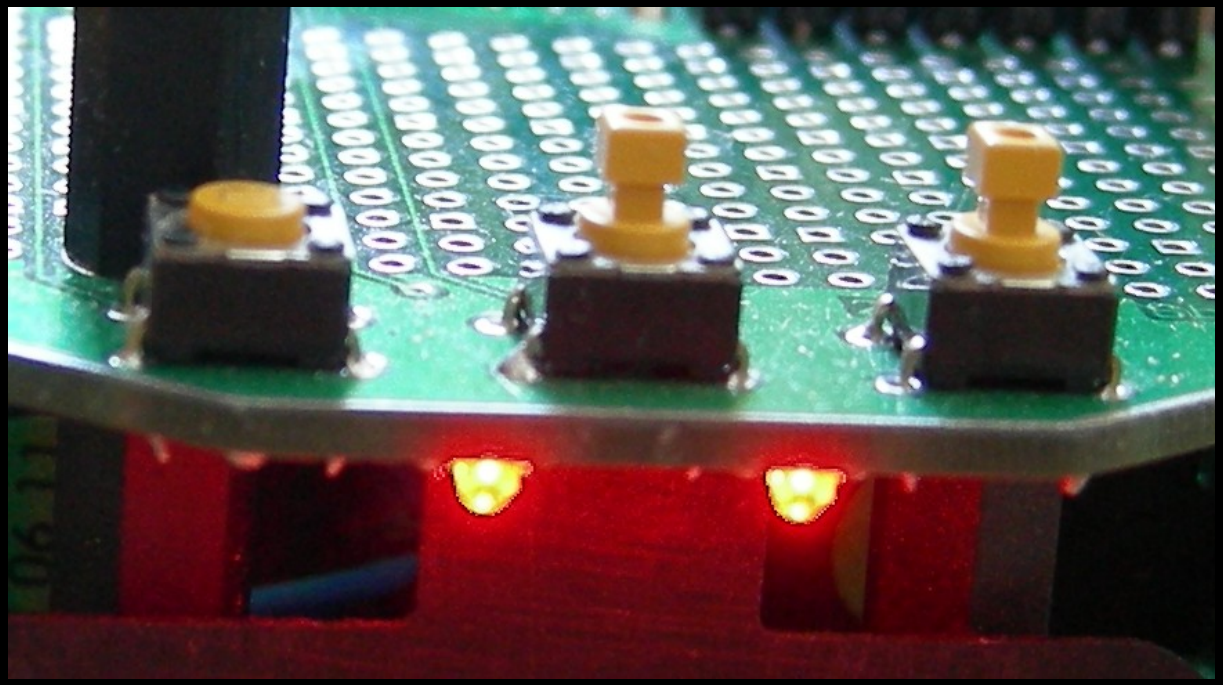
Firmware and software

- Firmware: Simple framework enables more developments written in C for AVR
- Whole development tools are free (compiler, simulator)
- Software: Any terminal program, or an user application

Technical Parameters

Diameter (with bumper)	150mm
Power supply	4x 1,2V NiMH/NiCD accu
Weight (with batteries)	396g
Drive	2x modified hobby RC servo, expandable up to 6
Speed	0,156m/s = 0,5625km/h
Main processor	ATMega128
Programming interface	ISP, bootloader
BlueTooth range	up to 30m
Basic sensors	2x line sensors, bumper with 4 directional switches
Advanced sensors	GP2Dxx distance sensors, additional line sensors
User interfaces	4x LED, 3x pushnutton
Programming language	C, assembler

Thanks for Your attention



Questions?