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Sukop Marek, PhD., doc., Ing.*Department of Robotics at Faculty of Mechanical Engineering, Technical University of Košice, Slovakia***PROPOSAL OF MOBILE ROBOT PLATFORM FOR TESTS ITS PERFORMANCE**

This article mainly deals with the design of an electronic part of robot whose playing robot category MiroSot. Sjf TUKE Robotics Team has the experience and achievements in this category, but for further progress is necessary improved still many details. The main detail is to improve the behavior of robots - players on the move. In particular, we consider it necessary to resolve the stability of the movement of mobile robots in various motion situations. This article describes how we designed the electronic parts of the robot. This section will serve us in the future for data acquisition. Later, the results can we expect that we will be able to design adaptive control for mobile robots and we will be able to improve movement stability of robots.

Electronic proposal

When we design electronics we are limited by the size of mobile robots. The dimensions are in the rules: a robot may not have dimensions greater than 7.5 cm cube with a side. The exception is the dimension of the antenna. Building on the proposal for our four-wheeled robot, then we are limited PCB dimensions approximately 55x57mm. The design of our robot is in figure 1. [1]

The basis for measurement, we selected module accelerometer POLULU-1247 (figure 2). The module is equipped with a 3-axis accelerometer MMA7341LC, which has the possibility of measuring acceleration in each axis ± 3 g or ± 9 g. [6]

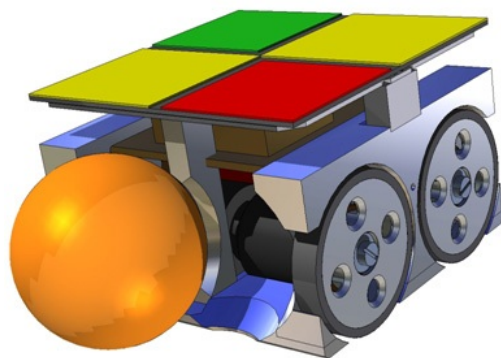


Fig. 1 Layout of the components

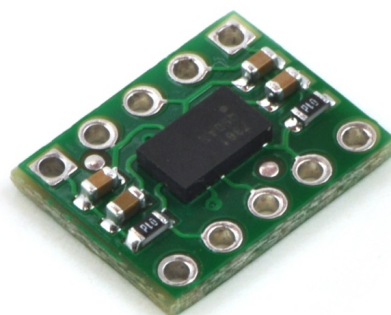


Fig. 2 Accelerometer module POLULU-1247

Another requirement is to use the bluetooth module (figure 3). This module should provide external communication with devices for data acquisition and control (such as a cell phone or tablet).

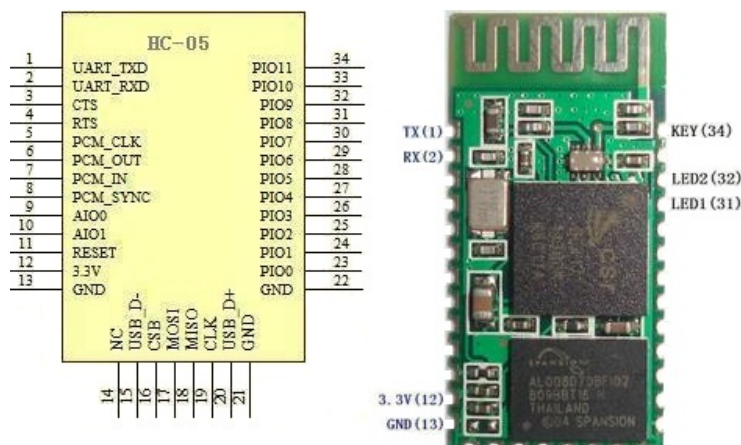


Fig. 3 Bluetooth module HC-05

The basis of our proposal became 8/16 bit microcontroller Atmel Xmega32A4 (figure 4).

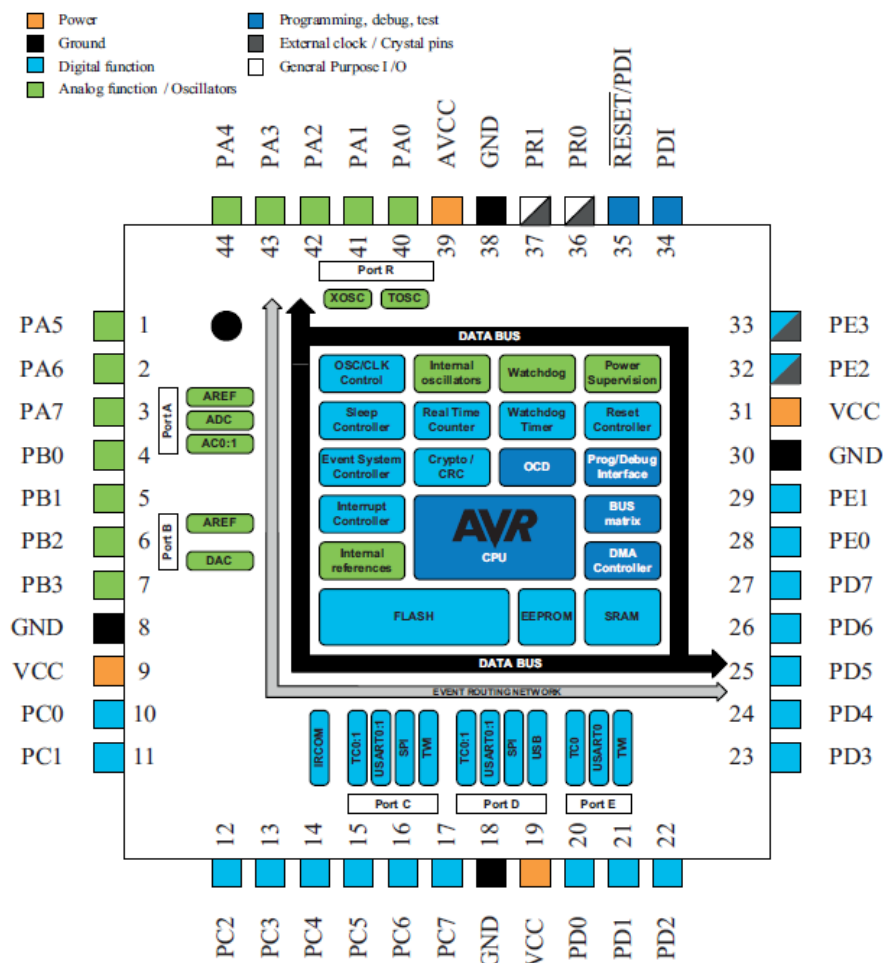


Fig. 4 Microcontroller Atmel Xmega

This microcontroller has dual hardware quadrature encoder, needed to retrieve the actual speed of dc motors. Its computing power is sufficient for our application. Package of this microcontroller has optimal dimensions (type TQFP44). [7]

In early draft we had to start preparing voltages. It should be used two levels: 3.3V and 5V. The working voltage of 3.3V: microcontroller, a Bluetooth module and accelerometer. The working voltage of 5V: Encoder for dc motors and power circuits for excitation DC motors. Format stress we created using dc / dc converters TSR1 (Figure 5).

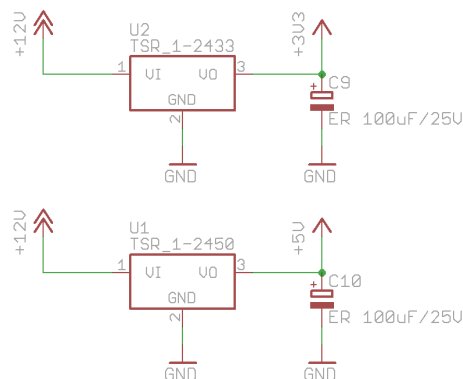


Fig. 5 Two levels of voltage

Involvement microcontroller is shown in Figure 6. As the pulse was used crystal with frequency 14,7456MHz. Microcontroller can be programmed directly in the application by PDI connector.

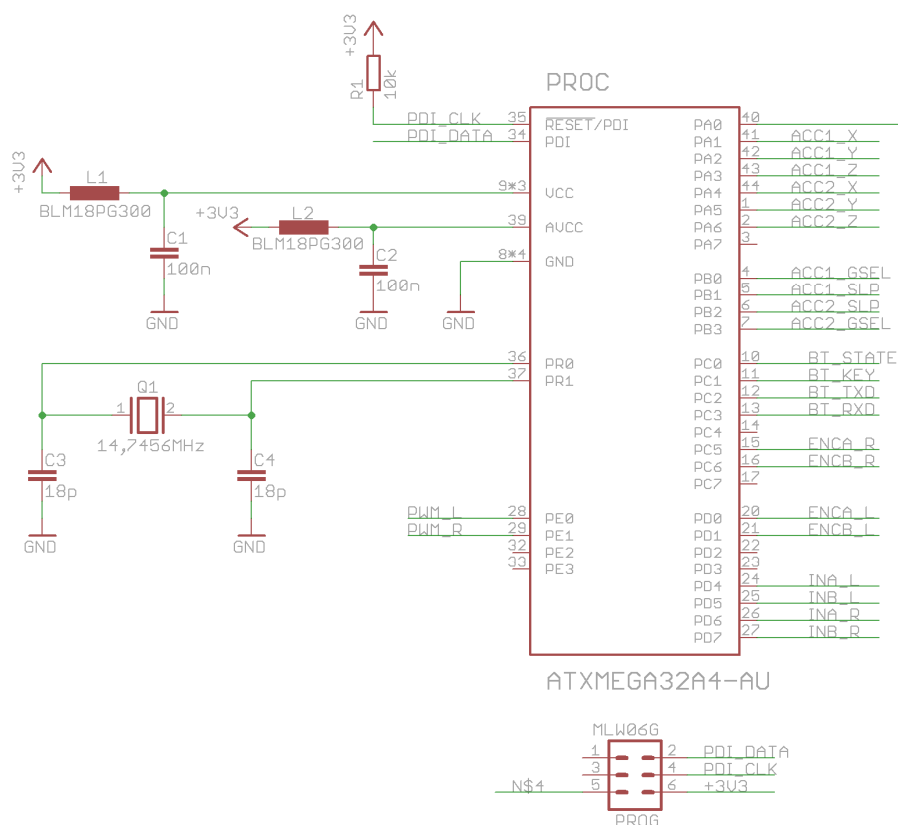


Fig. 6 Microcontroller circuit

Involvement accelerometers Polulu-1247 is on the figure 7. There is one but we used it two times. Second accelerometer module has the same involvement.

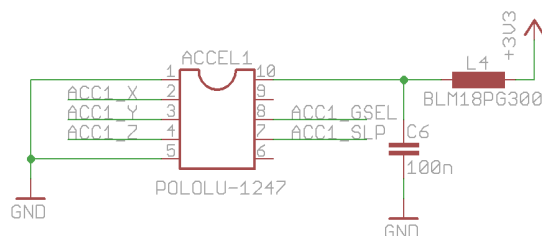


Fig. 7 Accelerometer circuit

Connecting the power section for controlling DC motors is shown in Figure 8. The figure indicated the involvement of the encoder.

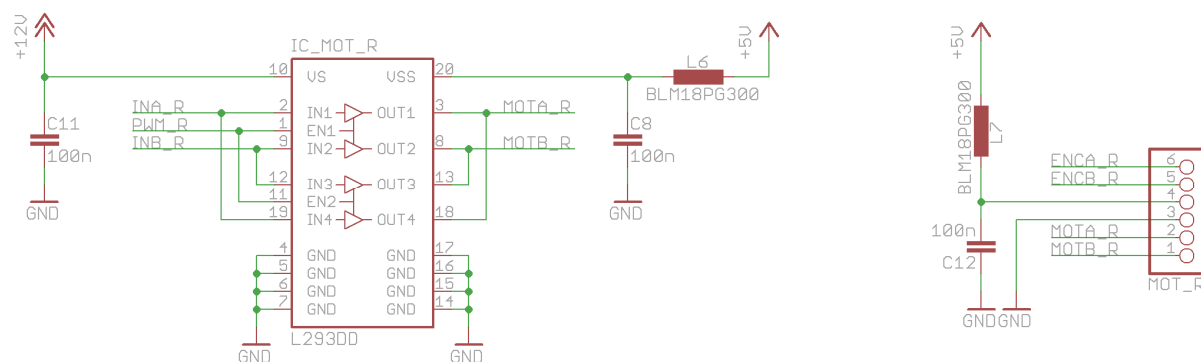


Fig. 8 Power section for controlling DC motors

The resulting PCB measuring 55x57mm is on Figure 9. There is upper side on the left side of the figure and down side is on the right side of the figure.

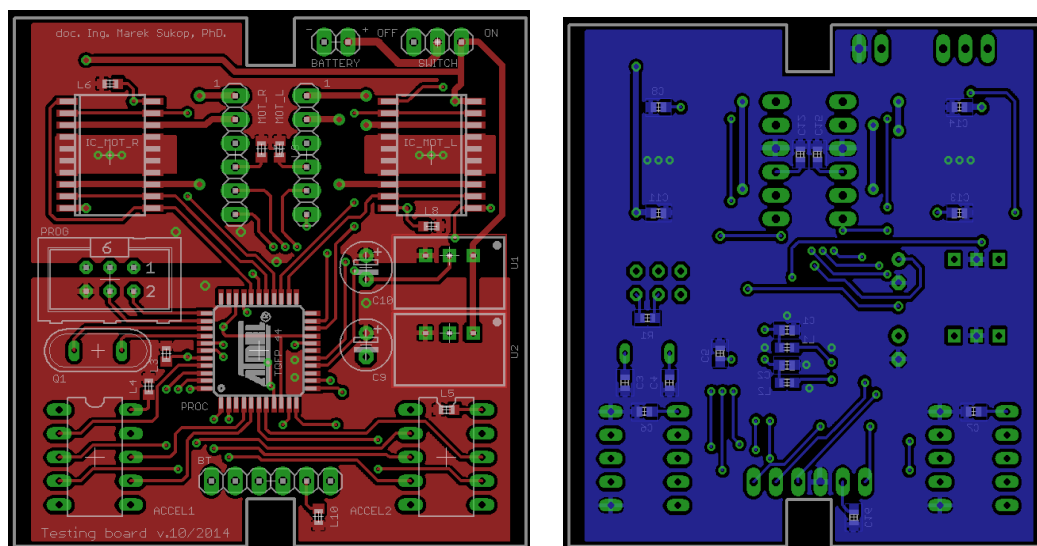


Fig. 9 PCB (upper side / down side)

Conclusions

We expect that the proposed electronic circuit helps us to develop adaptive algorithms motion control of mobile robots. This eliminates the need to configure the acceleration of robots that change during the game. Their changes occur mainly because of clogging the wheels. Also, in the course of the game are changing and turning characteristics.

List of sources used

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- [6] <https://www.pololu.com/product/1247>
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