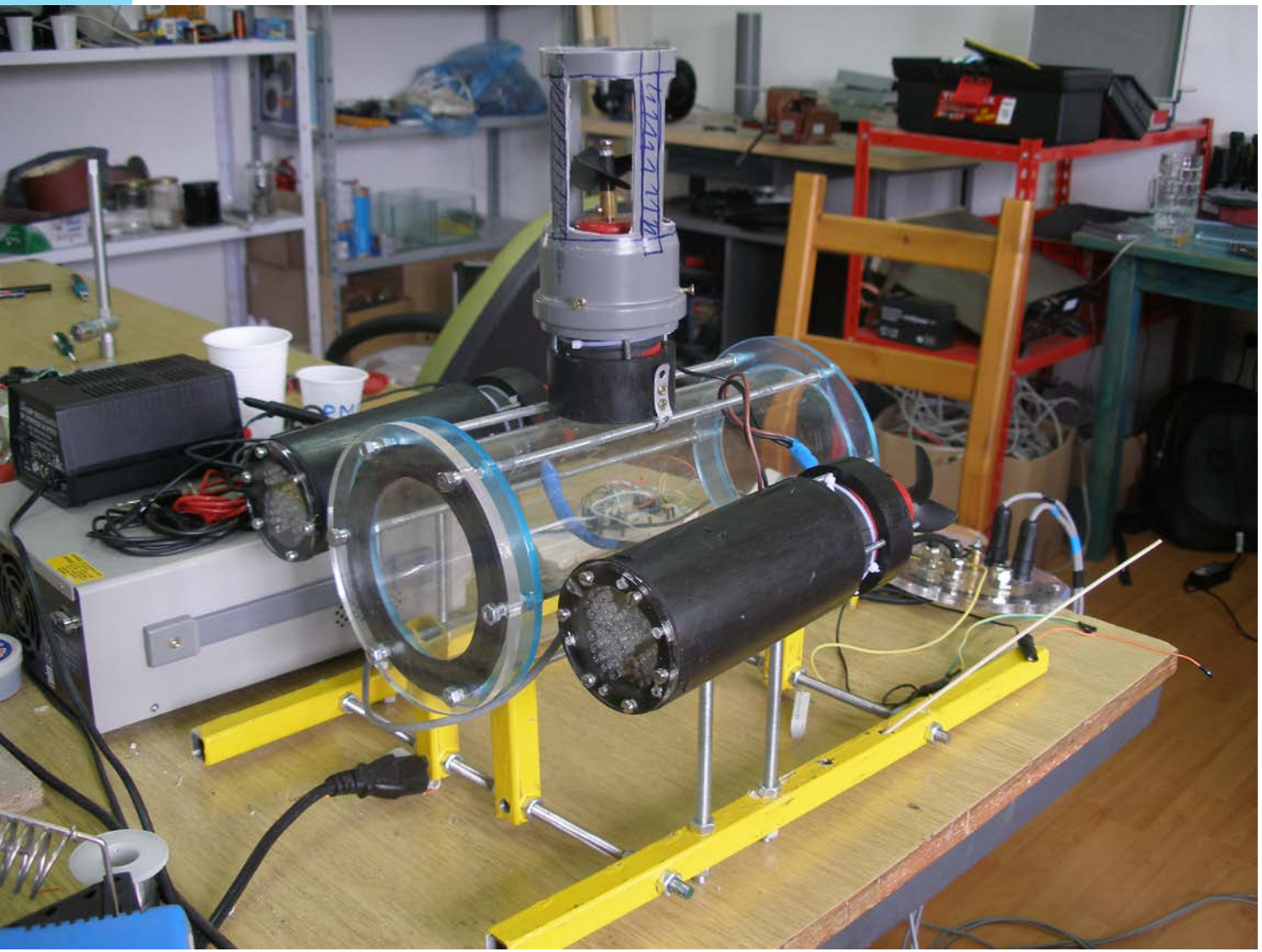


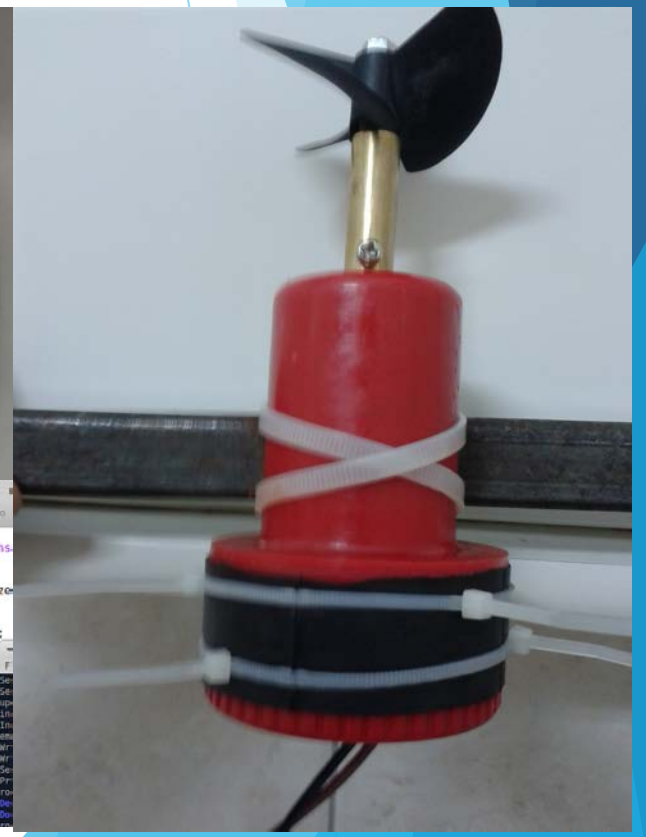
ROV

Tara Šverko, Jakov Jelenić, Daniel Silađi

Mentori: Danko Marušić, Dominik Barbarić

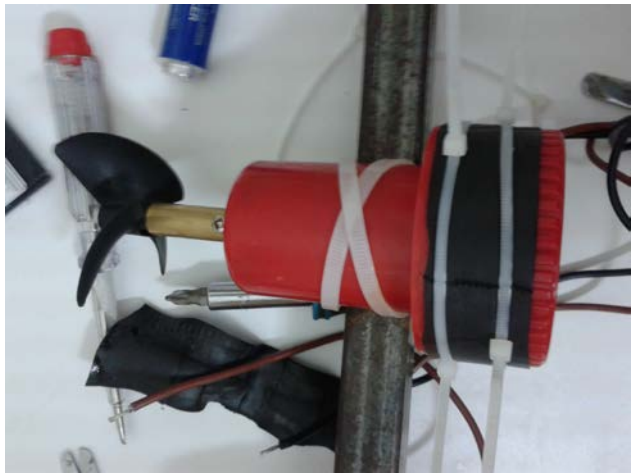
Što radimo i što su nam ciljevi?

- Pravljenje ROV-a (Remotely Operated Vehicle), operativnog na dubinama do 30m
- 3 dijela:
  - Hardware
  - Elektronika
  - Software
- Primjena: istraživanje morskog dna



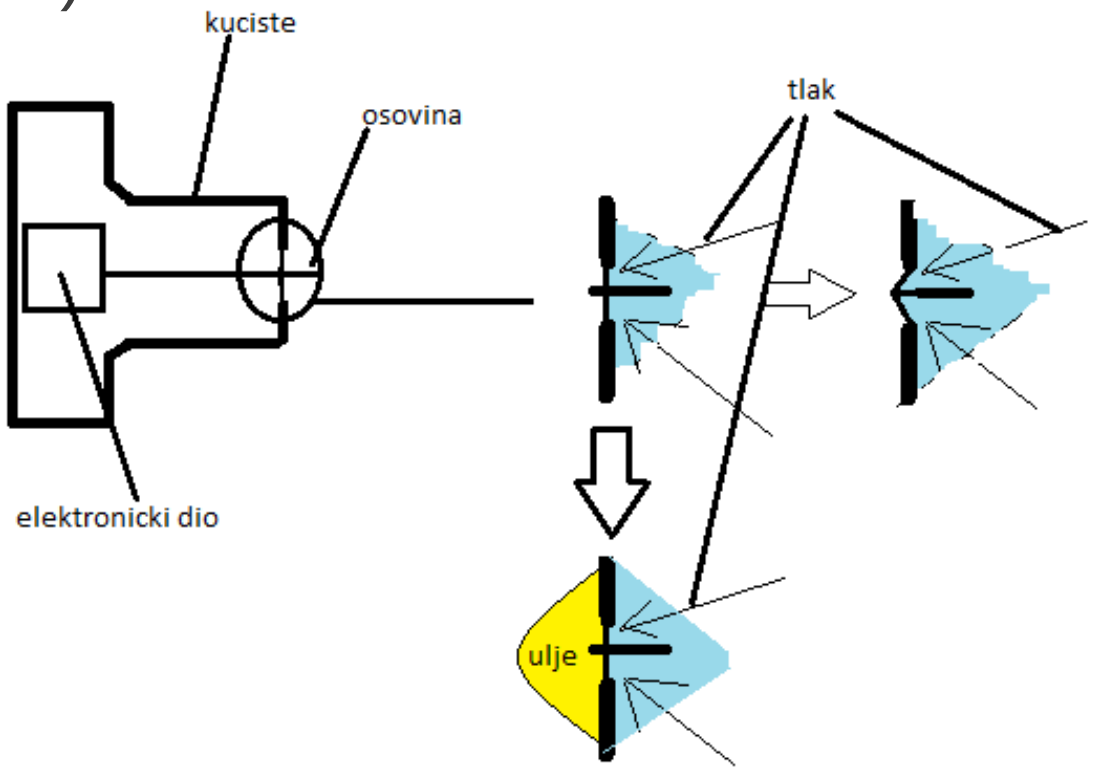
Hardware

- Kućište od pleksiglasa ojačanog željeznim šipkama
- Plastična ležišta za motore
- 3 DC motora
  - Lijevi
  - Desni
  - Centralni (gore - dolje)



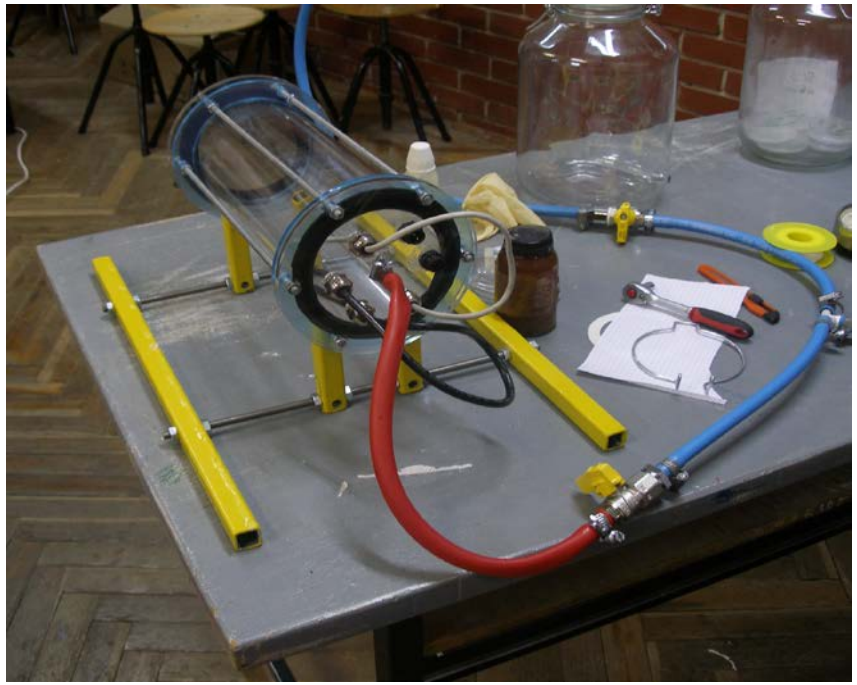
Izazovi

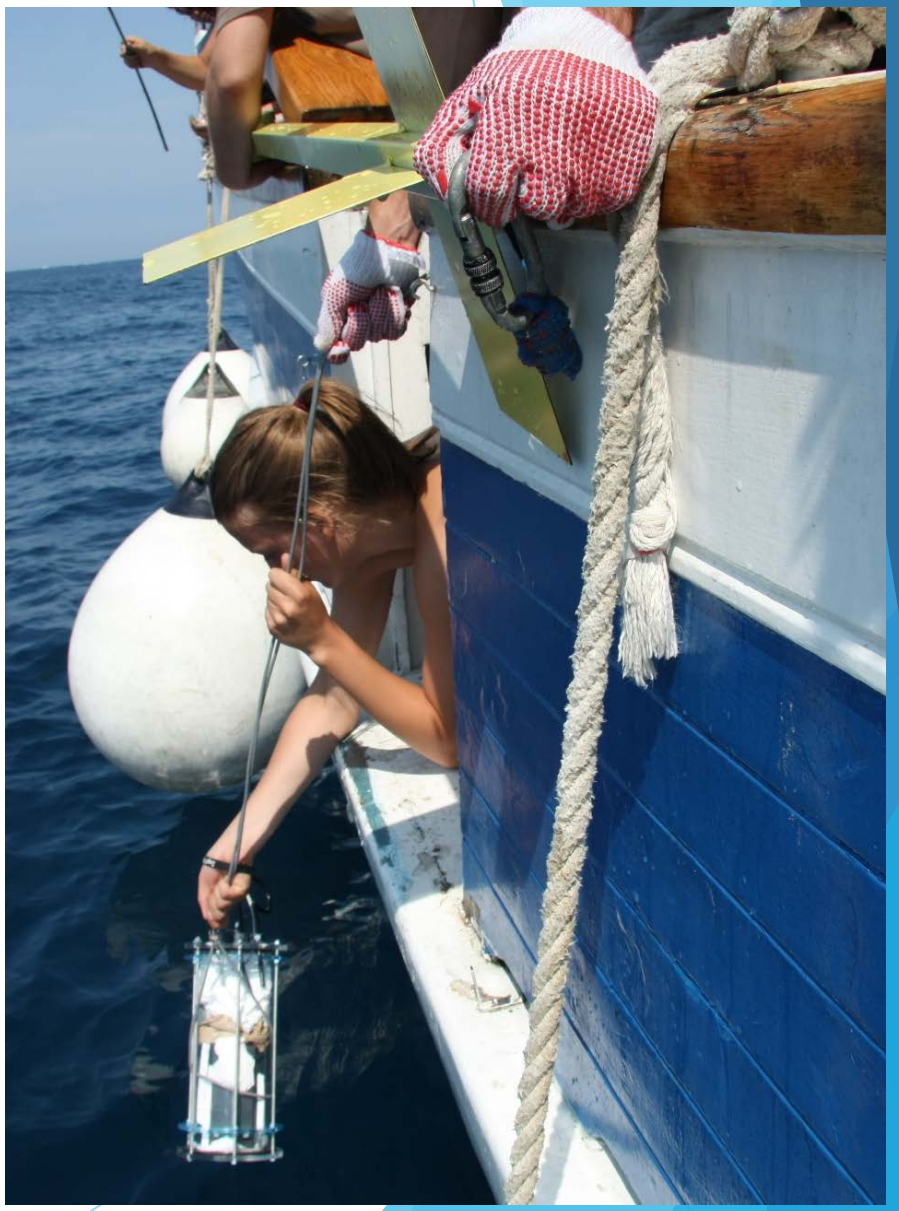
- Vodootpornost
- Otpornost na visok tlak (3 atm na dubini od 30m)
  - Motor
  - Kućište



Testiranje hardwarea

- Test kućišta na dubini od 15m
- Test rada motora na dubini od 30m
- Test pomoću vakumske pumpe



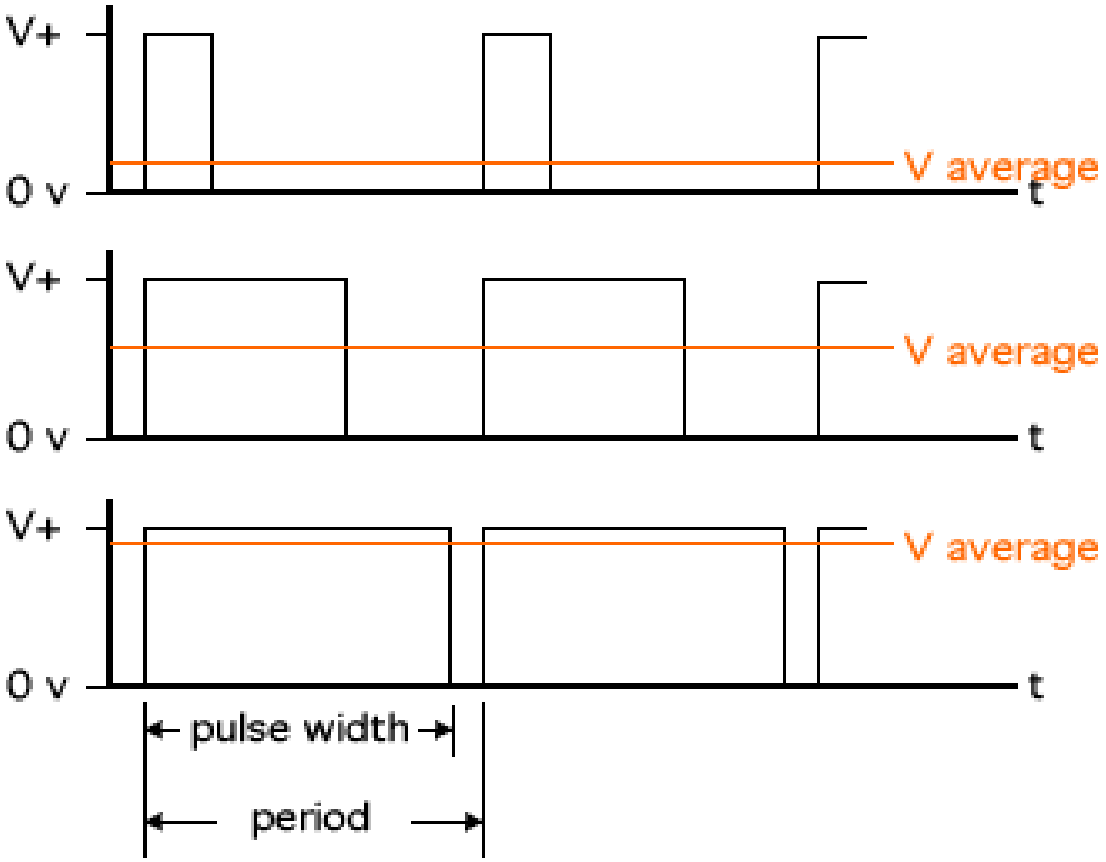


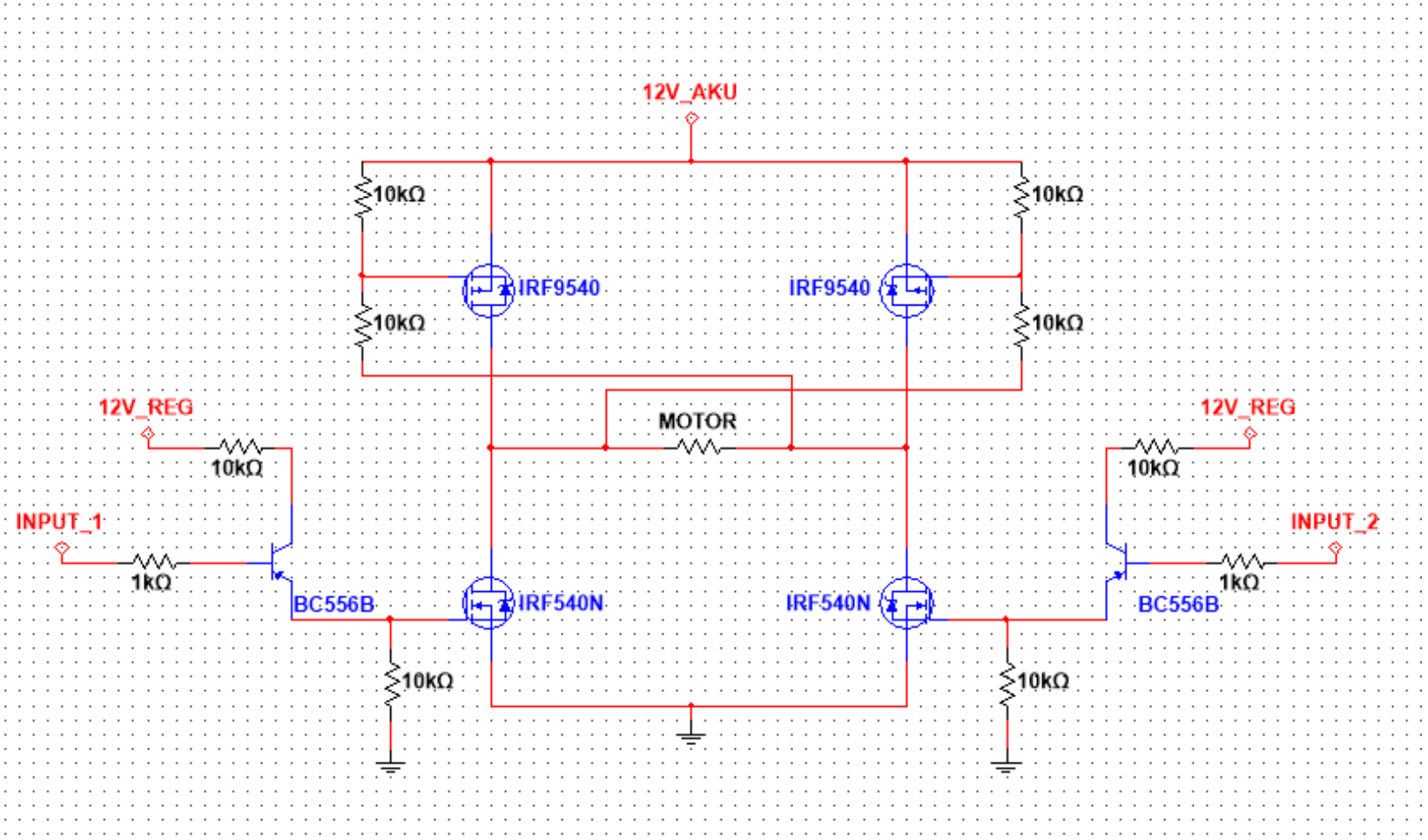
Karakteristike motora pod tlakom		
Dubina [m]	U[V]	I[A]
0	12,93	0,6
1	12,53	3,3
10	12,53	3,3
23	12,54	3,3
30	12,53	3,3

Elektronika

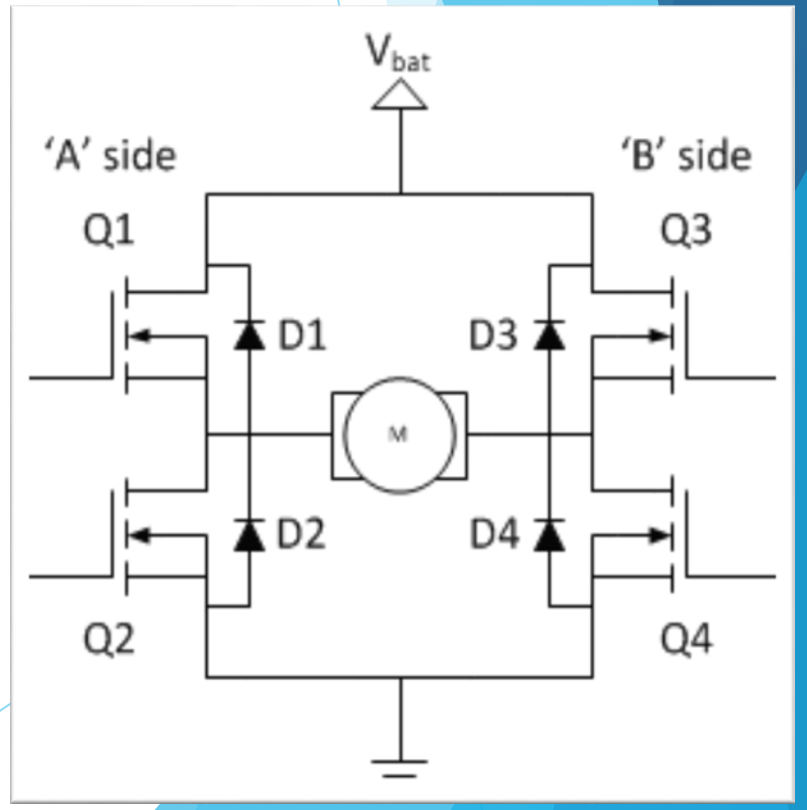
- Interface između motora i Raspberry Pi računala
- Potrebno je kontrolirati smjer i brzinu okretanja motora
  - Pulse wIdth modulacija
  - H – most
- Sami smo izradili svoje PCB-ove
- Dodatna elekronika
  - Rasvjeta
  - Regulator napona za Raspberry Pi

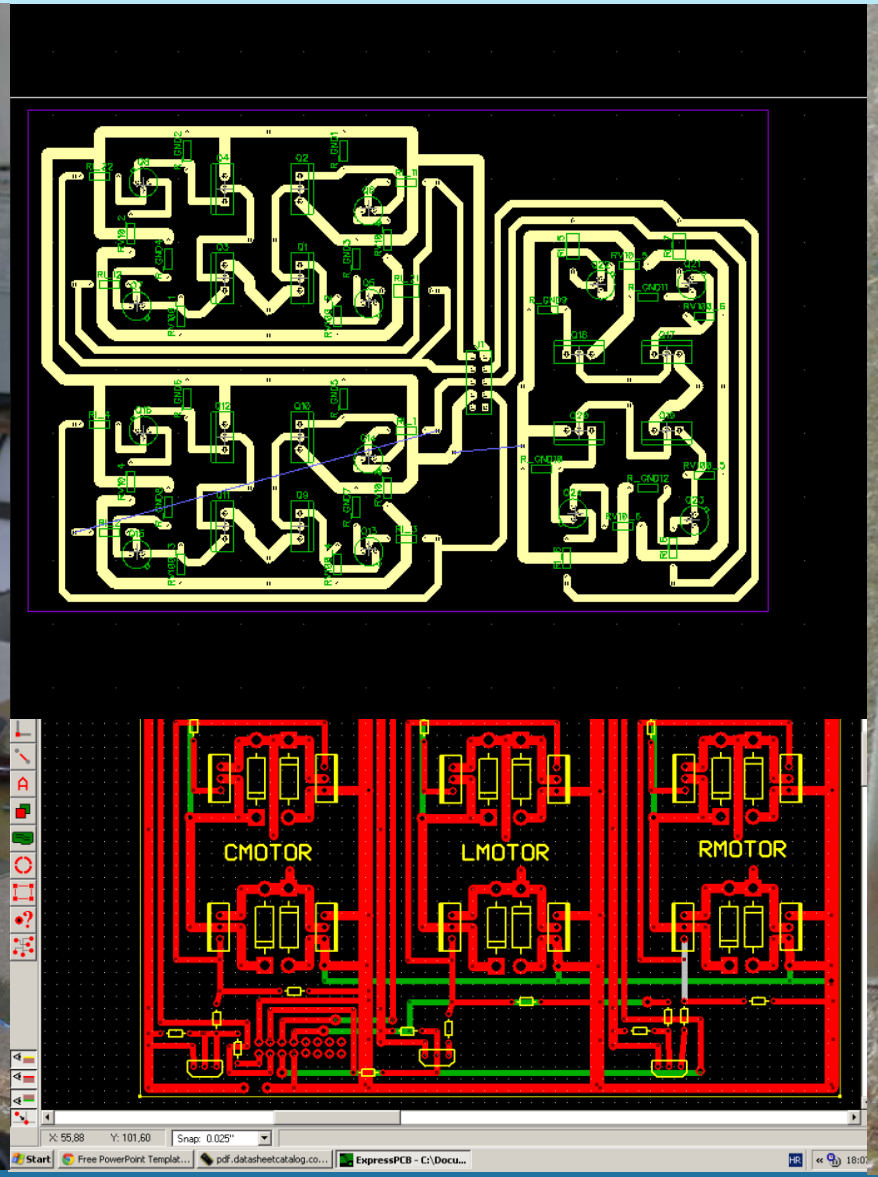
Pulse Width Modulation (PWM)

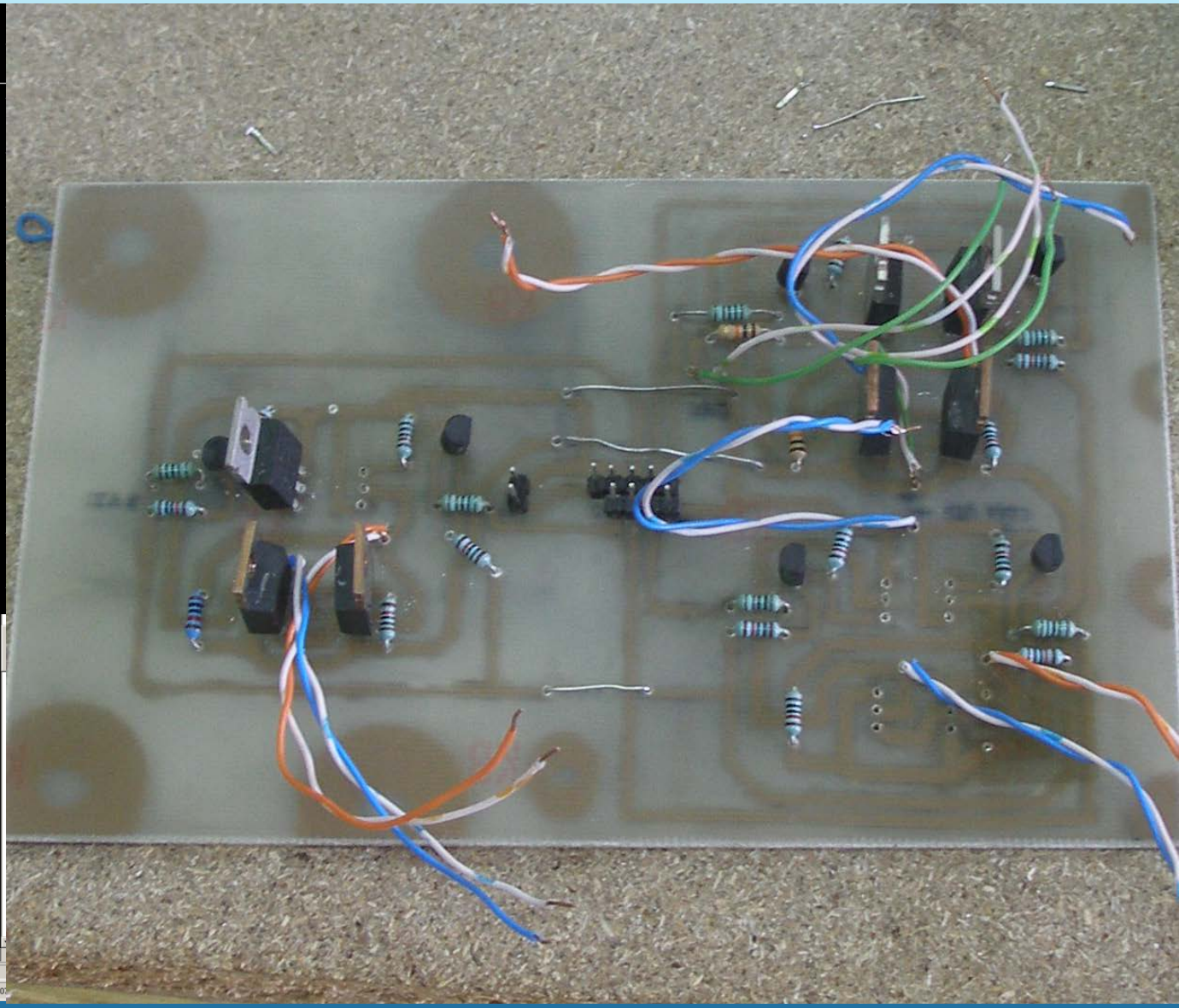



12V_AKU
10kΩ
10kΩ
IRF9540
IRF9540
10kΩ
10kΩ
12V_REG
MOTOR
12V_REG
10kΩ
10kΩ
INPUT_1
INPUT_2
1kΩ
1kΩ
BC556B
IRF540N
IRF540N
BC556B
10kΩ
10kΩ

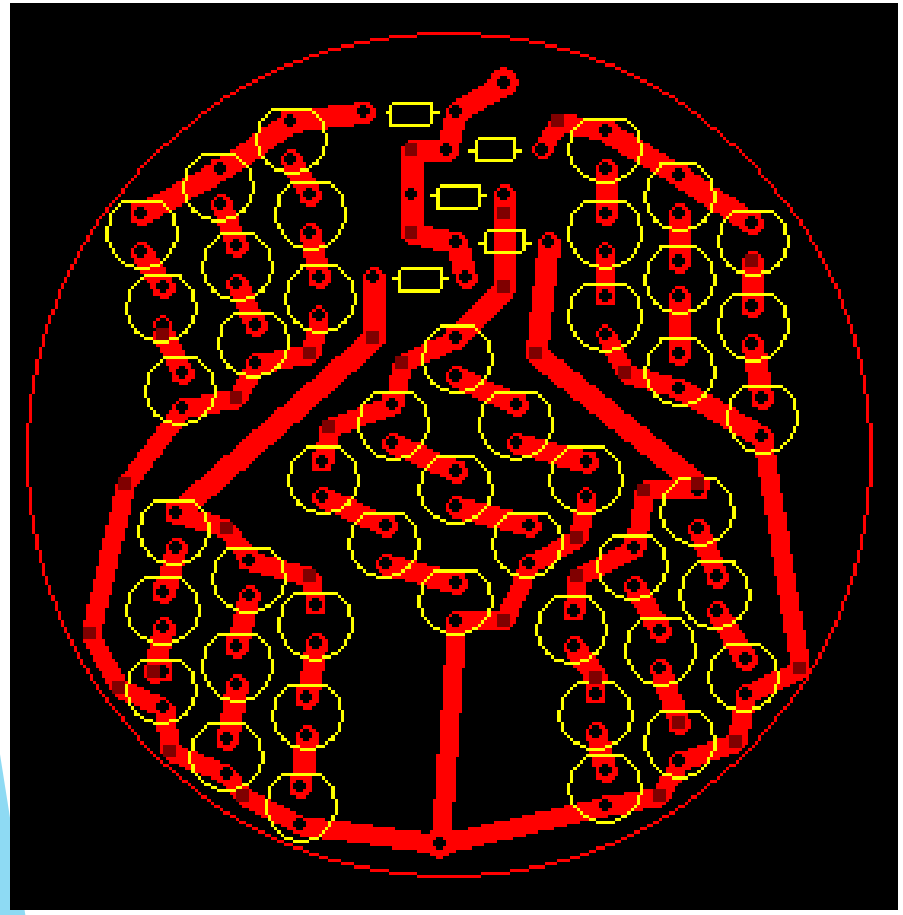
H-most


V_{bat}
'A' side
'B' side
Q1
Q3
D1
D3
M
D2
D4
Q2
Q4


CMOTOR
LMOTOR
RMOTOR
X: 55,88
Y: 101,60
Snap: 0.025"
Start
Free PowerPoint Templat...
pdf.datasheetcatalog.co...
ExpressPCB - C:\Docu...

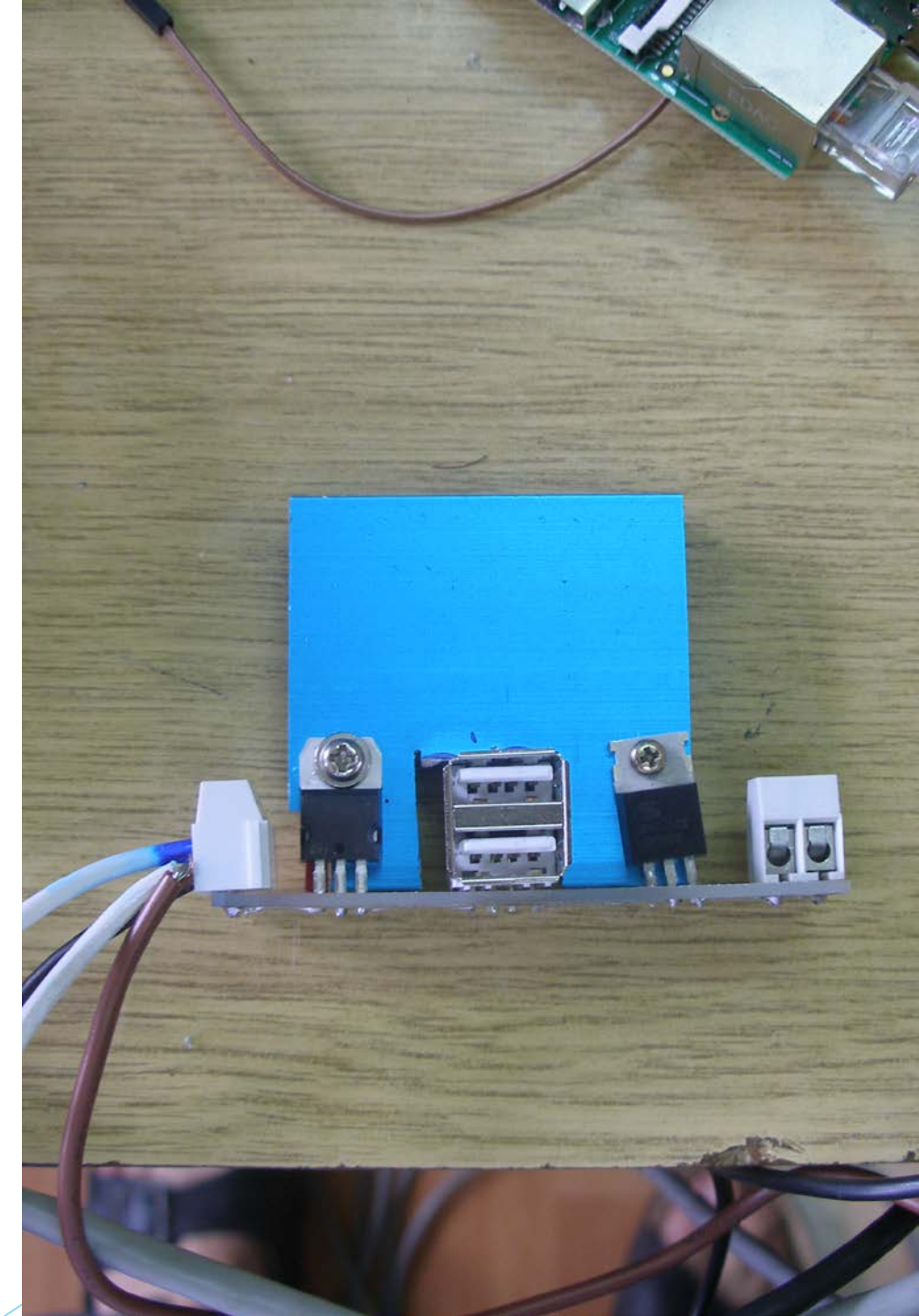


LED rasvjeta

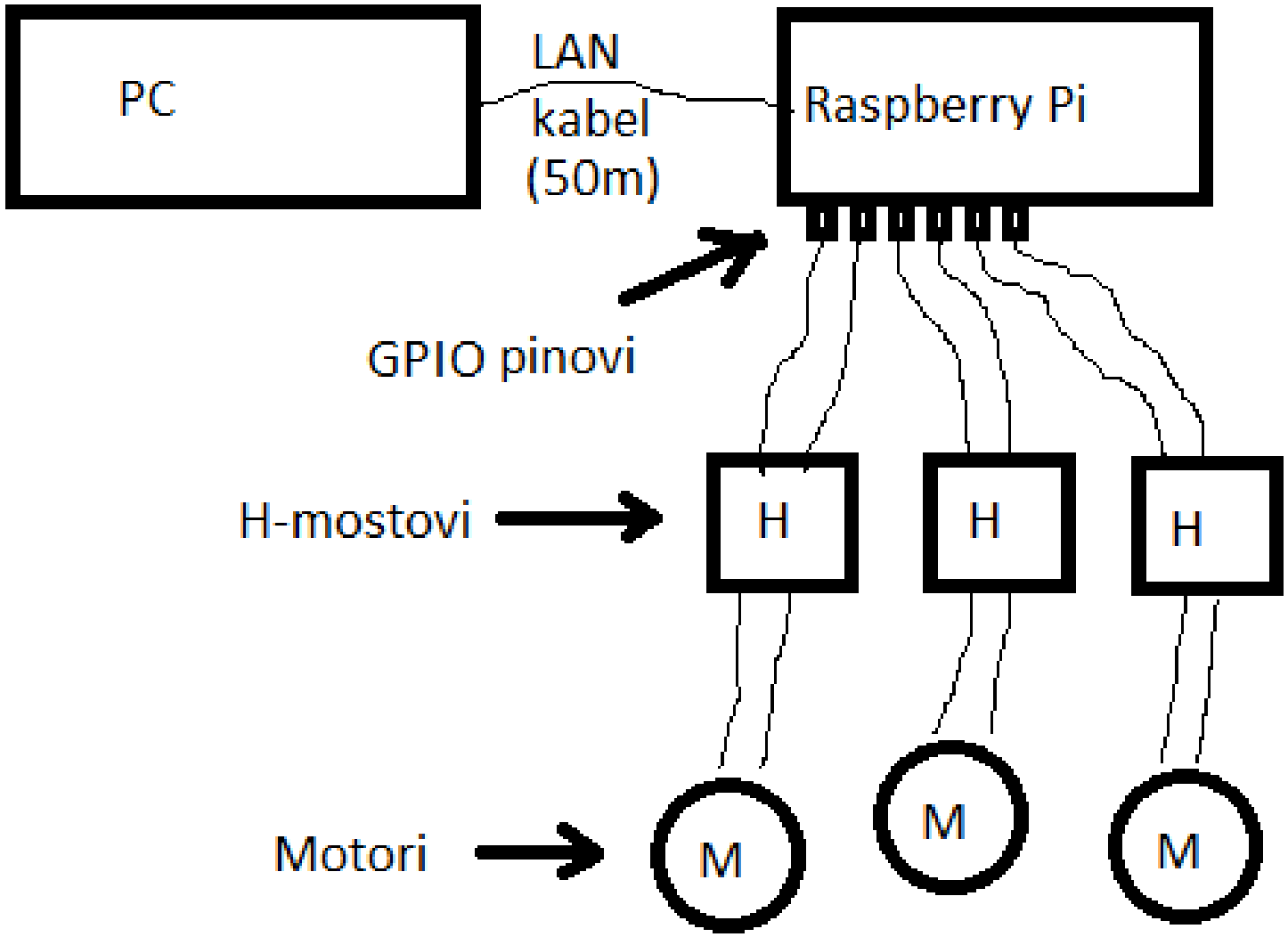


Regulator napona

- Napunjeni akumulator nam daje više od 12V
- Regulator nam osigurava stabilnih 12V i stabilnih 5V (za Raspberry Pi)
- Koristili smo sklopove 7805 i 7812



Software


PC
LAN
kabel
(50m)
Raspberry Pi
GPIO pinovi
H-mostovi
H
H
H
Motori
M
M
M

Kontroliranje ROV-a

- Klijent – server arhitektura
- Klijent periodično šalje stanje gumbova na joysticku (biblioteka pyGame)
- Server (također periodično) obrađuje te podatke i na osnovu njih pali i gasi motore
- Ukoliko ne želimo pokretati motore punom snagom, šaljemo PW moduliran signal

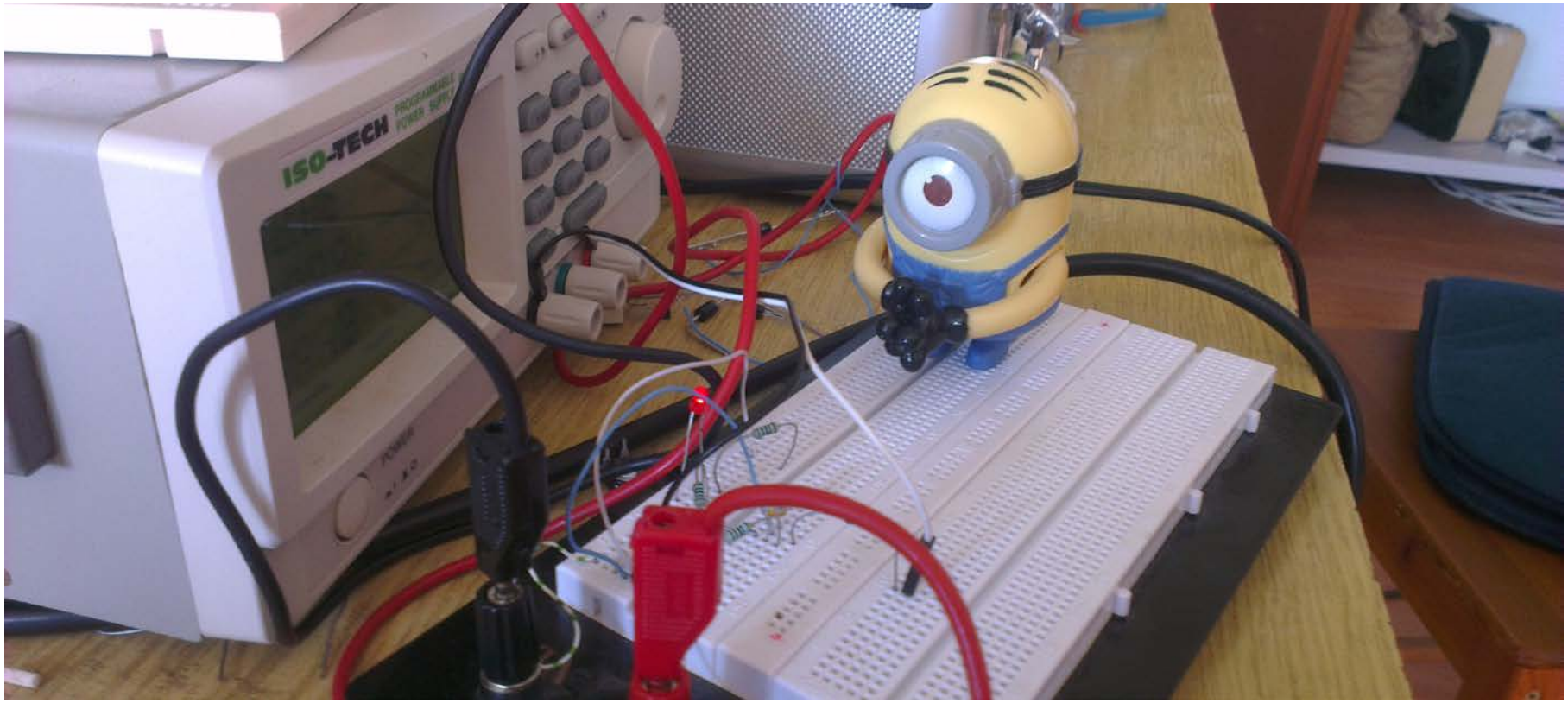
```
import pygame, struct, socket, time, sys
from pygame.locals import *

networking = True
if networking:
    sock = socket.socket(socket.AF_INET, socket.SOCK_ST
    sock.connect(('10.1.2.135', 1234))

pygame.init()
pygame.joystick.init()
stick = pygame.joystick.Joystick(0)
stick.init()
pygame.key.set_repeat(1, 1);
pygame.display.set_mode((20, 10))
pygame.display.set_caption('RovController')

print('{0} axes, {1} buttons'.format(stick.get_numaxes(

while True:oollooooo
    pygame.event.pump()
    kb_keys = pygame.key.get_pressed()
    mask = 0
    for i in range(stick.get_numbuttons()):
        mask|=stick.get_button(i)<<i
    axes = [round(float(stick.get_axis(i)), 2) for i in

    if kb_keys[27]:
        mask|=1<<8
    if kb_keys[K_o]:
        axes[2] = -1
    if kb_keys[K_l]:
        axes[2] = 1
    if kb_keys[K_w]:
        axes[1] = -1
    if kb_keys[K_s]:
        axes[1] = 1
    if kb_keys[K_a]:
        axes[0] = -1
    if kb_keys[K_d]:
        axes[0] = 1
    if kb_keys[K_q]:
```

Kamera

- Cilj je da ROV prenosi livestream koji će olakšati upravljanje i navigaciju
- Idealno bi bilo prenositi video u HD rezoluciji, pri bar 30fps
- Ograničeni smo brzinom Ethernet kabla (100Mbps) i procesorskom snagom Rpi (ARM11@700Mhz)
- Kompromis: nekompresirani VGA video pri 15fps
- Sav prijenos podataka se vrši preko TCP

Planovi za dalji rad

- Kratkoročni
  - Izraditi novi elektronski sklop na tiskanoj pločici
  - Hardversko enkodiranje videa sa web kamere
- Dugoročni
  - Primjena u istraživanjima
  - Adaptiranje kućišta na veće dubine i ostale posebne uvjete
  - Povezivanje sa prošlogodišnjim projektom izrade robotske ruke



Hvala na pažnji, pitanja?