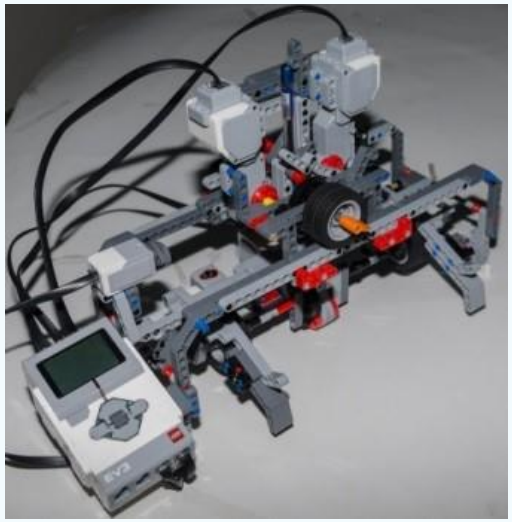




A MINI SZATELLITTŐL A SUMO-ROBOTIG

Az atomoktól a csillagokig

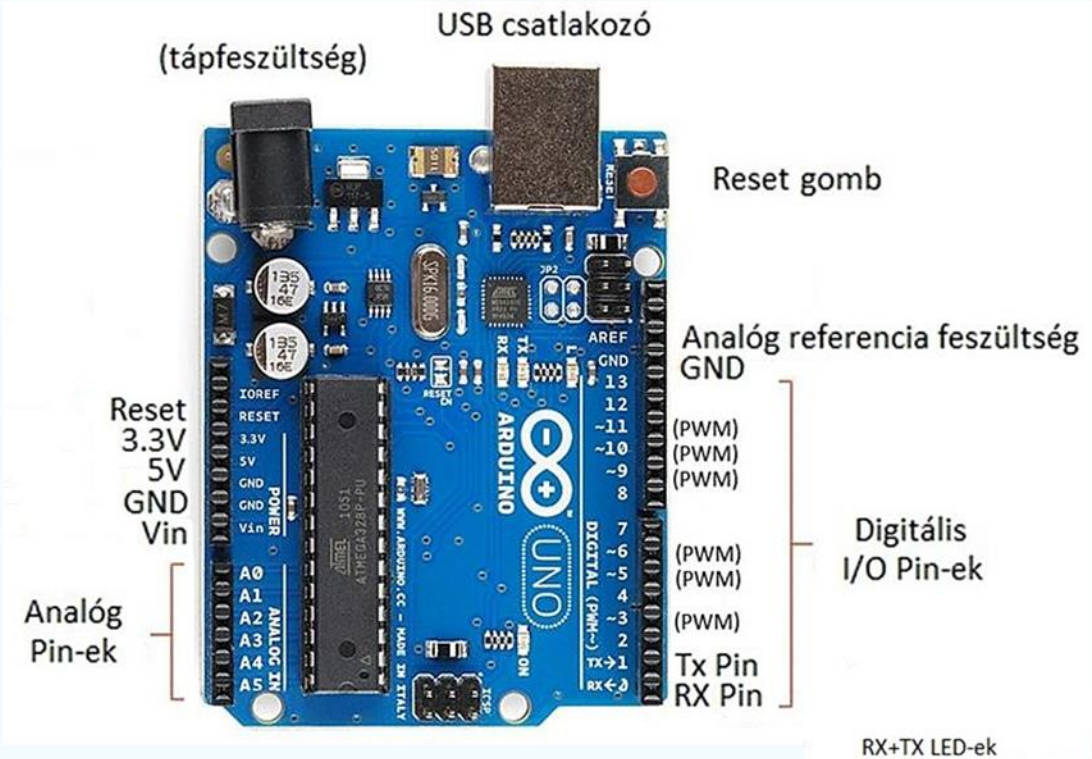
2018. nov. 29.

Pető Mária
Székely Mikó Kollégium, Sepsiszentgyörgy
MTA-ELTE Fizika Tanítása Kutatócsoport

Témáink:

- Arduino - röviden
- CanSat- mini szatellit
- Elektromágneses hullámok sebességének meghatározása méréssel
- Sumo robot
- Lego-robotok
- Versenyek - RoboChallenge; WRO; RoboTec

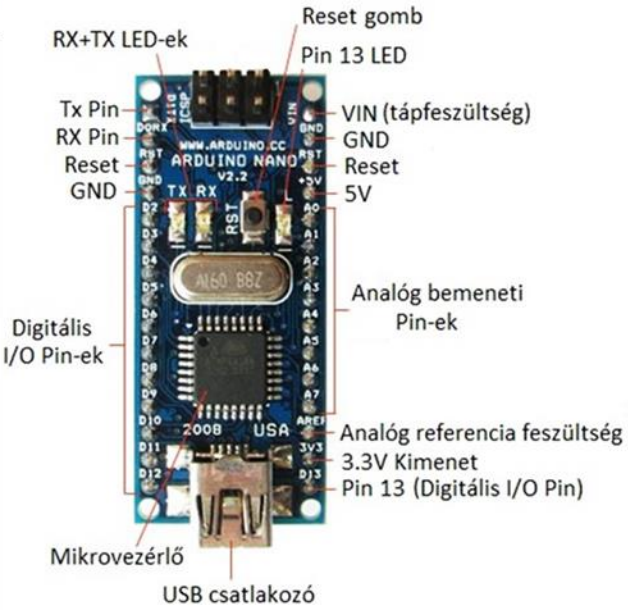
Arduino UNO mikrokontroller

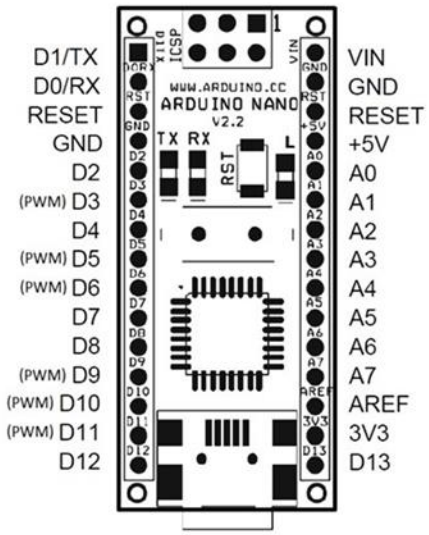


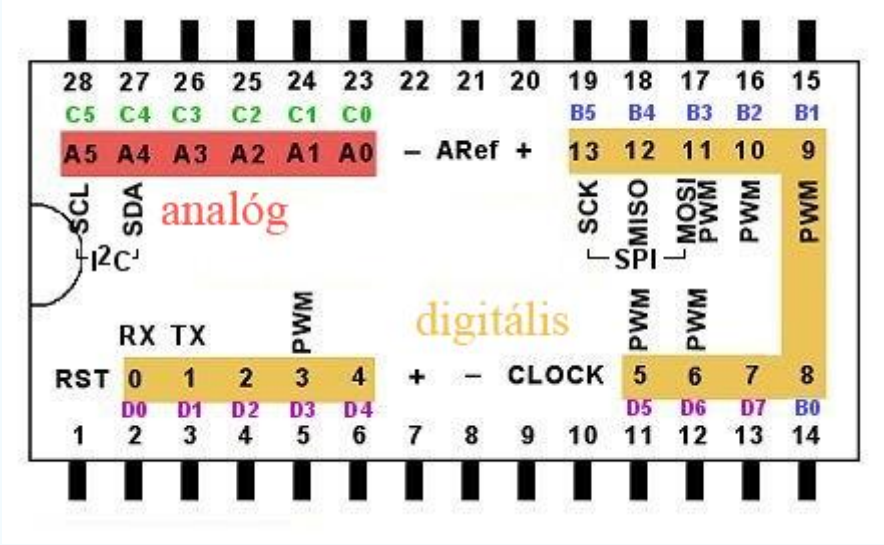
- Szabadforrású fejlesztői környezet;
- Atmel ATMEGA 328 mikrovezérlővel;
- C++ alapú programozási nyelv, saját könyvtár;

http://arduino.cc/en/Main/Software

Arduino Nano

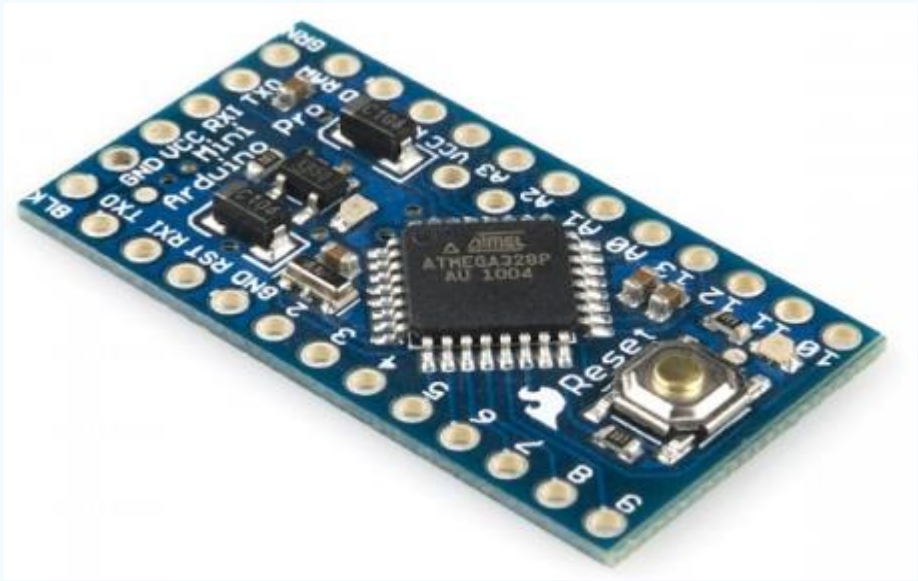


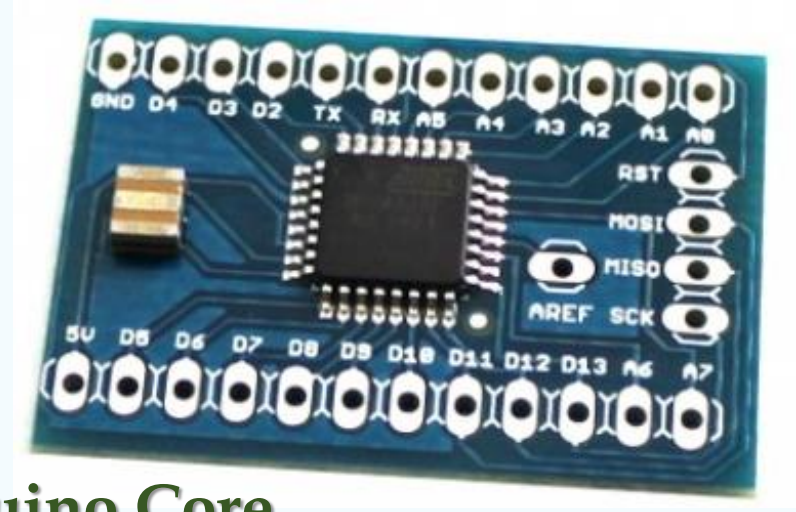




Arduino UNO

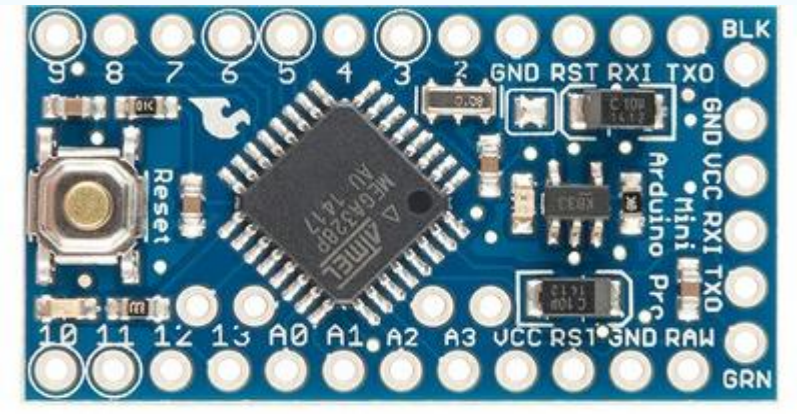
Arduino Pro Mini 382
5V/16MHz



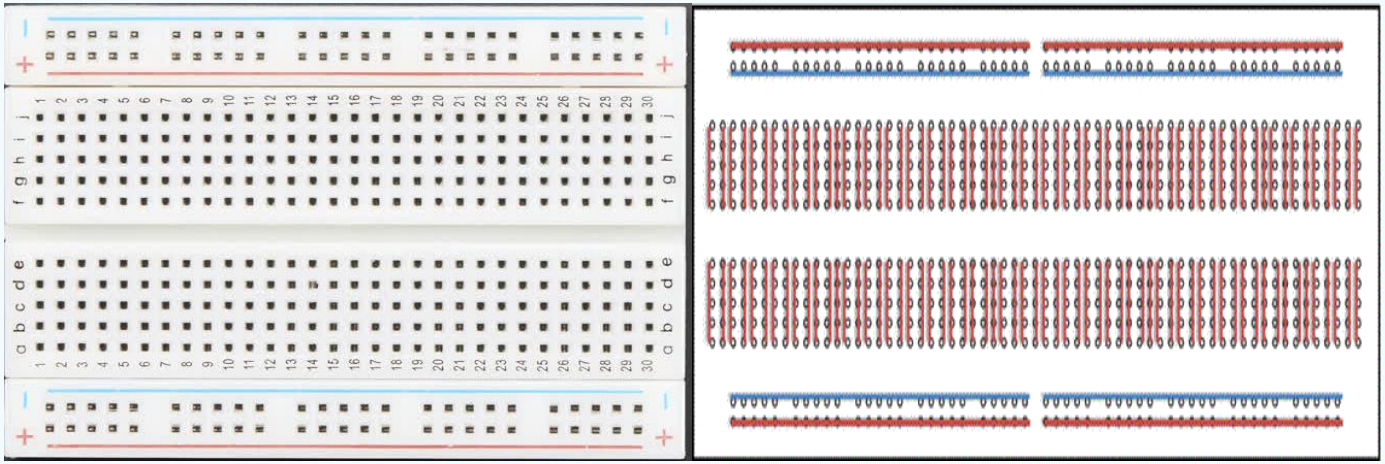


Reduino Core

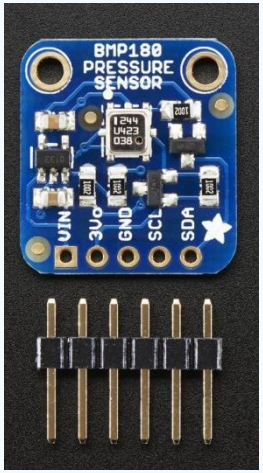
http://www.robofun.ro/reduino-core



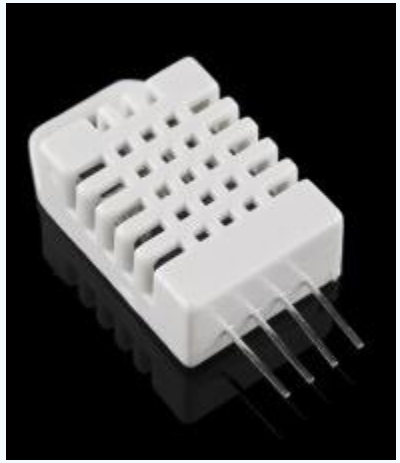
Csatolható szenzorok, áramköri elemek



Áramköri tűzőlap, dugaszolós próbapanel



BMP180



DHT22

GPS _GP735

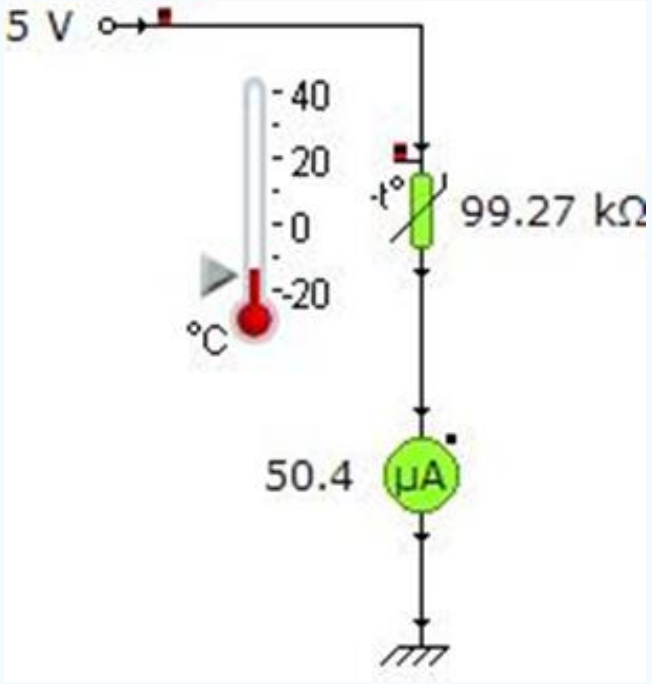
Motor

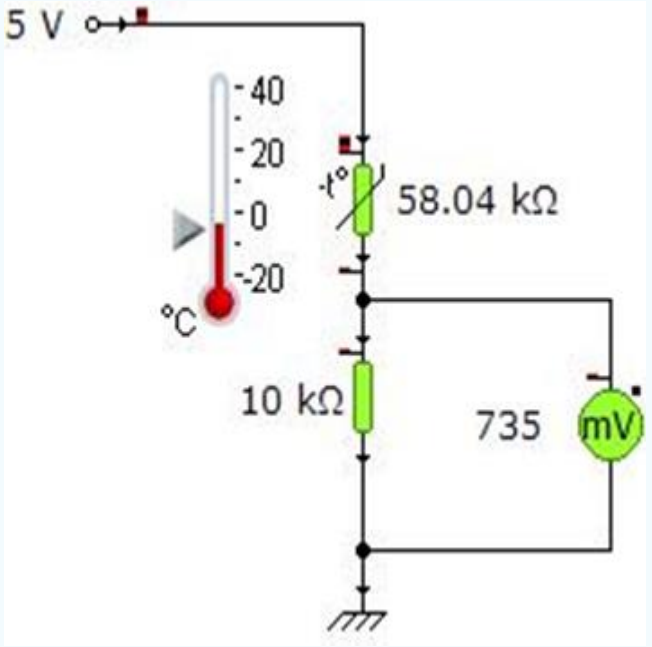
A hőmérsékletmérés elve:

- Ohm törvénye: $U = R * I$

- Az ellenállást a ampermérő adataiból kapjuk: $R = \frac{U}{I}$
- 1000Ω t= $0°C$
- 680Ω t= $-80°C$

- Az ellenállást a voltmérő adataiból kapjuk meg:





Csatolható áramköri egységek

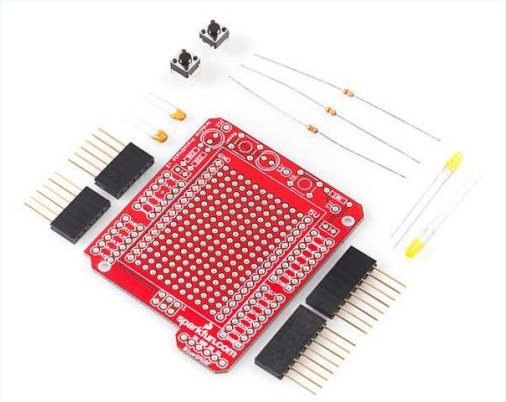
Shield- olyan elektronikus áramkörök, amelyek az Arduino egységekhez egyszerűen illeszthetők; ezekkel bővíthető a mikrokontroller feladatcsomagja. Pld.

WiFi Shield

Ethernet Shield

LCD Shield

GSM-GPS Shield

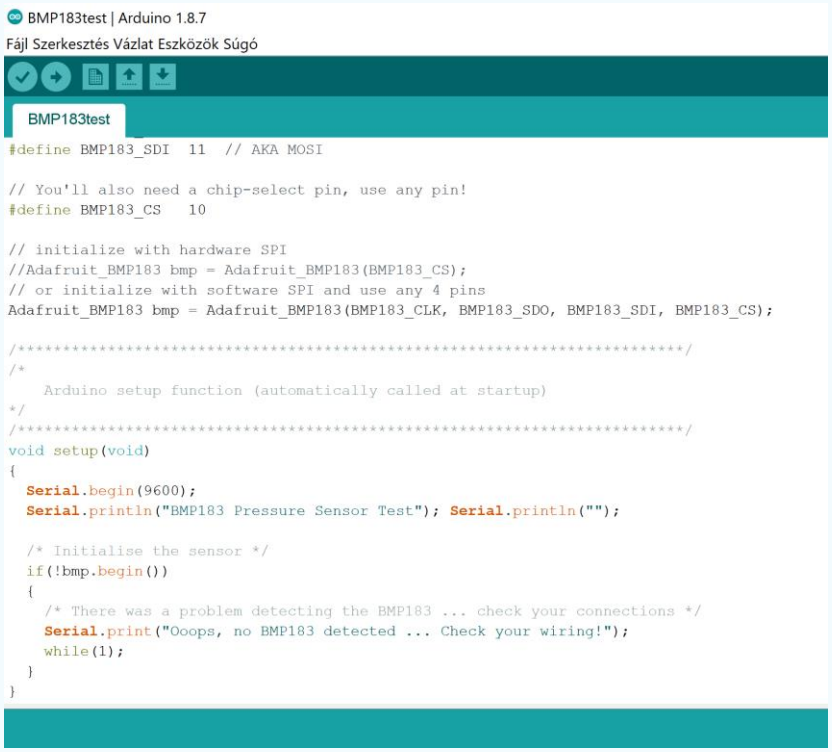


Proto Shield

Motor driver

Az Arduino programozása

Arduino IDE egy kereszt-platformos Java nyelven írt fejlesztőkörnyezet; "Wiring" nevezetű C/C++ programkönyvtárral,
-programok: C/C++ nyelven, amelyek USB porton keresztül tölthetők fel a kontrollerre;
A fejlesztői környezetbe beépített funkciók:
void setup (): a használt pin-ek, portok és könyvtárak megadása; egyszeri;
void loop (): többször fut, kimeneti és bemeneti változók a feladat szerint;



Kézikönyv, segédlet:
https://www.peschka.hu/userfiles/7/files/tavir_arduino_notebook.pdf

Mi a CanSat?

Egy 330ml –es üdítős dobozba zárt autonóm mérőegység, amely tudományos feladatok végrehajtására alkalmas.

Egy diákok által tervezett és megépített eszköz, amely modellezi a valódi műholdak mozgását, működését.

ESA

Kreatív, innovatív tanulási lehetőség. Érdekes, csapatépítő, ötletes műhelymunka.

A CanSat program célja:

- a CanSat műholdegység megépítése
- a mérőegység tervszerinti működése a fellövés alatt és kilövés után is (áramforrás, a szenzorok bekapcsolnak, adatátvitel megkezdődik)
- az ejtőernyő hatékony nyílása, működése
- esési sebesség (8-8,1)m/s
- valós légköri adatok rögzítése a különböző magasságokban (elvárt és mért adatok között ne legyen nagy különbség)
- sikeres földet érés, az egység működik landolás után is;
- hatékony rádiókommunikáció és adatátvitel
- a mért adatok rögzítése, feldolgozása, értékelése;

Ötletbörze: mi legyen a mérési feladatunk

A feladat tudományos megalapozása.

Az eszköz megtervezése és megépítése

A modulok, vezérlők, szenzorok összehangolása

Tesztelés, próbamérések

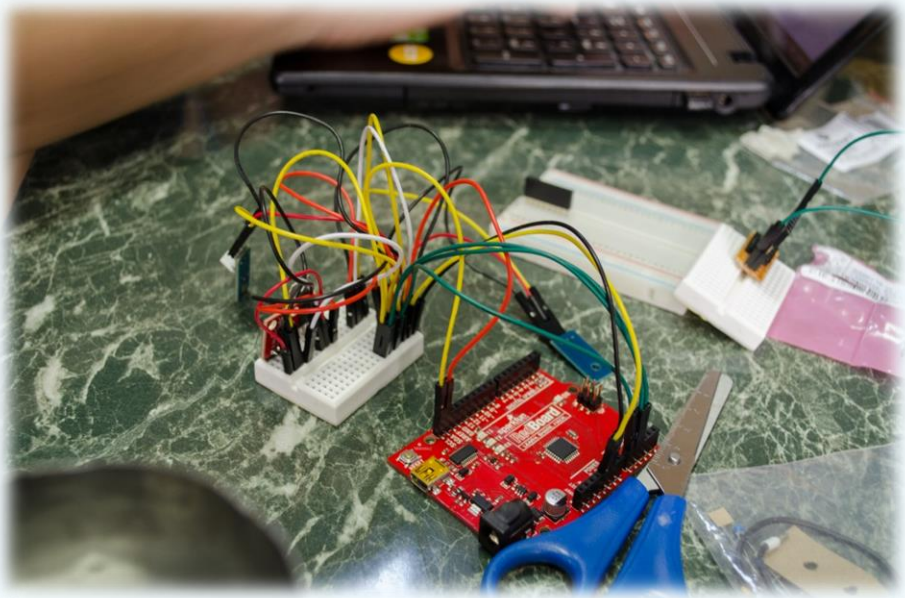
Az egység előkészítése a feladatra.

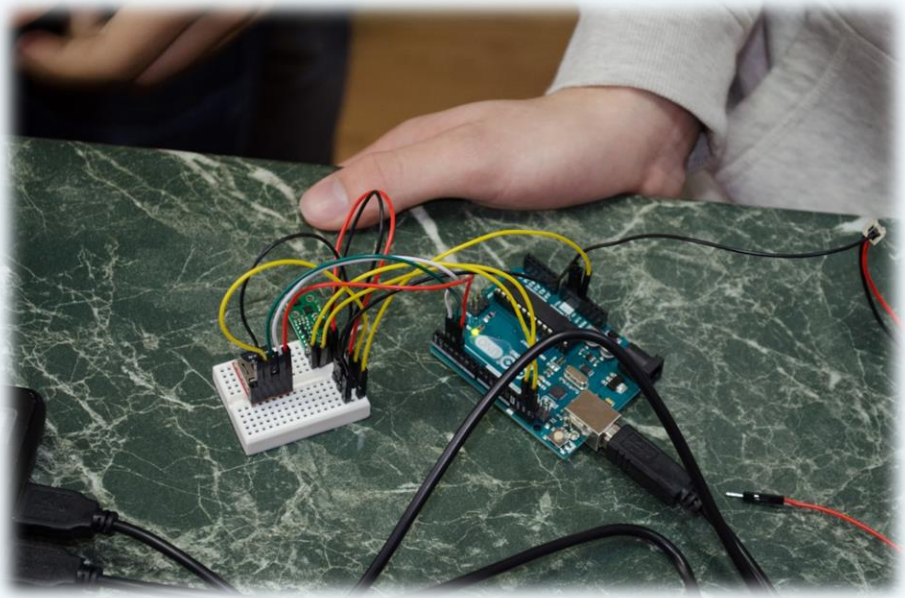
Mérések, prezentáció.

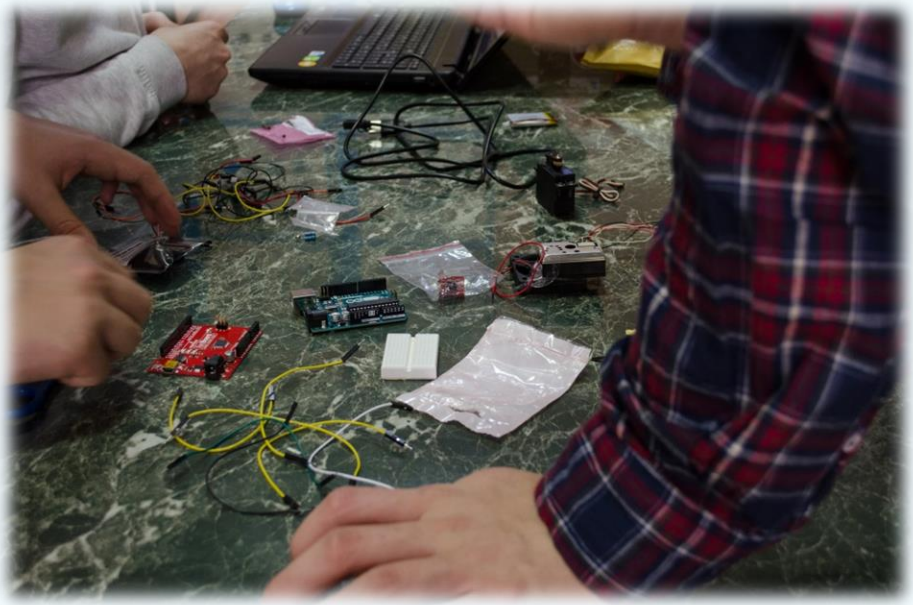
Adatrögzítés, elemzés, értékelés.

Népszerűsítés, zárójelentés, összegzés.

Ötletbörze







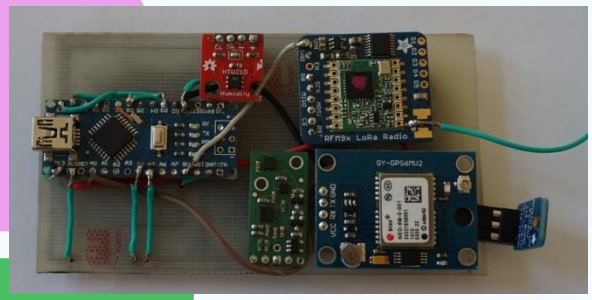
Felépítés

- Külső burkolat;
- Ejtőernyő;
- Tartószerkezeti elemek,

Mechani-ka

Elektronika

- Szenzorok;
- Áramforrás;
- Kapcsolók;
- Adó;
- Adatgyűjtés,



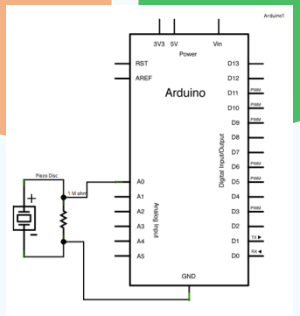
Kommuni-káció

- Antenna
- Földi vevőegység
- Adatátvitel, adattárolás, feldolgozás

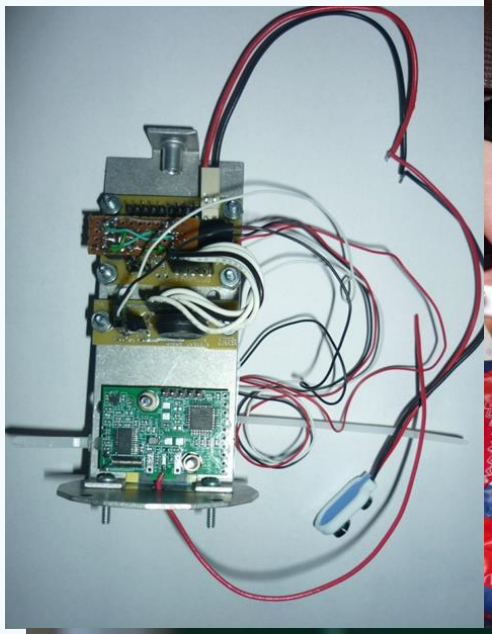
Vezérlés

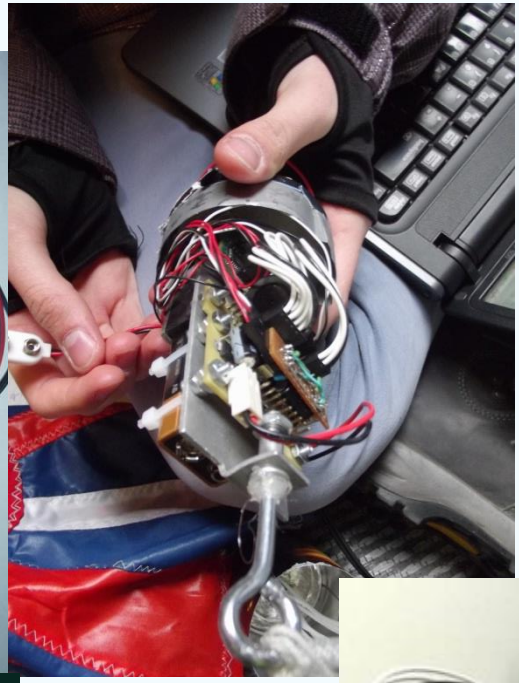
Mikrontroller (Arduino)

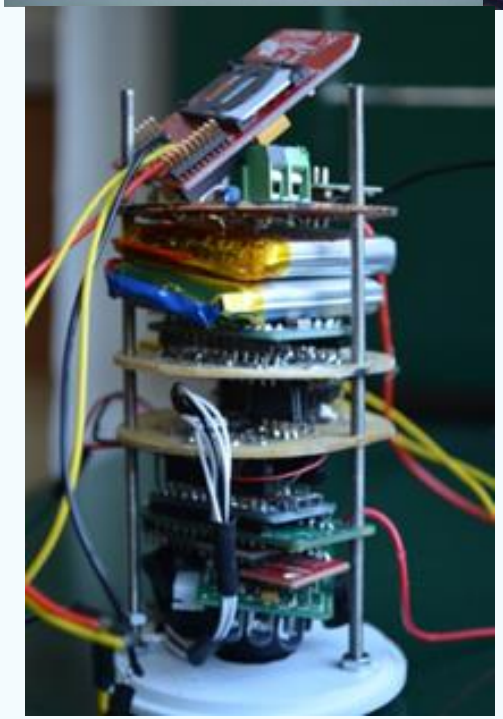
- Vezérlőprogramok;
- Adatfeldolgozás,



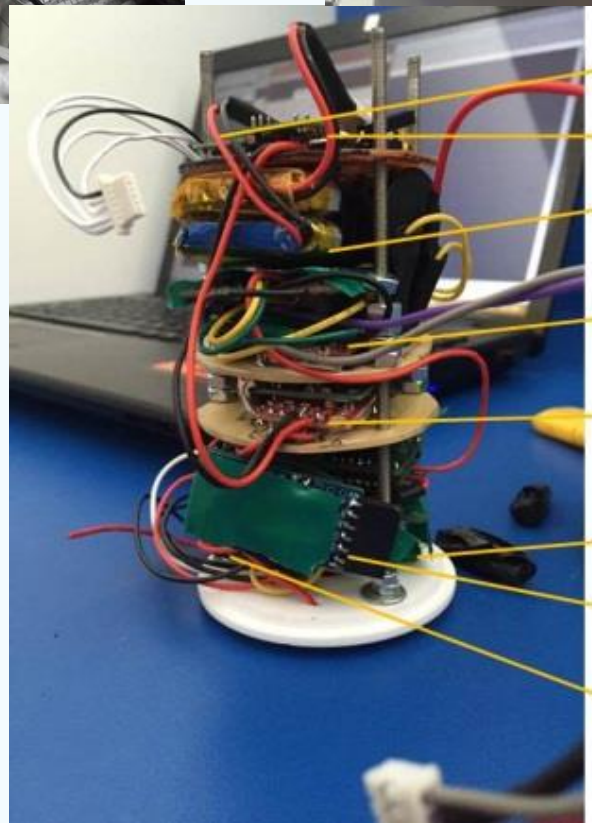
2o12



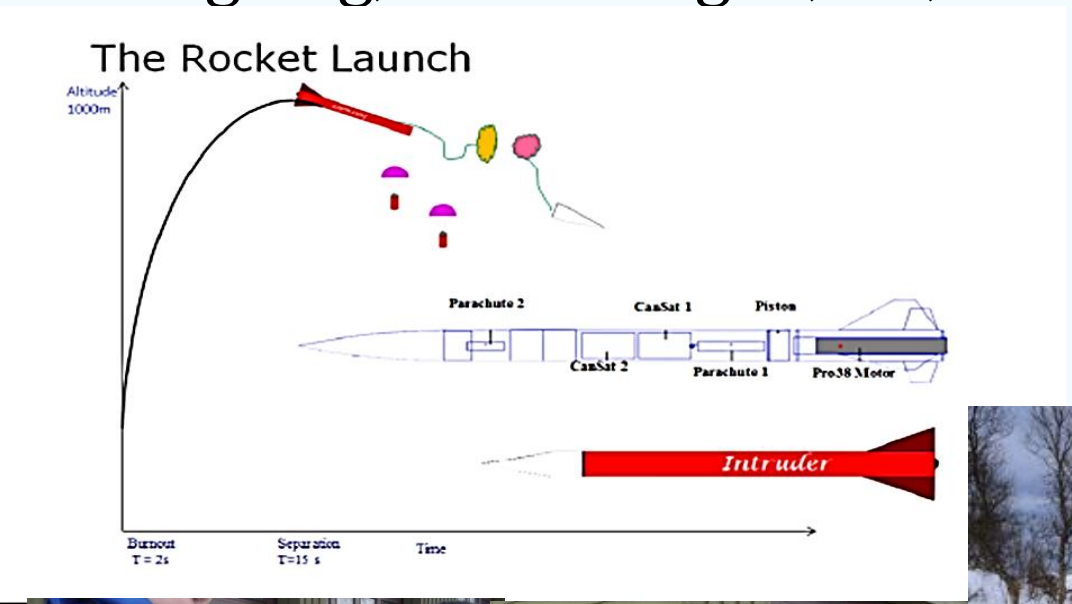




2o16


UV szenzor
GPS GP735T egység;
RFM69H adóegység
GSM egység és LIPO akku
OPENlog, Reduino Core mikrovezérlő
ALTIMU1oV4 szenzor; órajel
egység DS13o7
CMOS Kamera
HTU21D hőmérséklet,
páratartalom szenzor
Piezo - ütés szenzor

Az **INTRUDER** rakéta adatai (ez emeli 1km magasra a mérőegységet): gyorsulás 11g, sebesség: 550km/h, tömeg 3kg, hosszúság: 1,5m, kilökési nyomás 40atm.



2o12 Andoya Rocket Range, Norvégia

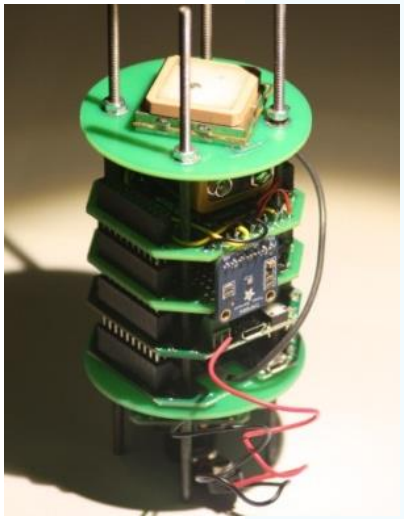
2o12 Andoya Rocket Range, a „Bolyai” csapat

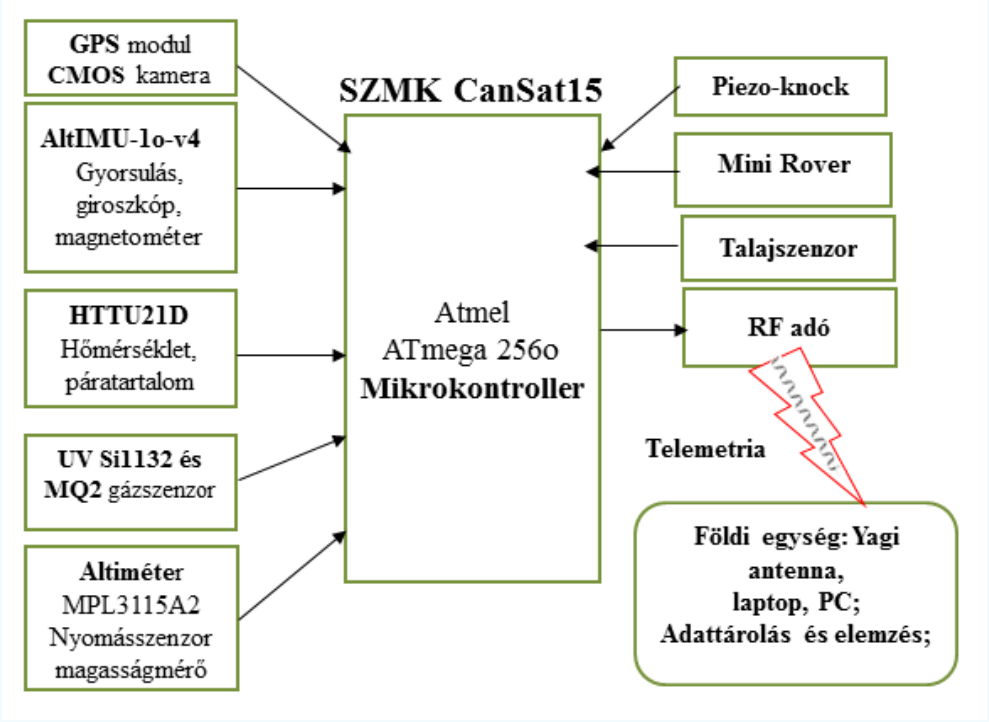
sensorReading | Arduino 1.8.5

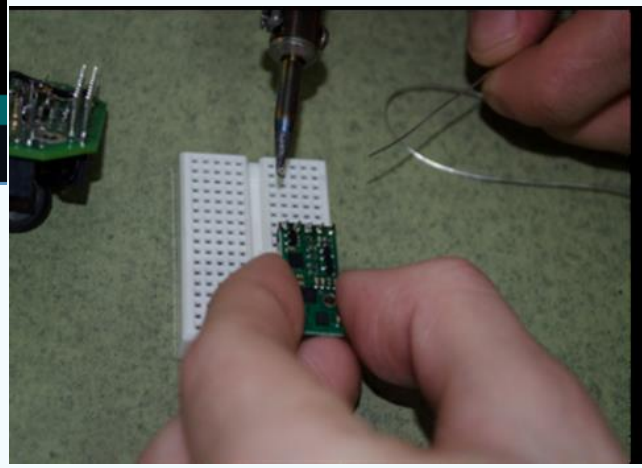
Fişier Editare Schiţă Instrumente Ajutor

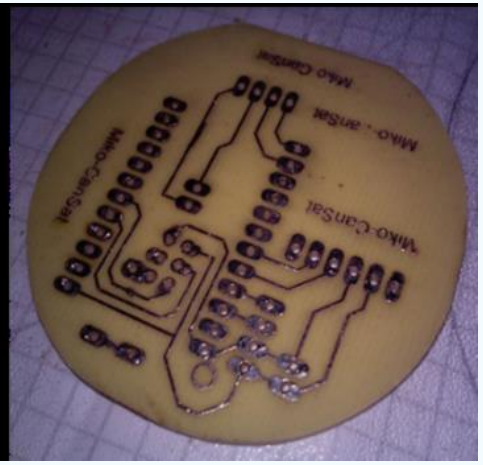
sensorReading

```
void loop() {

  // Serial.print(analogRead(A4));
  float pressure=readPressure();
  float LM35temp = readTempLM35();
  float NTCtemp=readTempNTC();

  Serial.print(pkId);
  Serial.print(", ");
  Serial.print(pressure);
  Serial.print(", ");
  Serial.print(LM35temp);
  Serial.print(", ");
  Serial.print(NTCtemp);
  Serial.println();


  Serial1.print("iovanalex, ");
  Serial1.print(pkId);
  Serial1.print(",");
  Serial1.print(pressure);
  Serial1.print(", ");
  Serial1.print(LM35temp);
  Serial1.print(", ");
  Serial1.print(NTCtemp);
  Serial1.println();
```

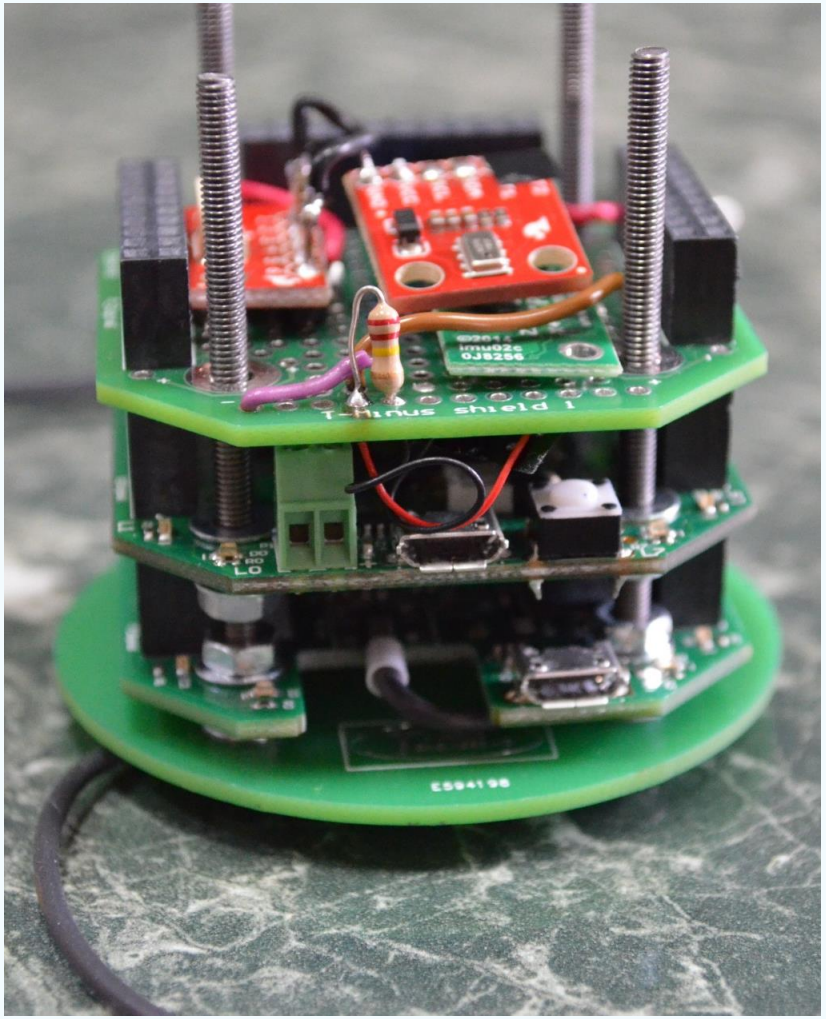




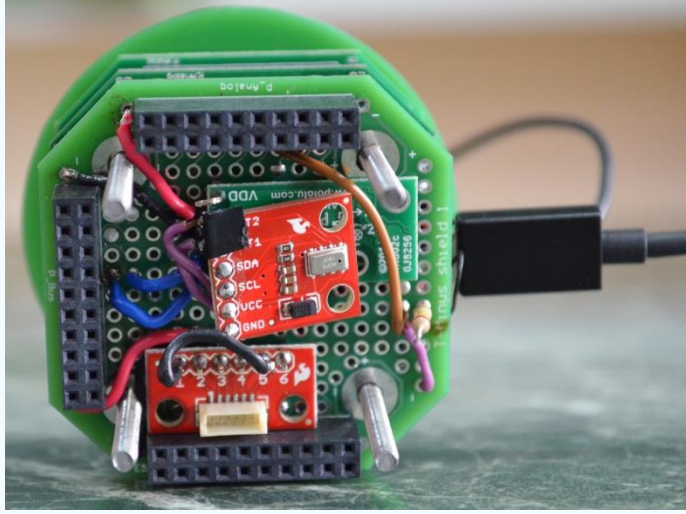


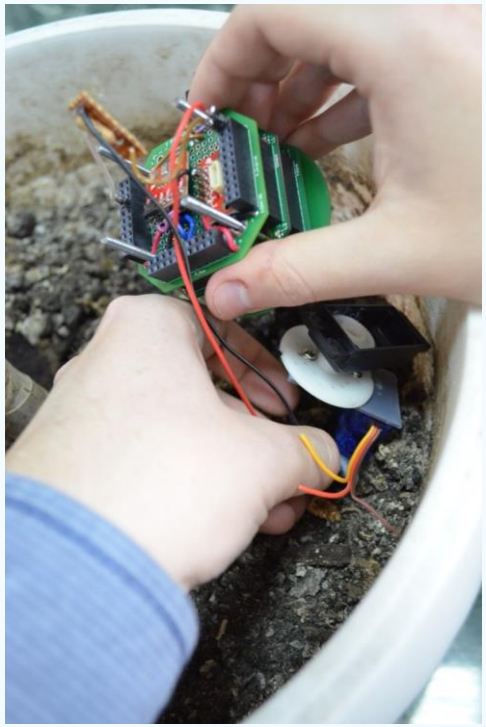


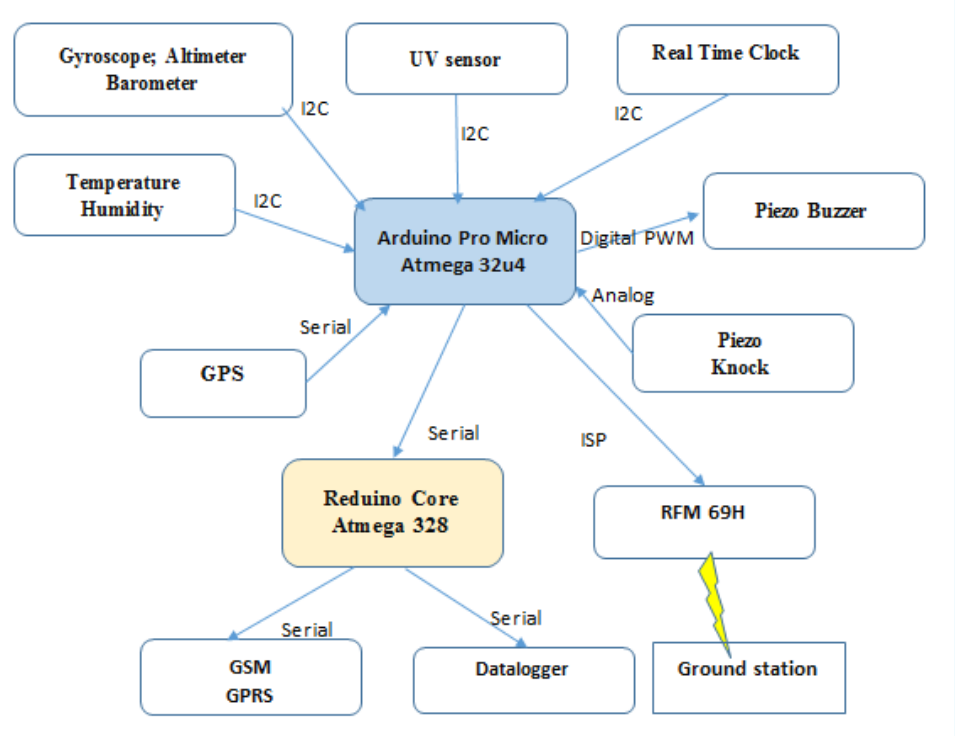
CanSat15



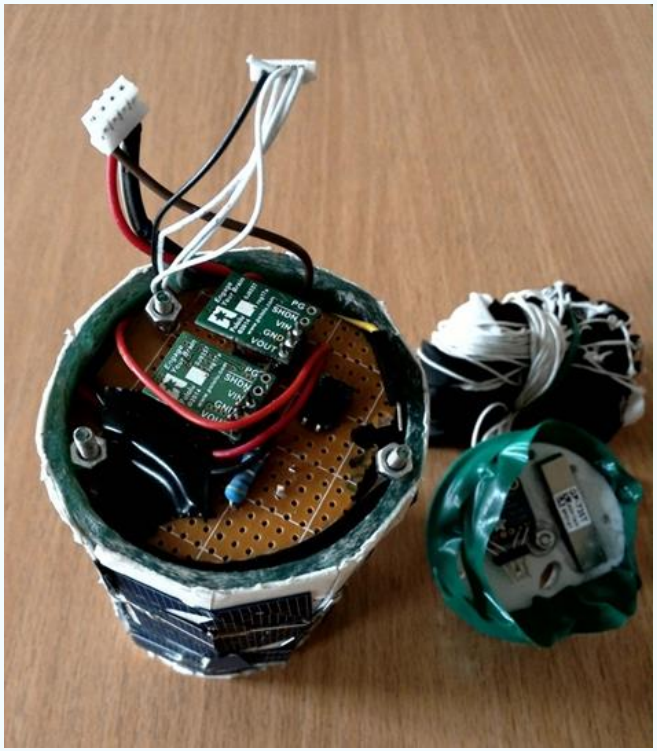
szenzorok:
nyomás;
hőmérséklet;
Magasság:
MPL3115A2;
Relatív
páratartalom
HTU21D;
LSM303D
magnetometer;
UV index,
MQ-2 gázok ;
gyorsulás;
giroszkóp;
GPS és CMOS
kamera;
Talajnedvesség,
Piezo knock

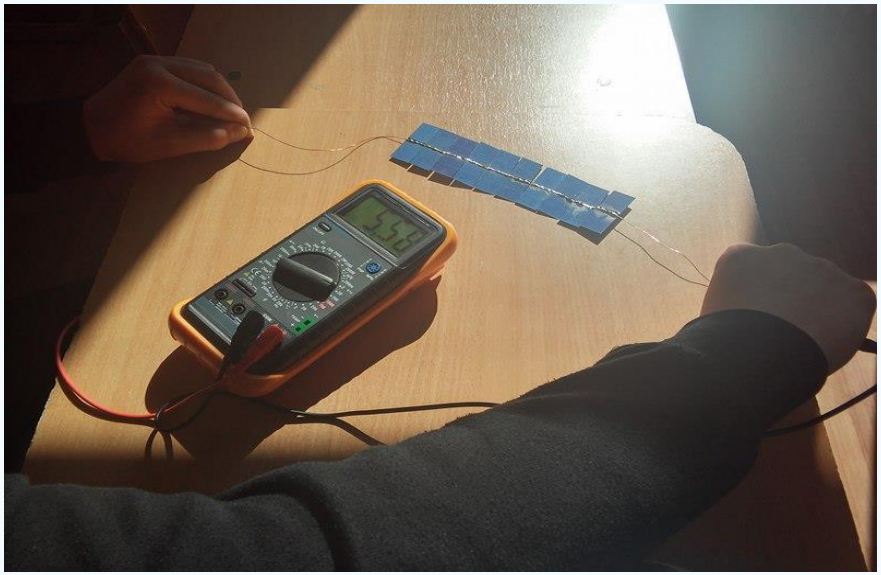


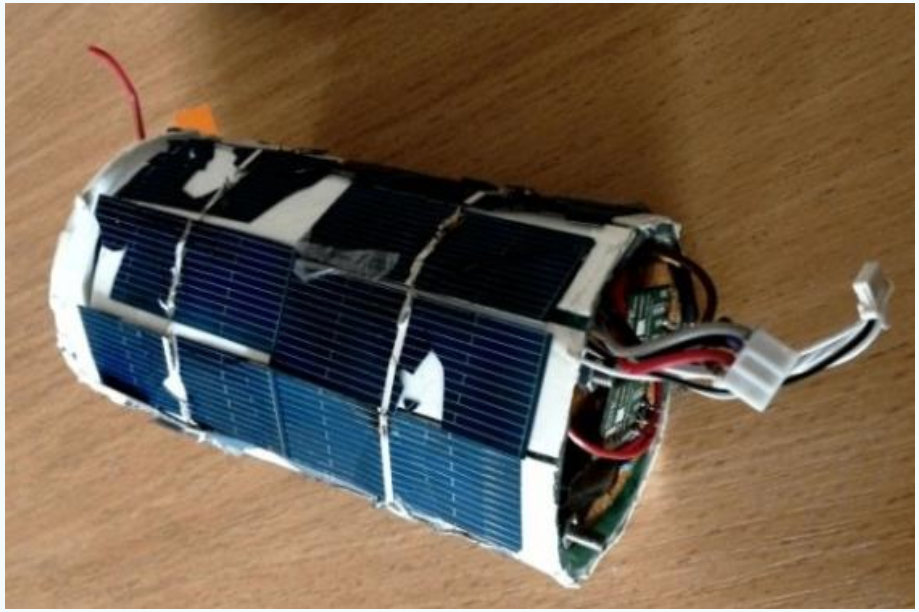


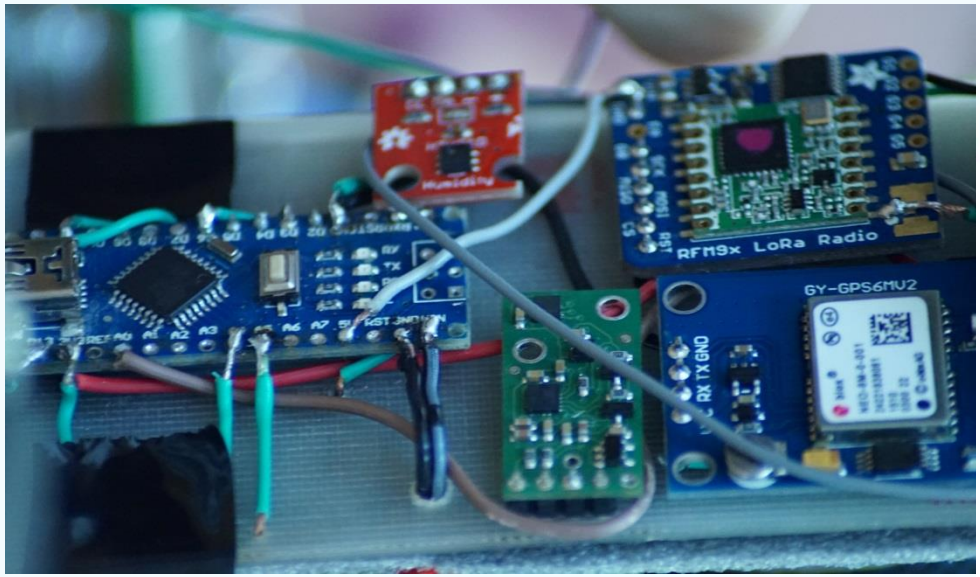

Gyroscope; Altimeter
Barometer
UV sensor
Real Time Clock
I2C
I2C
I2C
Temperature
Humidity
I2C
Arduino Pro Micro
Atmega 32u4
Digital PWM
Piezo Buzzer
Analog
Serial
GPS
Piezo
Knock
Serial
ISP
Reduino Core
Atmega 328
RFM 69H
Serial
Serial
GSM
GPRS
Datalogger
Ground station

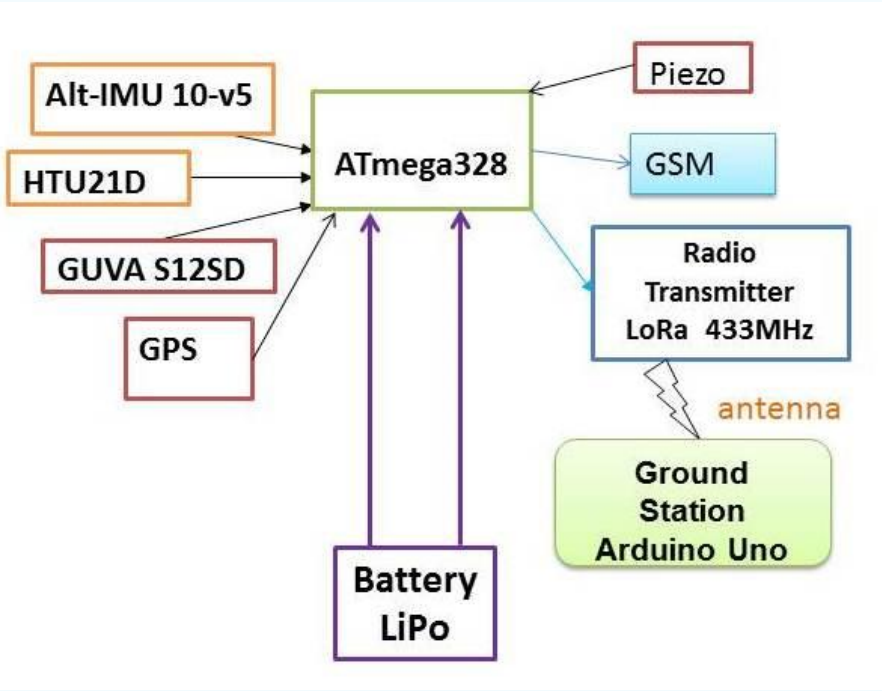
CANSAT16



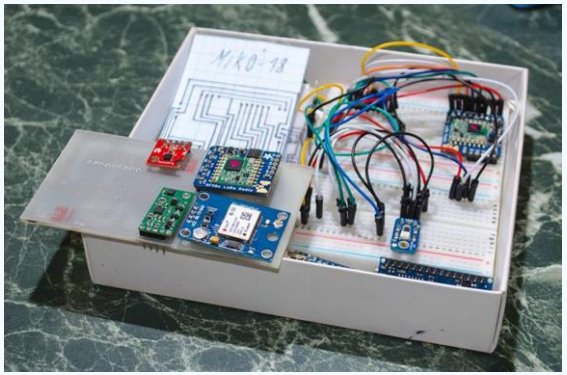


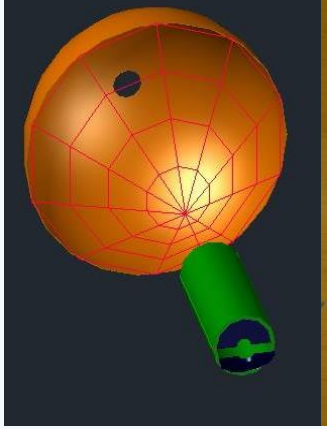




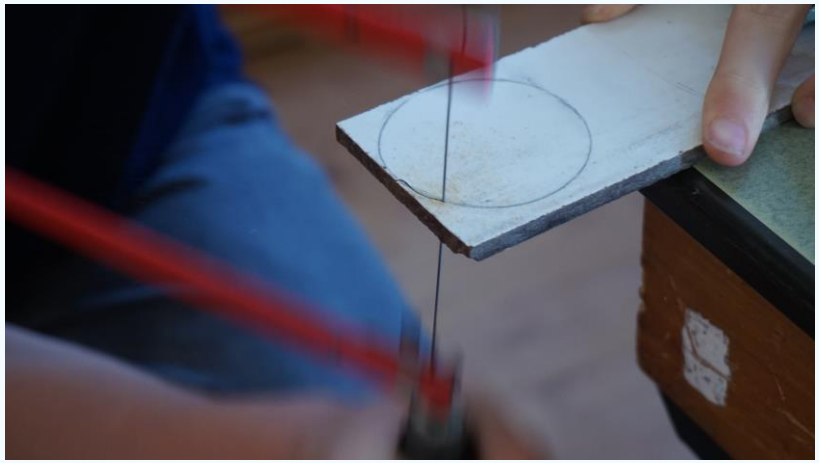


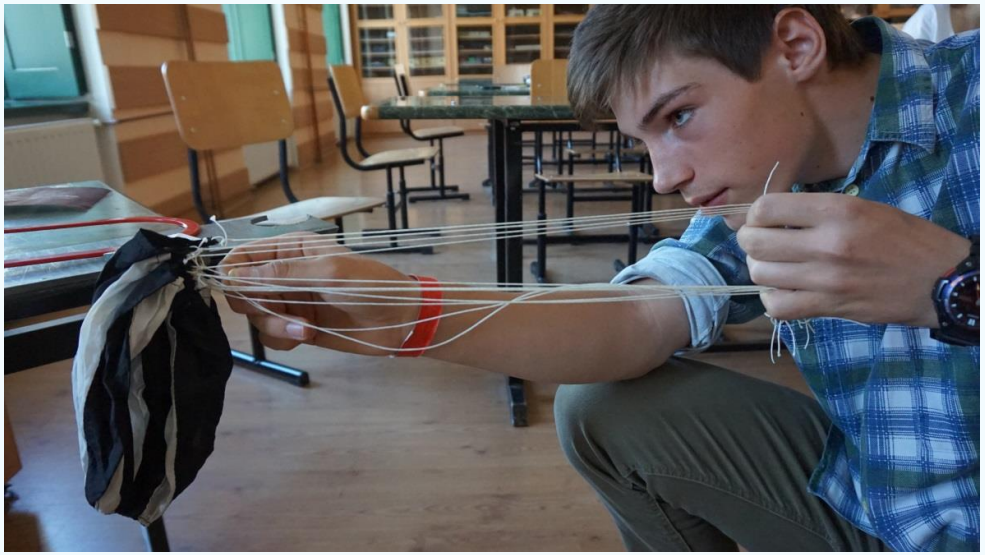
Tervezés - épités

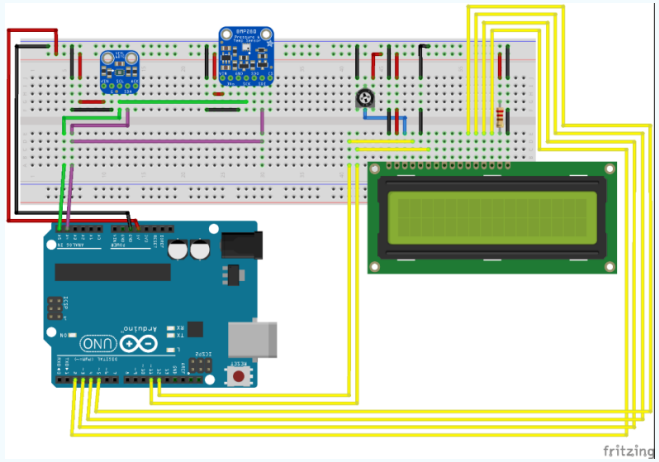


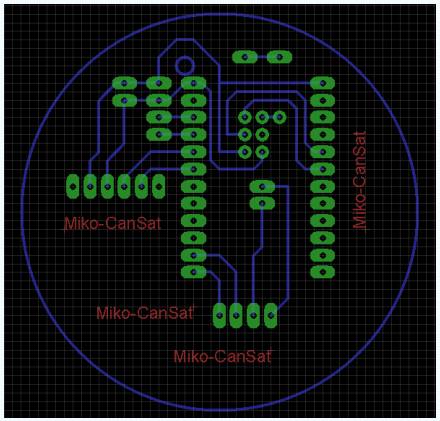


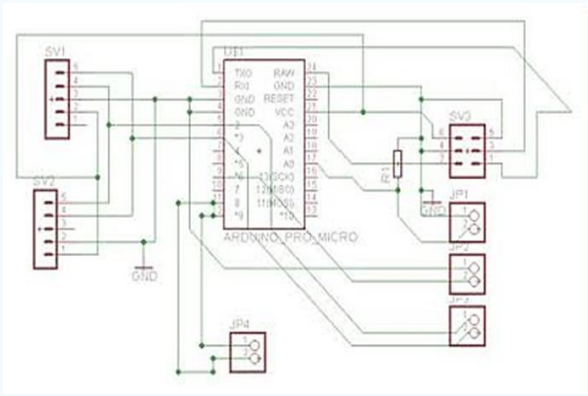
Tervezés - építés







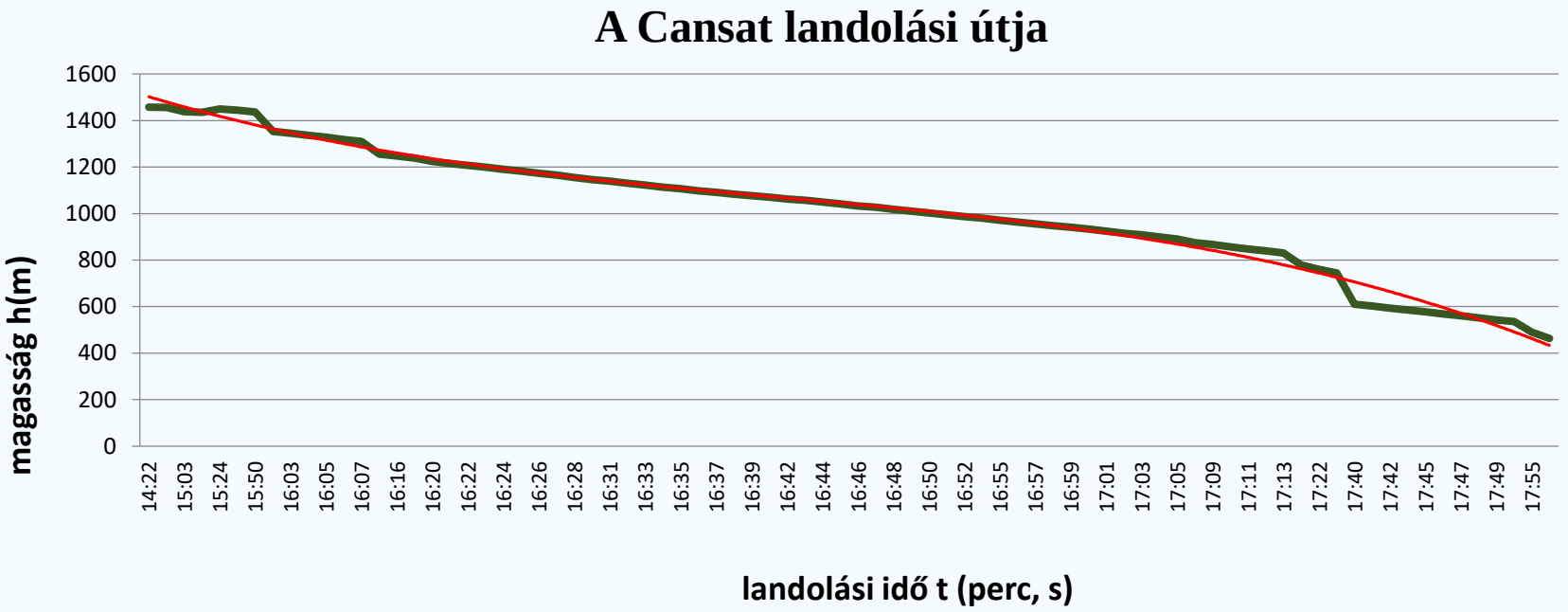


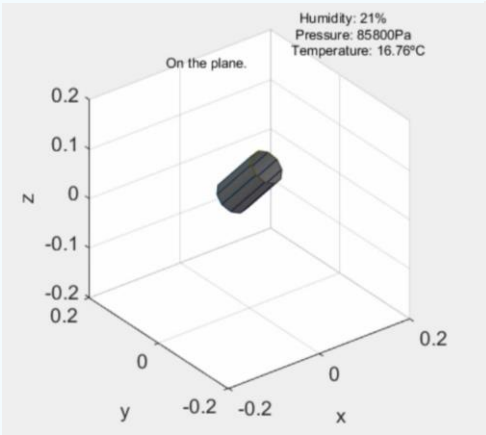


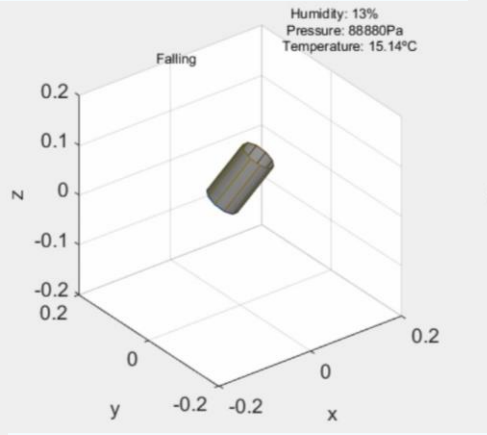
Ejtőernyő teszt

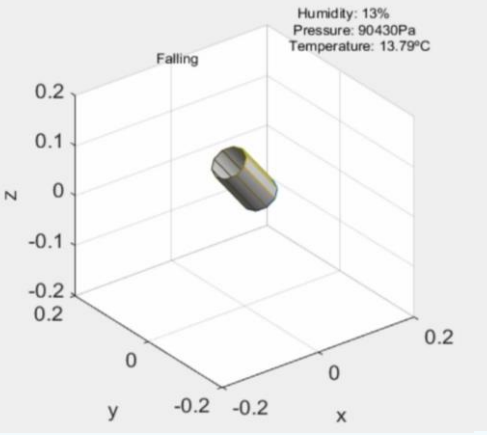
adatfeldolgozás

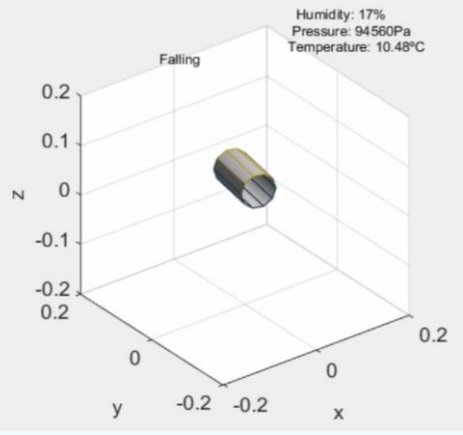
Adatfeldolgozás



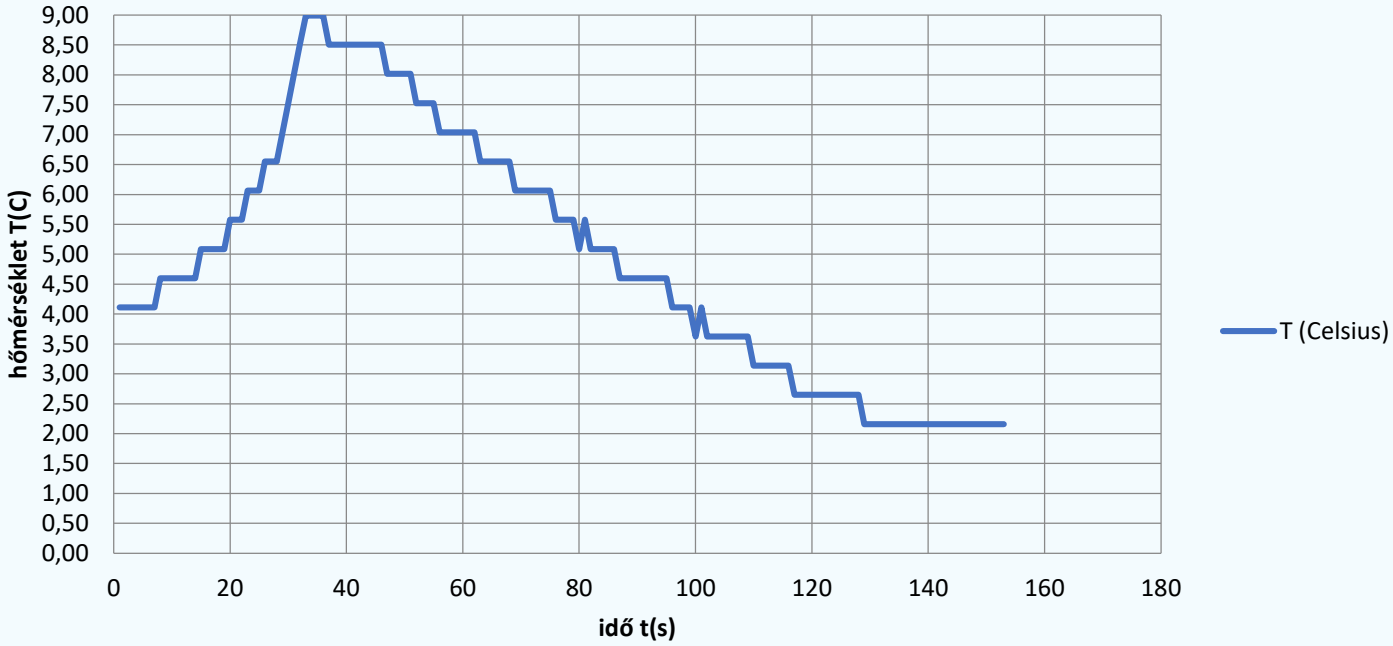




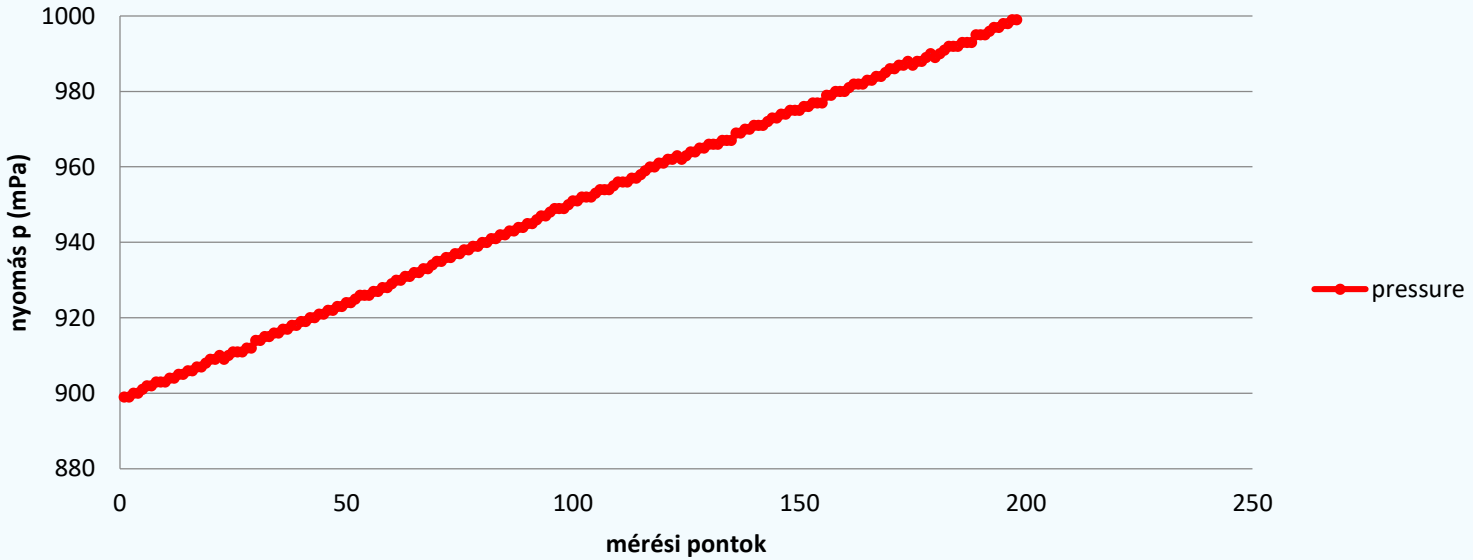


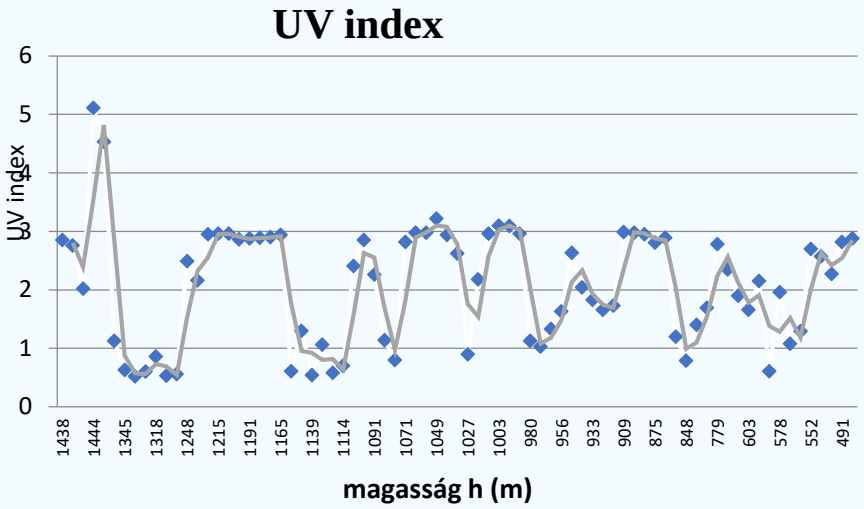


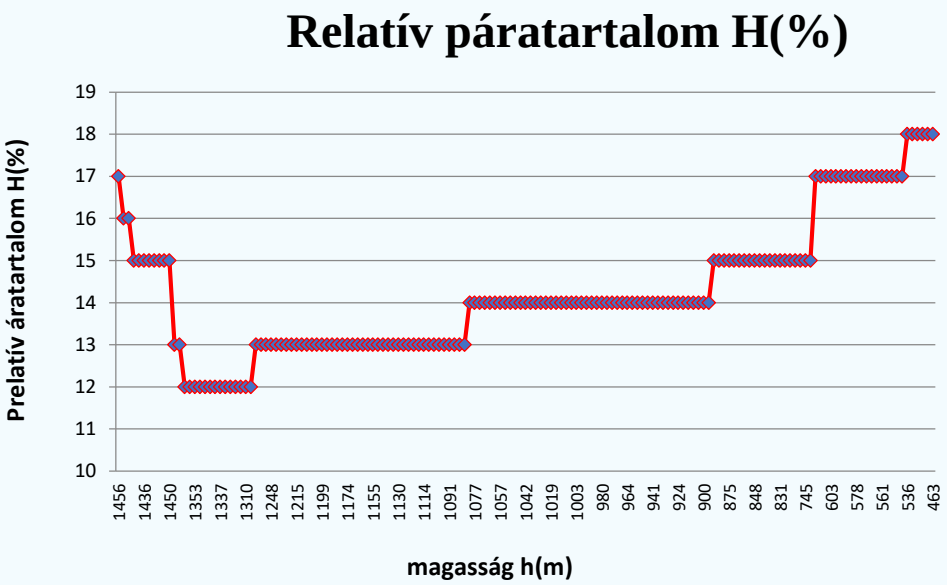
A hőmérséklet változása az egység emelkedése és esése alatt

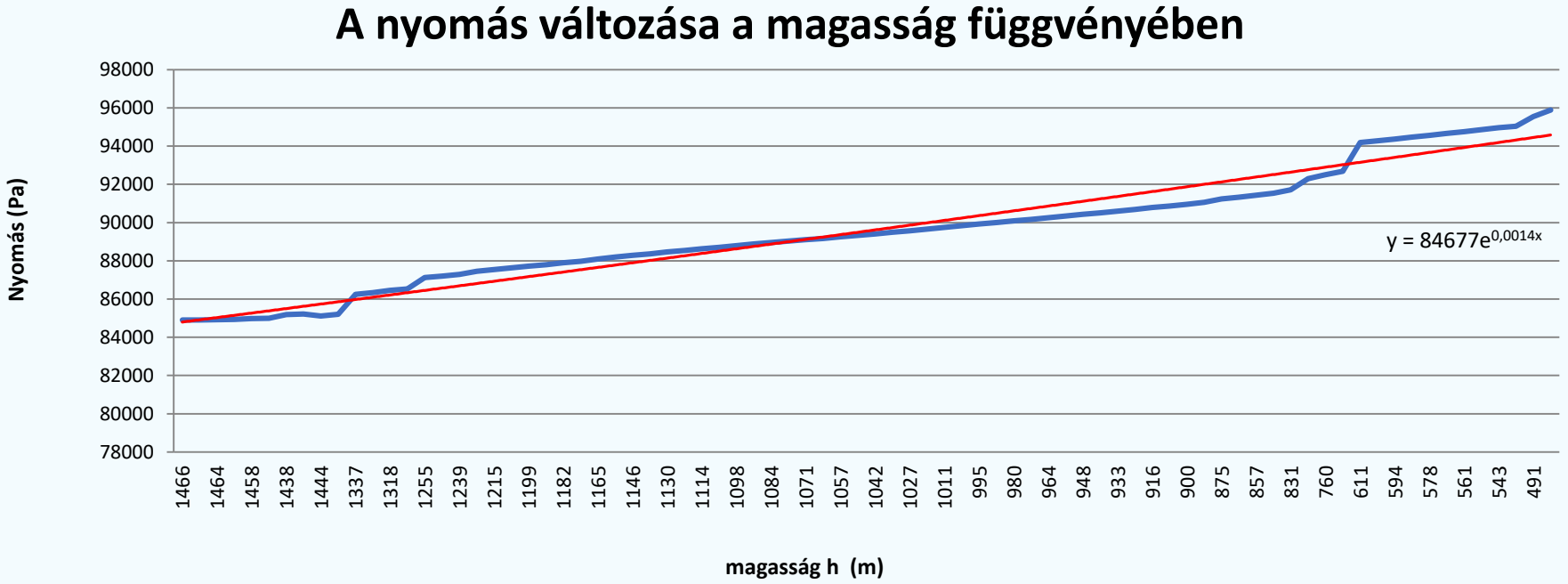


A nyomás értékei az egység esése során




UV index
UV index
magasság h (m)


Relatív páratartalom H(%)
Prelatív áratartalom H(%)
magasság h(m)


A nyomás változása a magasság függvényében
Nyomás (Pa)
y = 84677e0,0014x
magasság h (m)

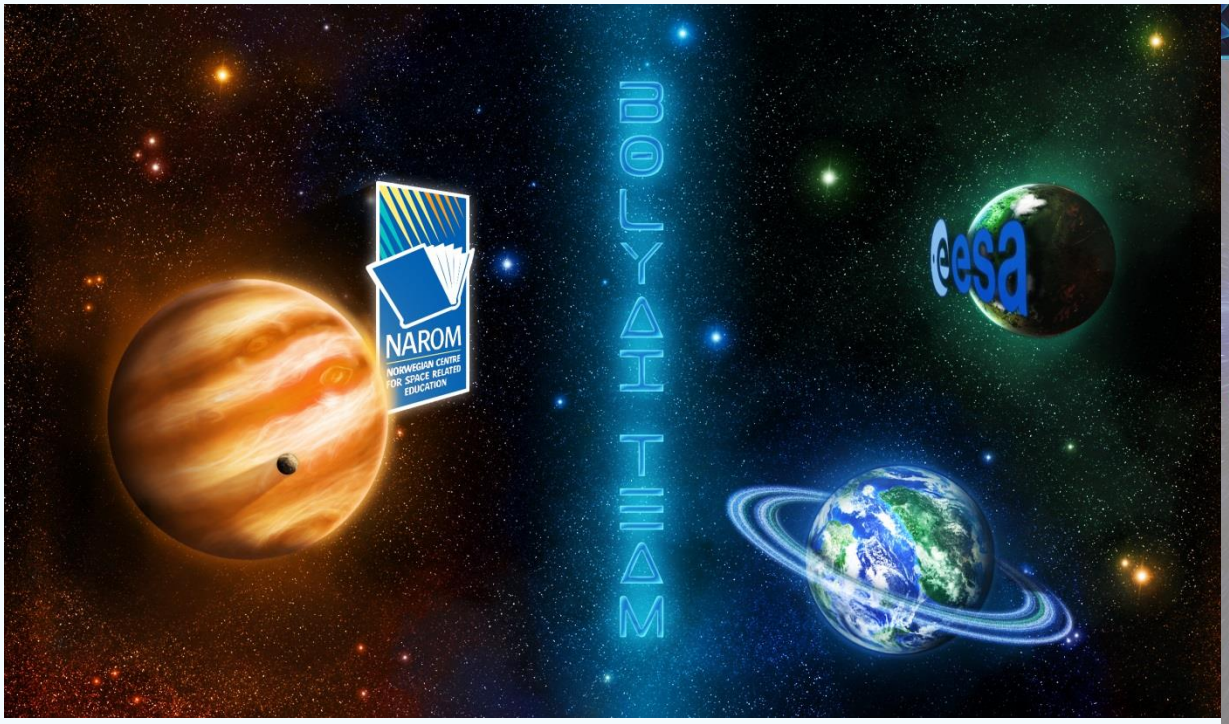
Az új mini-szatellitünk

Most repülővel indítják az egységeket….

CanSat 2018

„Frekvenciára” hangolva…

A Mikó18 csapat, akik II. díjat nyertek

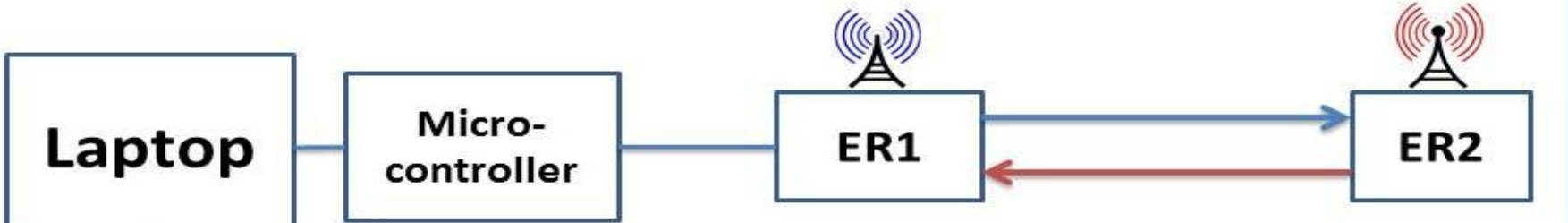

BOLYAI TEAM
NAROM
NORWEGIAN CENTRE FOR SPACE RELATED EDUCATION
esa

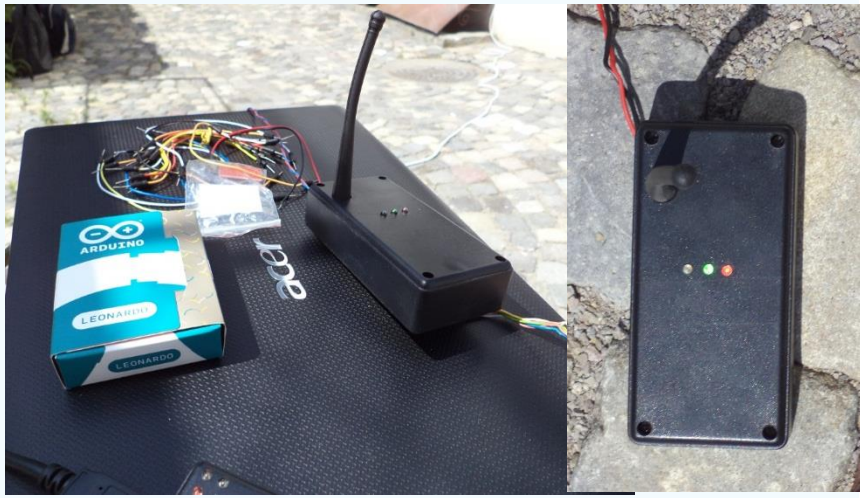

CANSATS IN EUROPE
BOLYAI TEAM
gnome
ROTARY SF. GHEORGHE
Sepsiszentgyörgy Megyei Jogú Város Tanácsa
BERTIS
AQUARIS
MOBLUK KFT
HELP
Szemerjai és központi lelkészi hivatalok
Angelo foto Kontés
Háromszék
Sláger Rádió
krónika
Hírmondó
OBSERVATORUL
"Az Idő s Tér bilincsei
nem kötik meg a lelkeket."
(Bolyai Farkas)

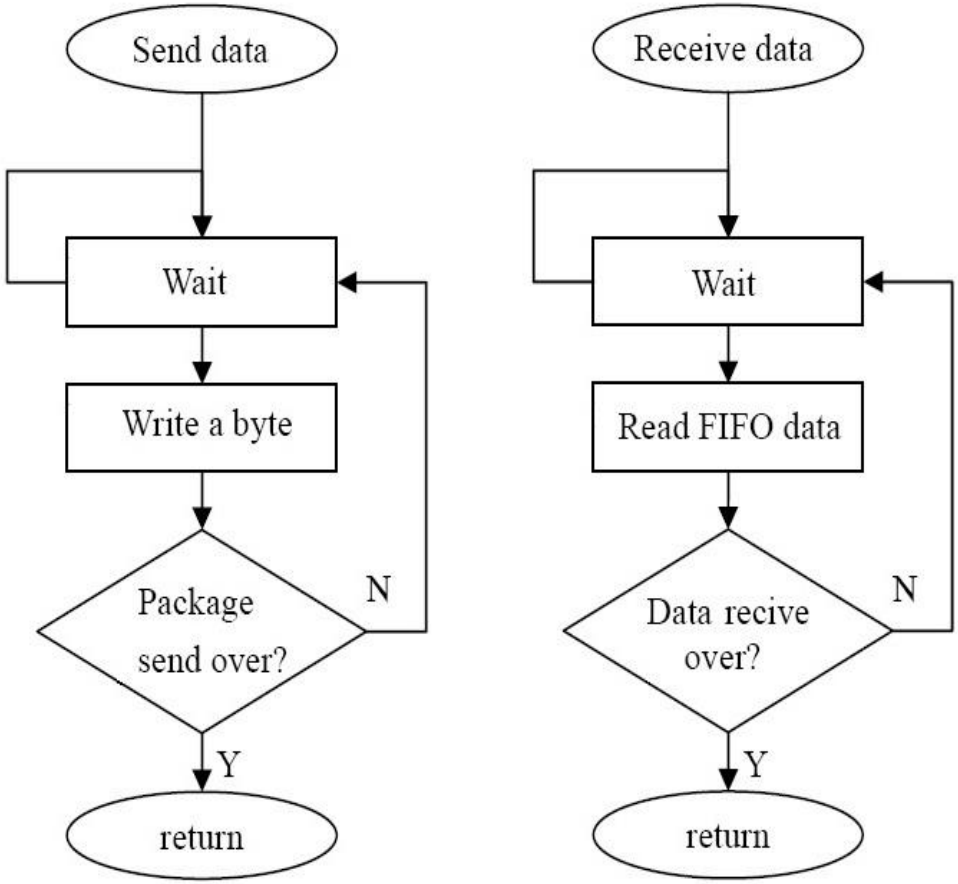
2012 → 
MIKÓ CANSAT 2016
→ 2016

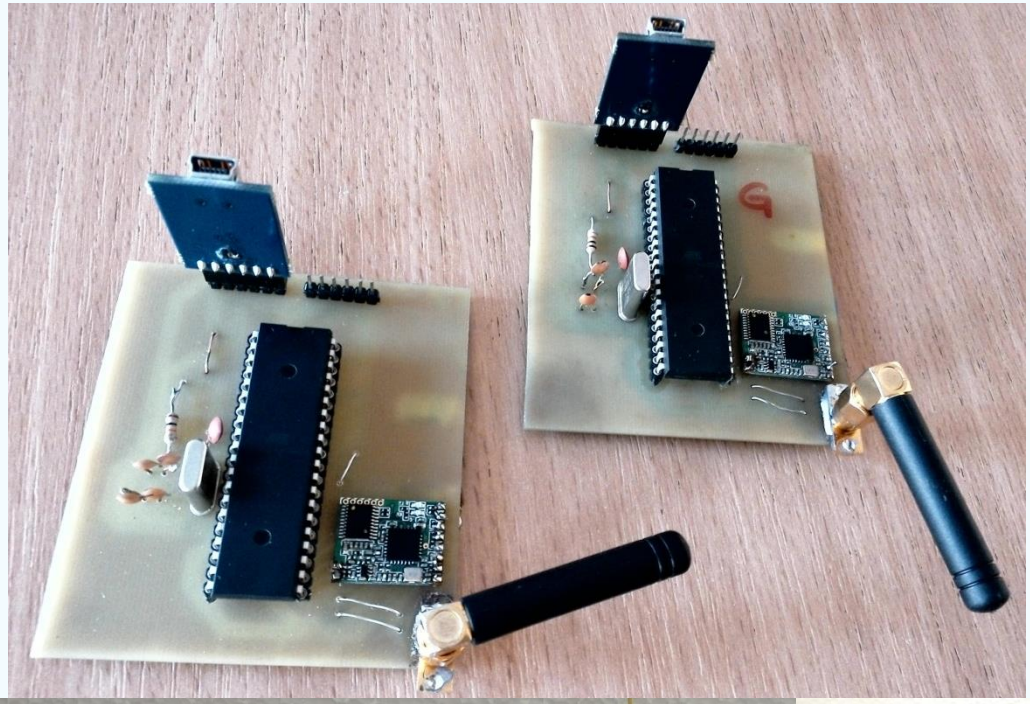

MIKÓ-CANSAT TEAM
2016 SEPSISZENTGYÖRGY

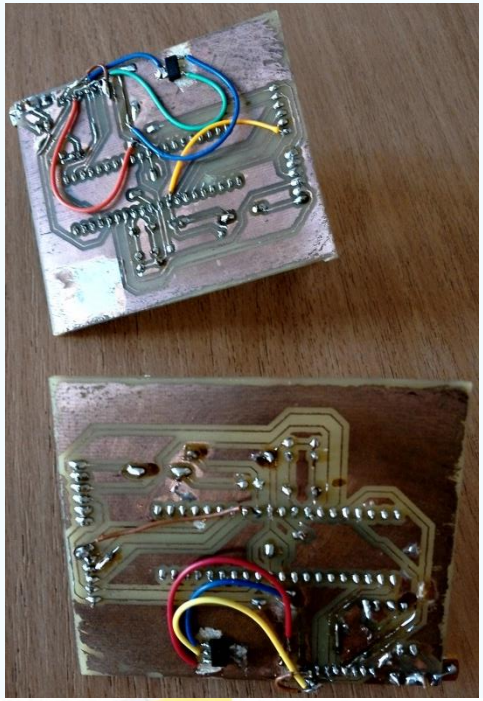
Az elektromágneses sugárzás sebességének meghatározása

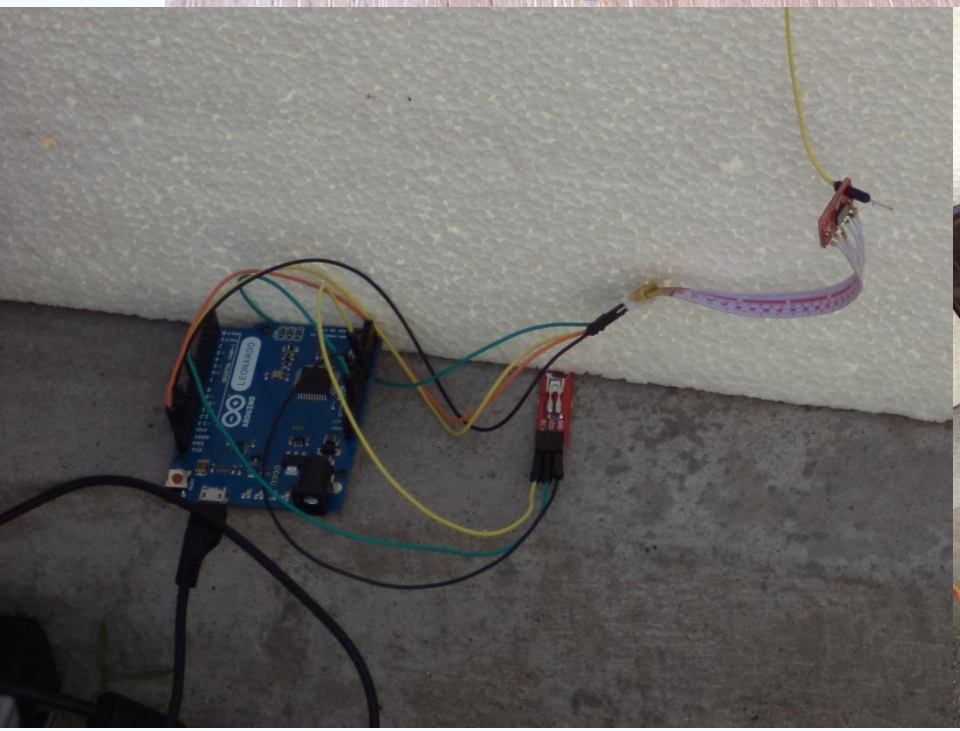


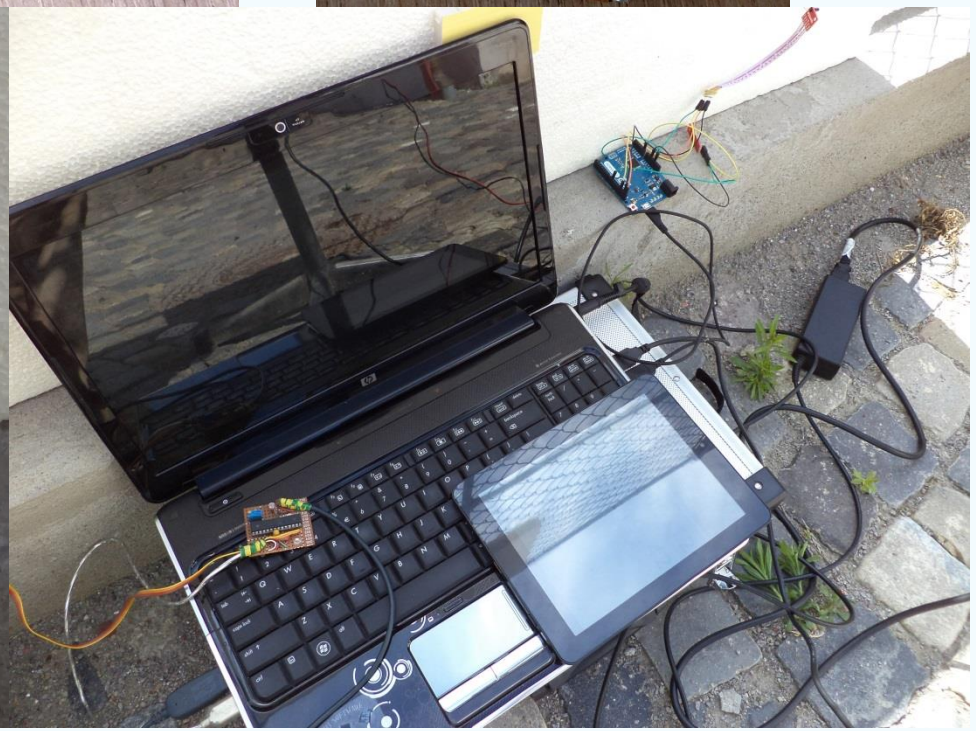


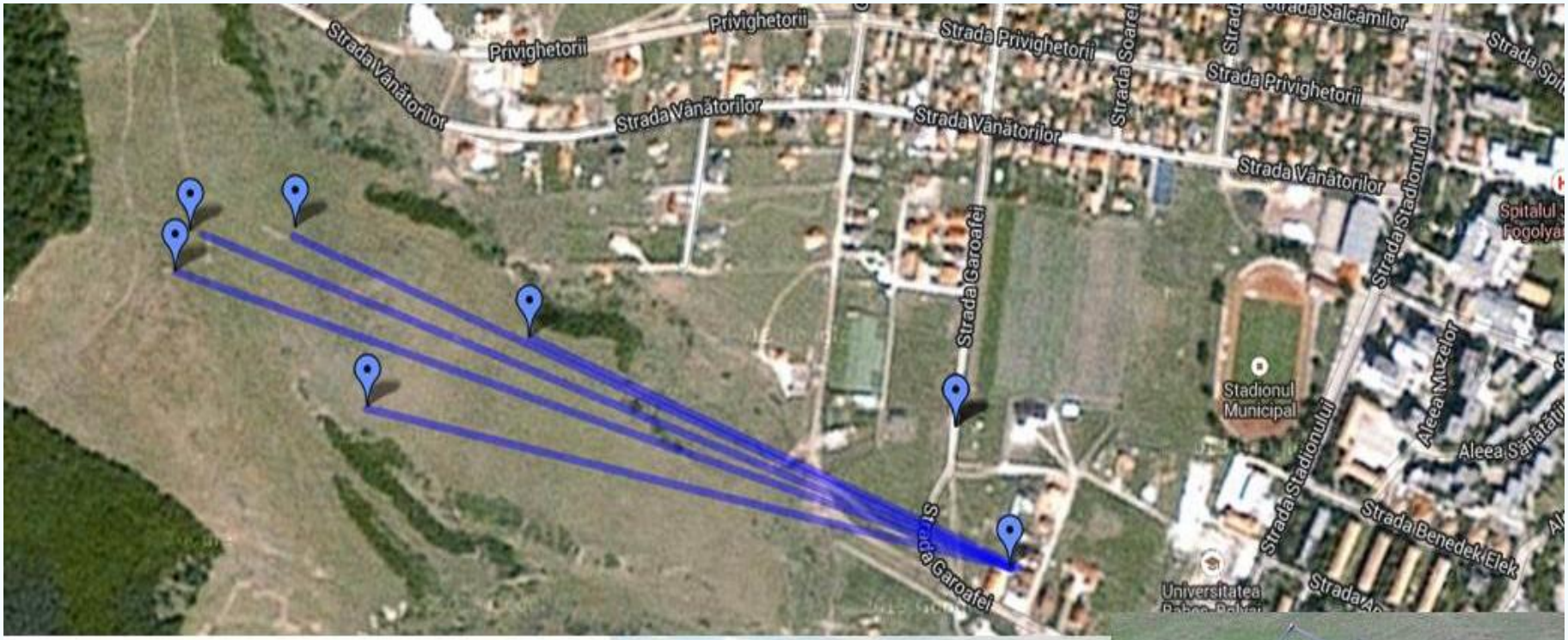






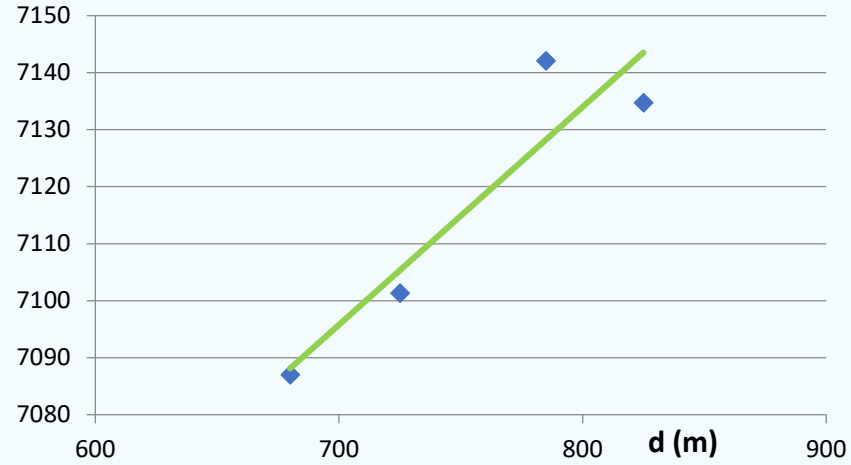


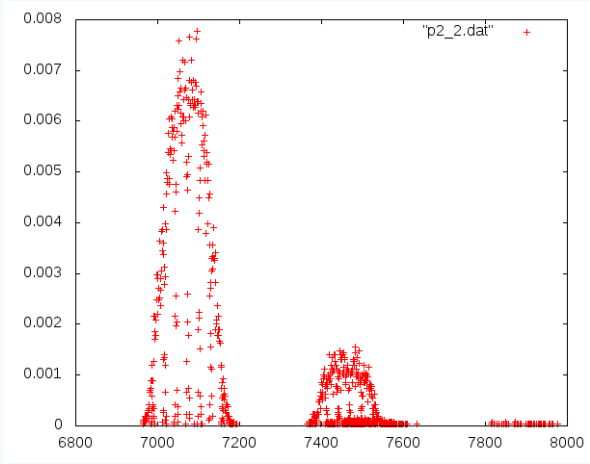



Strada Vânătorilor
Privighetorii
Strada Privighetorii
Strada Soarelui
Strada Salcâmilor
Strada Spitalului
Strada Garoafei
Strada Stadionului
Stadionul Municipal
Aleea Muzeelor
Aleea Sănătății
Strada Benedek Elek
Universitatea

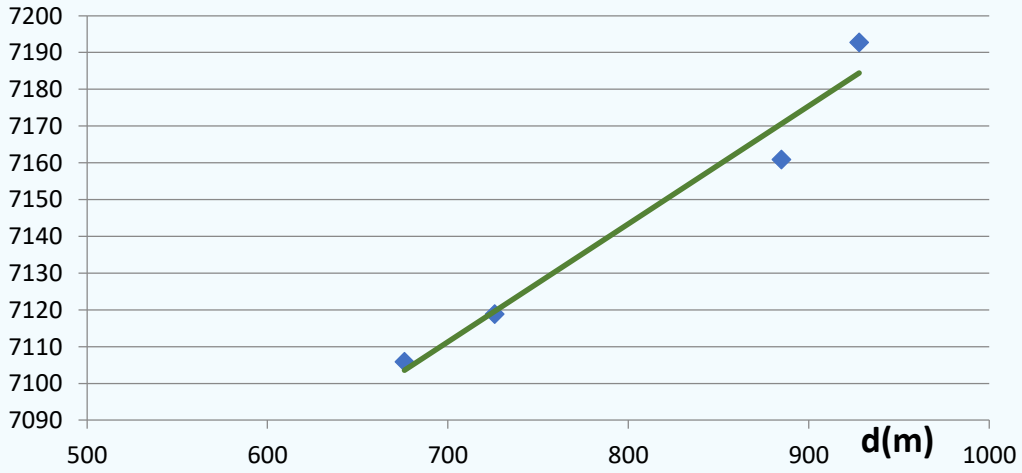
a	0,321058	0,31883	0,3508146	average
c (10^8 m/s)	3,114702	3,13644	2,8505086	3,033882
a (day2)	0,38215	0,368516	0,329877	average
c($1o^8$ m/s)	2,616776	2,713584	3,031431	2,787264

Day2 time (µs)



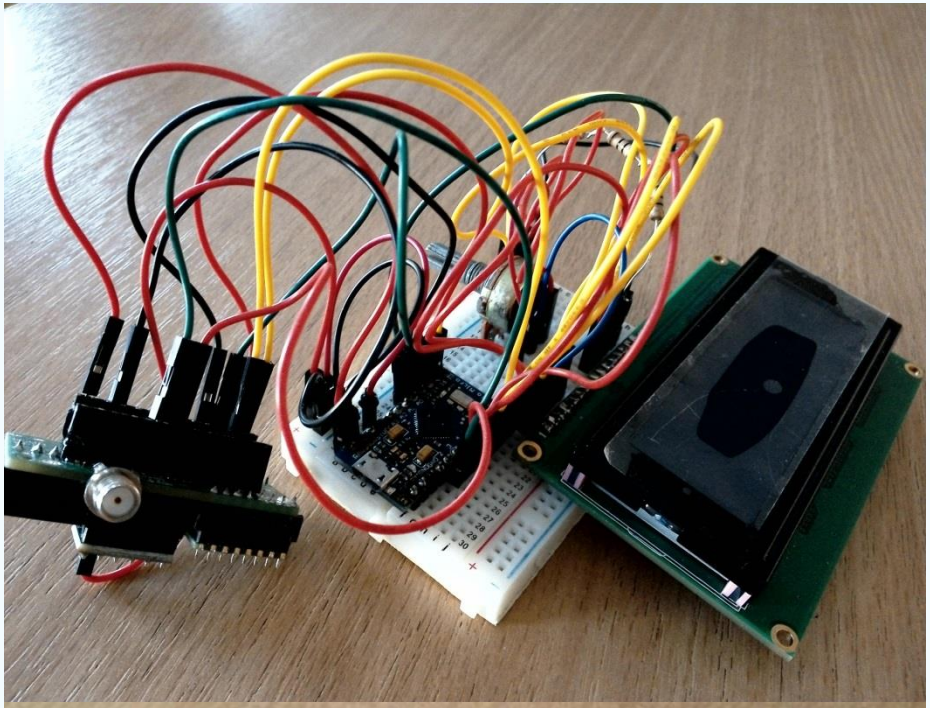


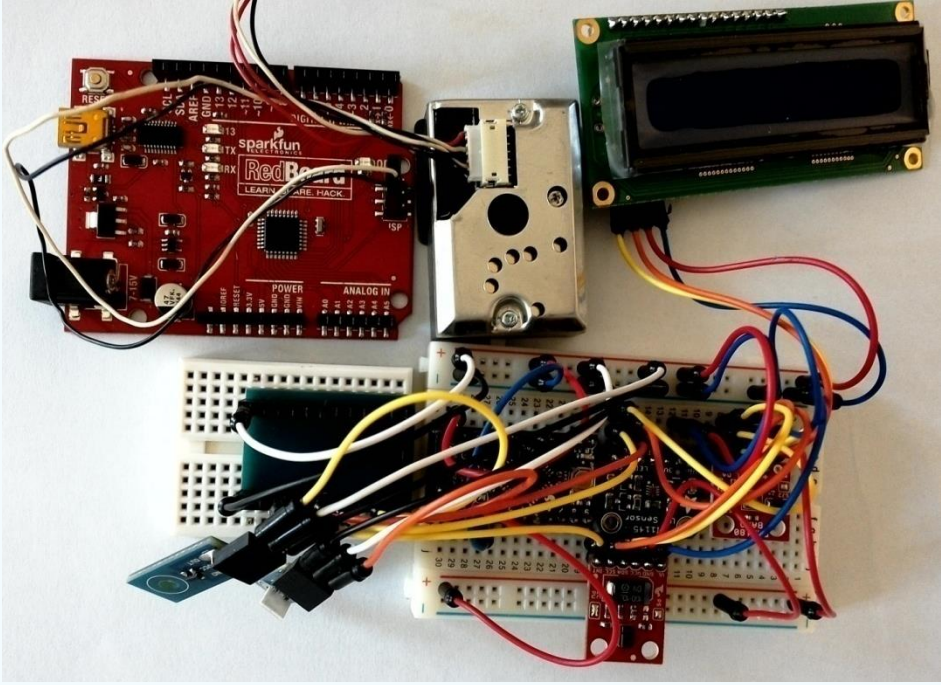
day1 time (µs)

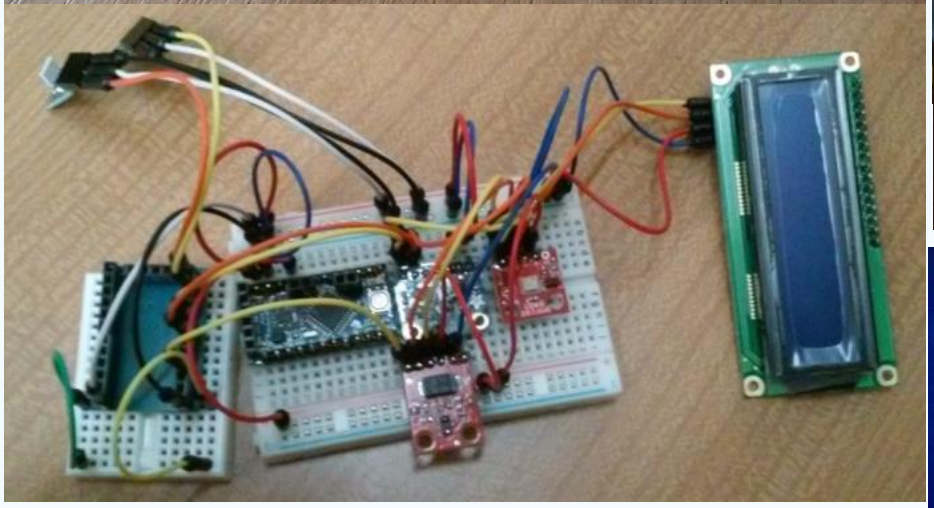


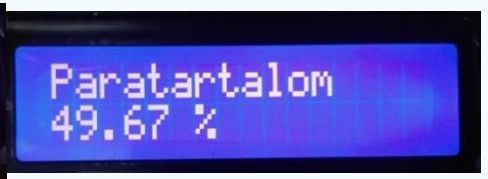
f(x)=ax+b, f(x)−idő, x−távolság (d)

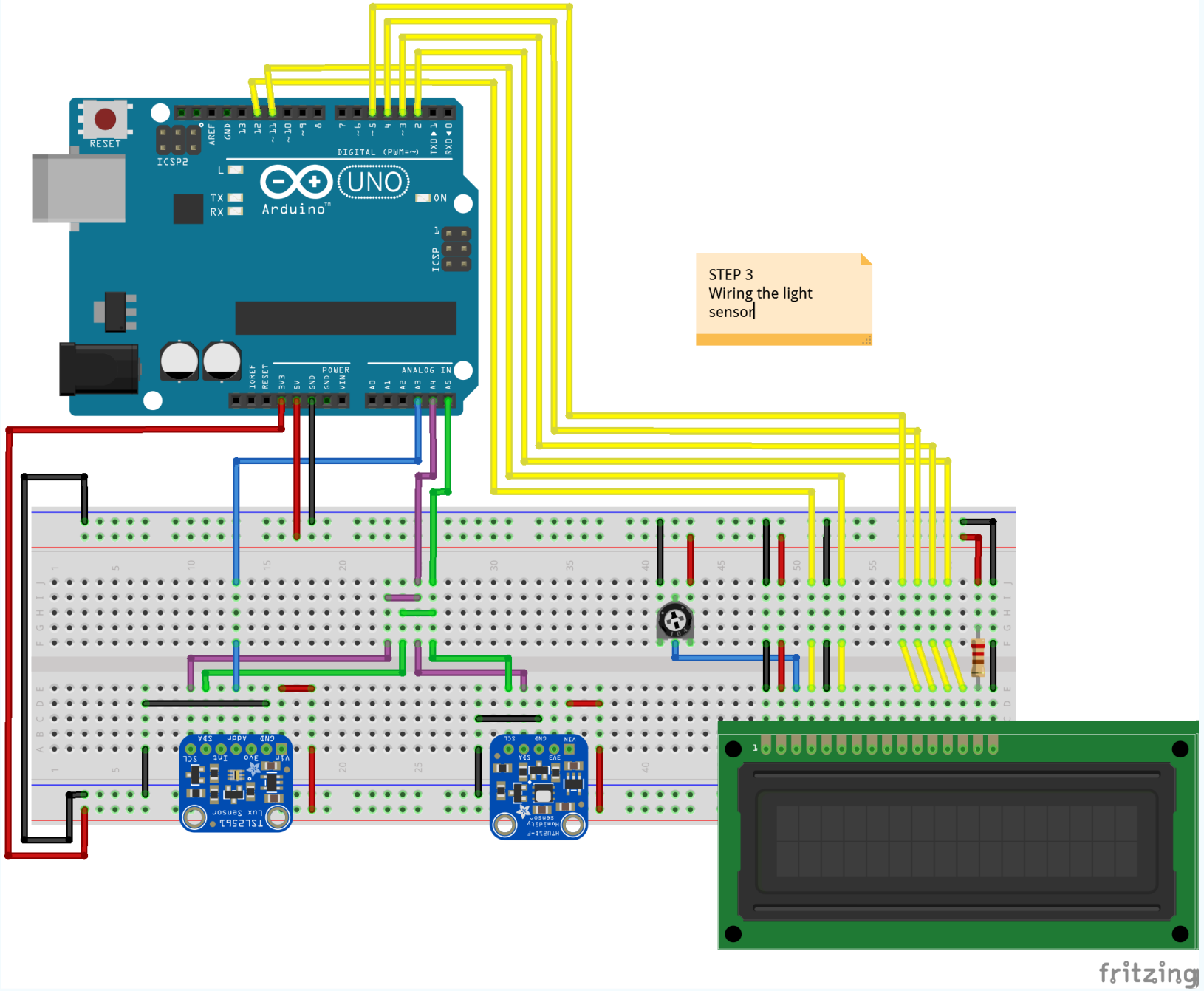
Légkörfizikai mérések





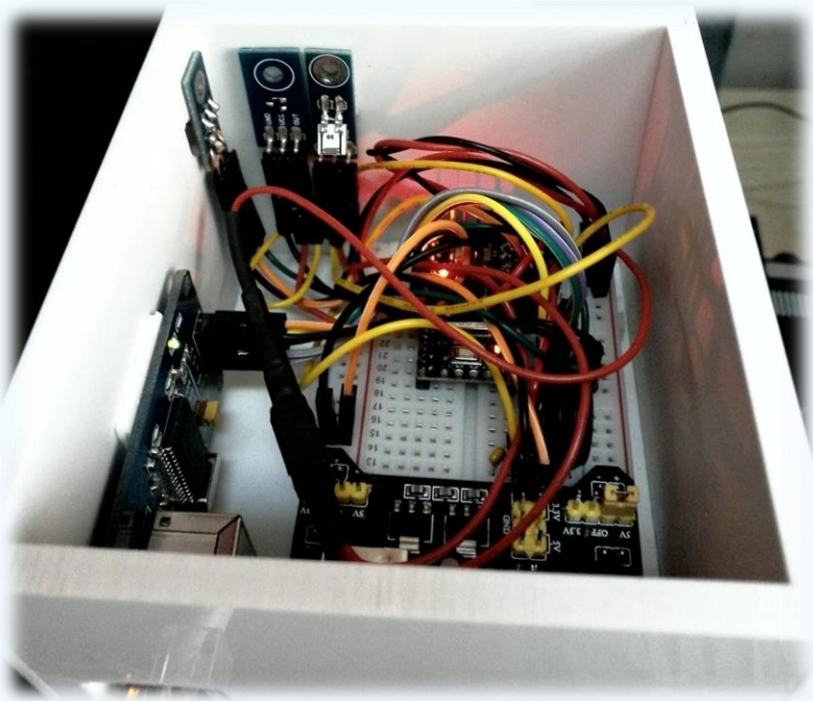


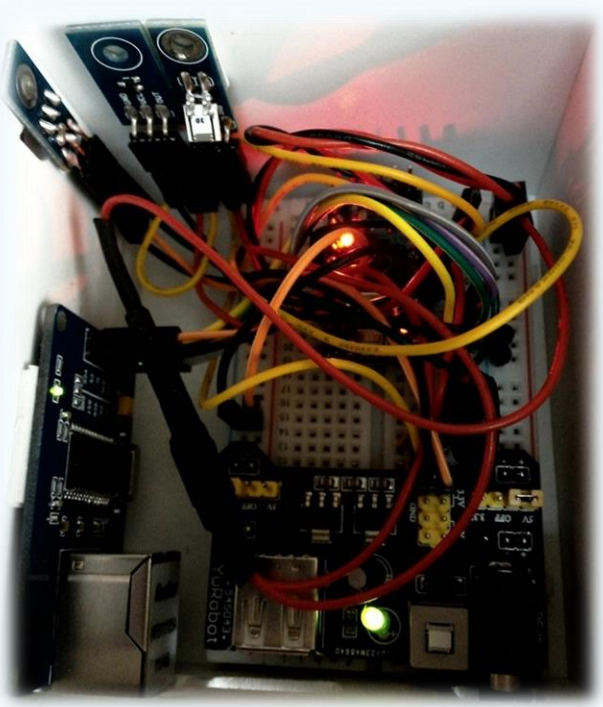


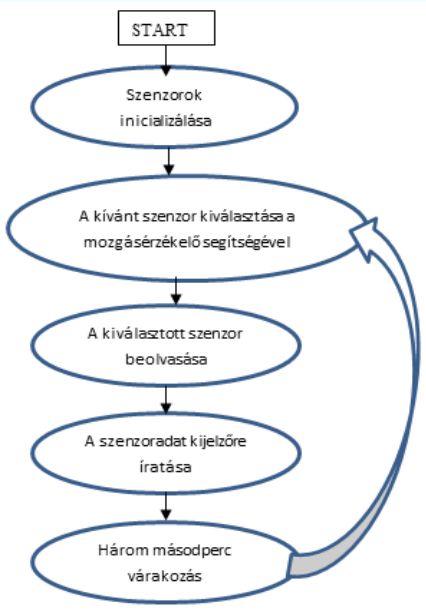


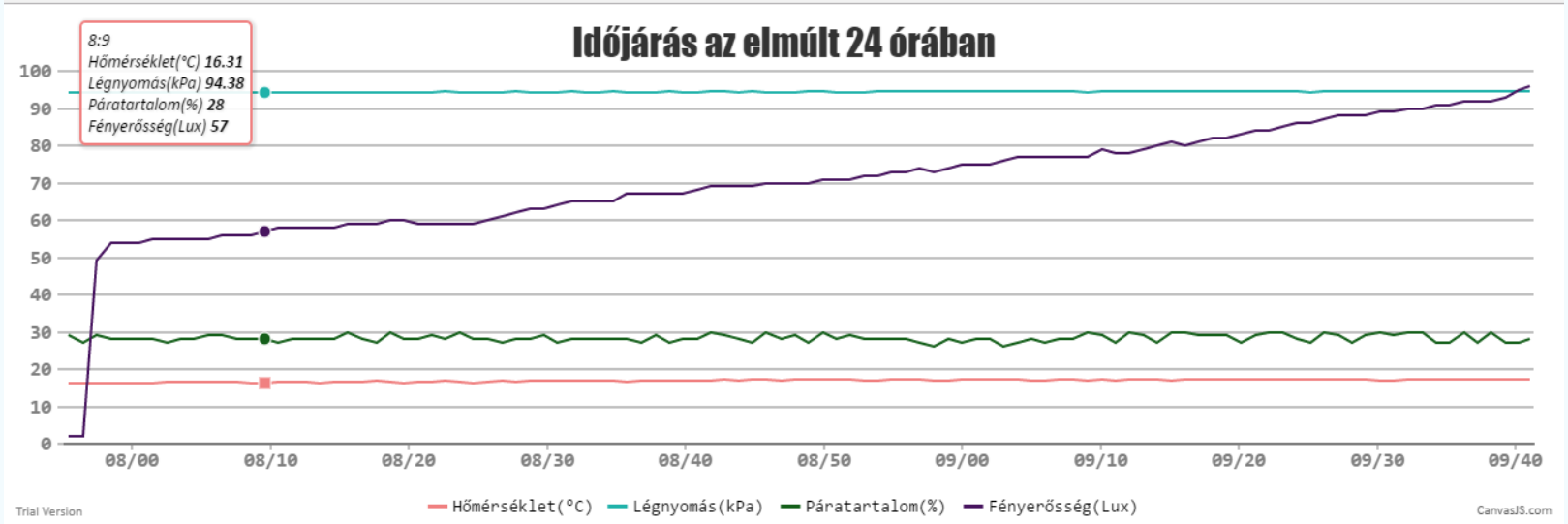
Meteo egység építése

V.V. Áron munkája





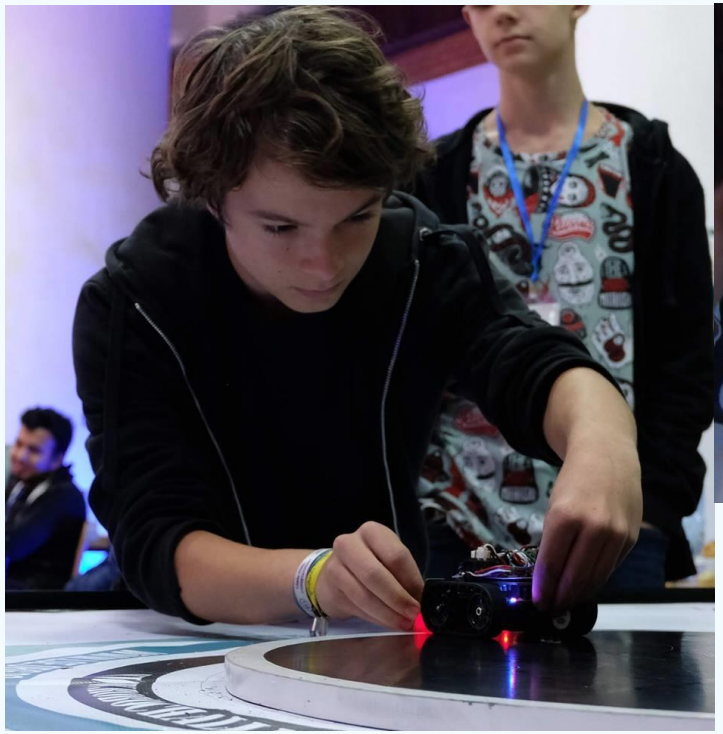


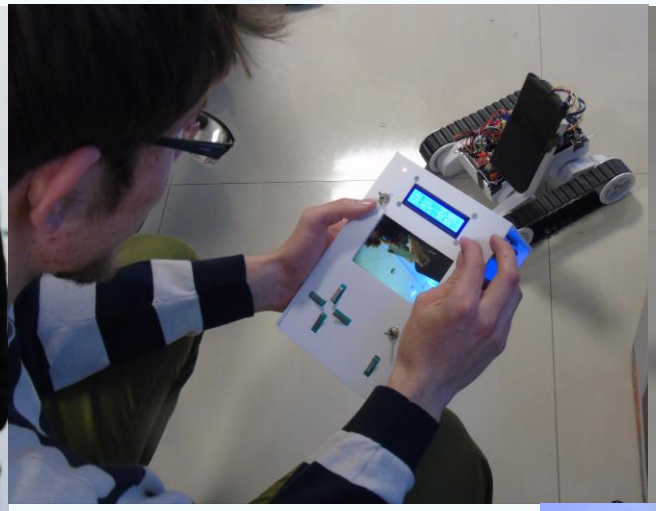


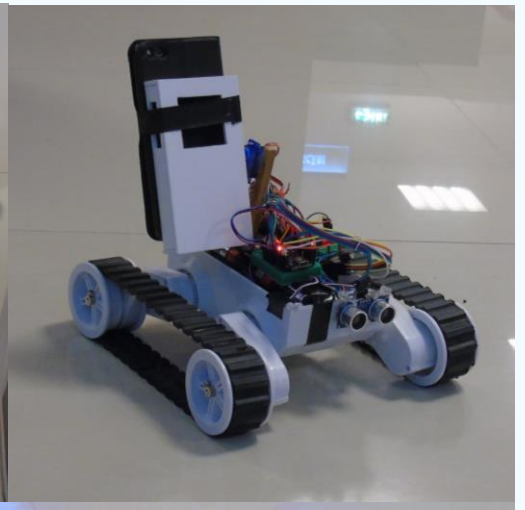
Hőmérséklet: 17.14 C
Páratartalom: 28 %
Fényerősség: 96 Lux
Légnyomás: 94.48 kPa
Dátum: 2016-12-07 09:41:01

http://globalweather.000webhostapp.com/

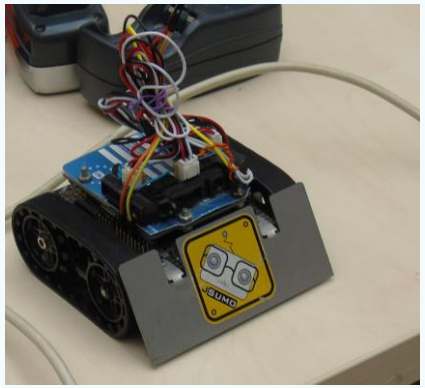
Medgyesi A. és V. V. Álmos munkája

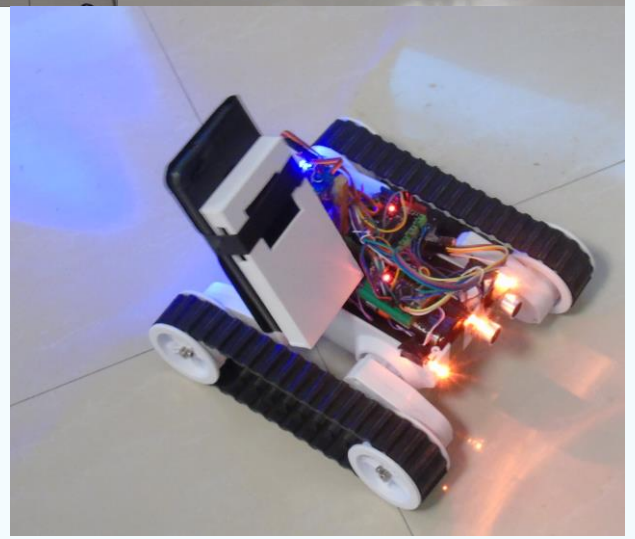


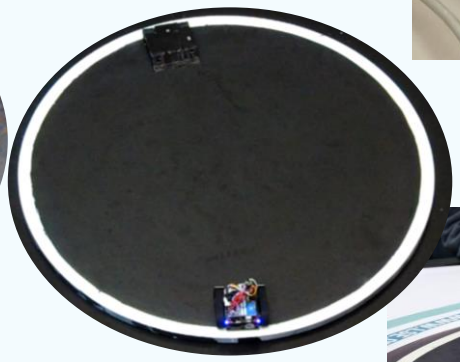


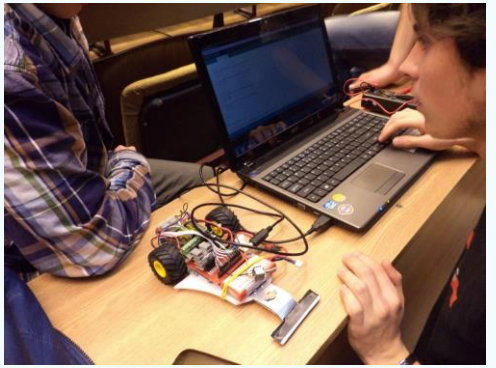


A „szumóka” versenyre kész

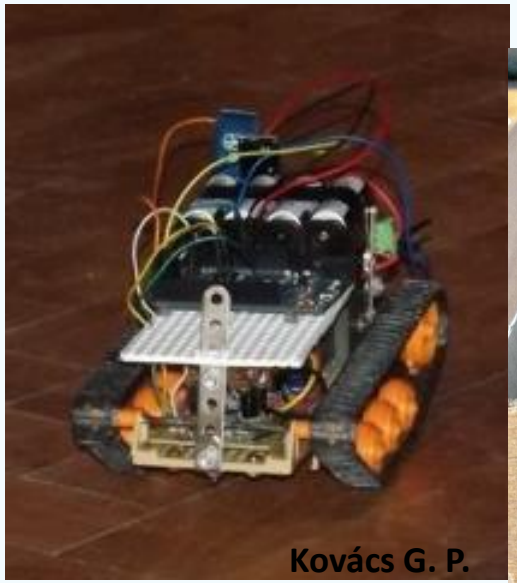


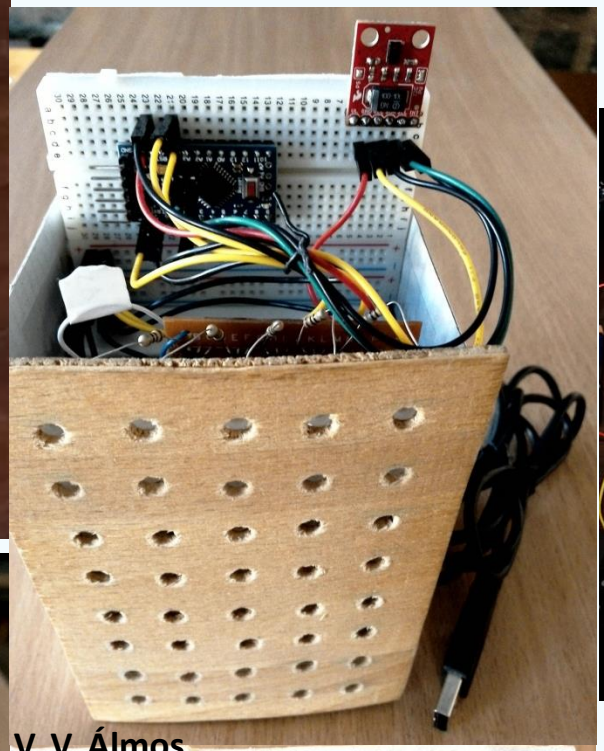


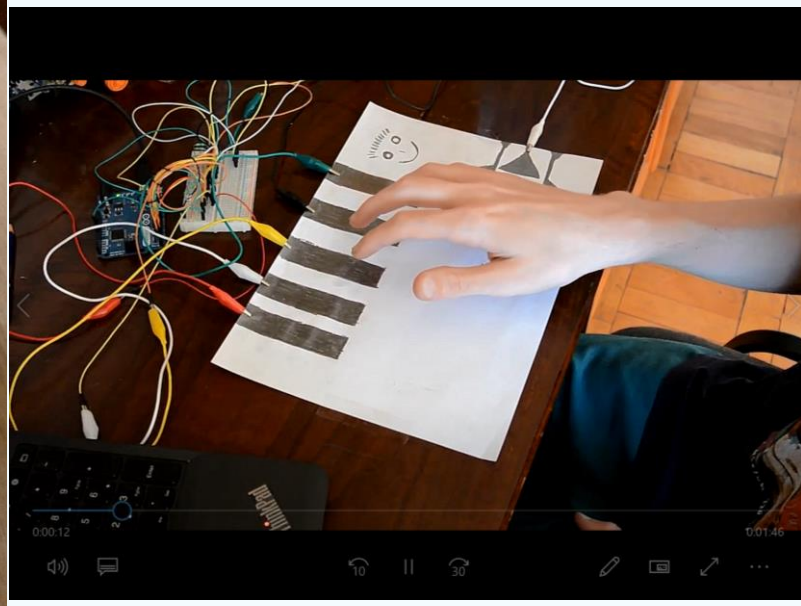


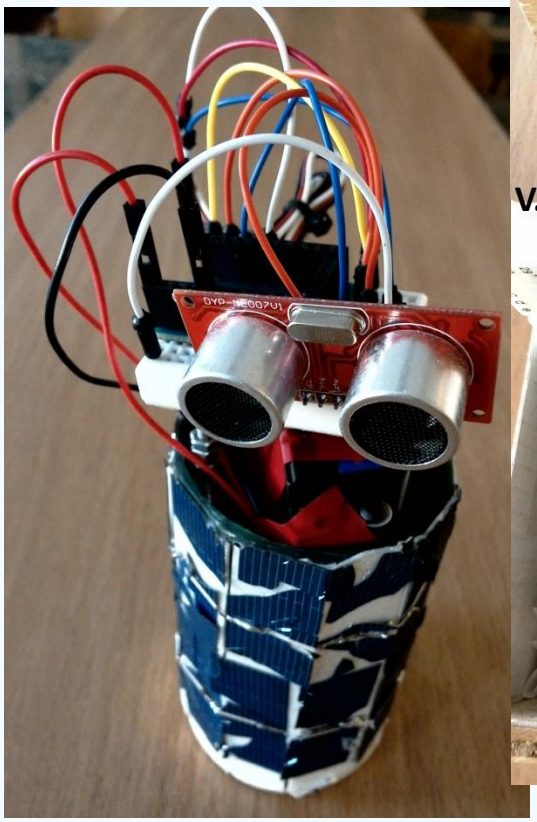


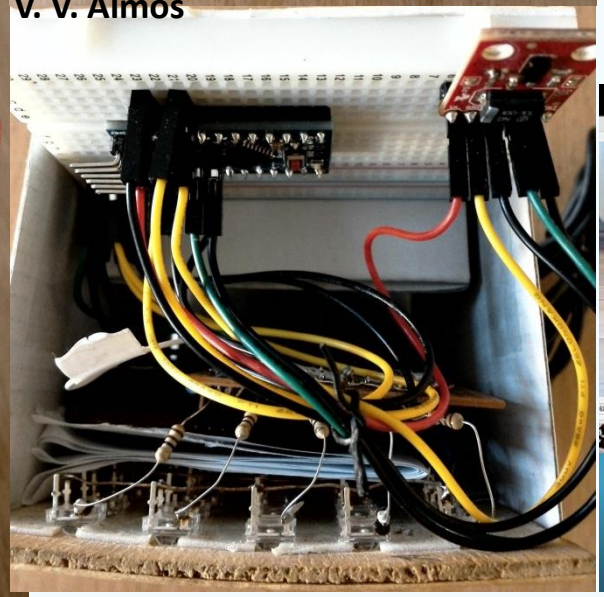
Arduino robotok

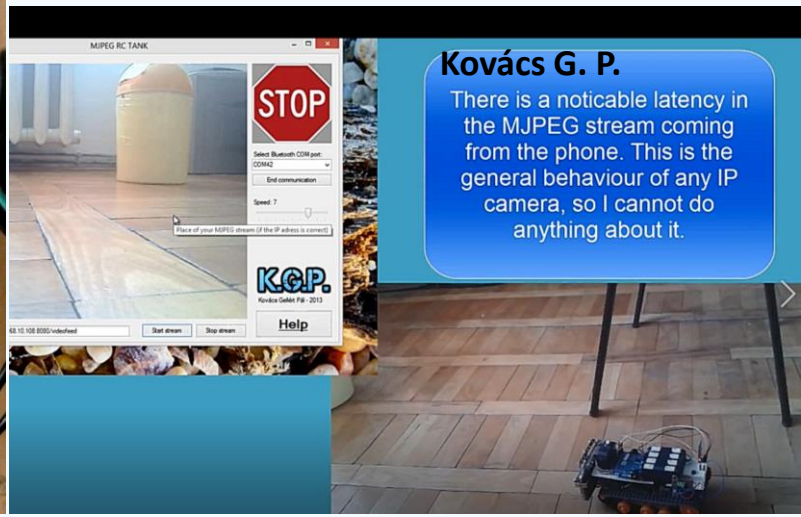

Kovács G. P.


V. V. Álmos







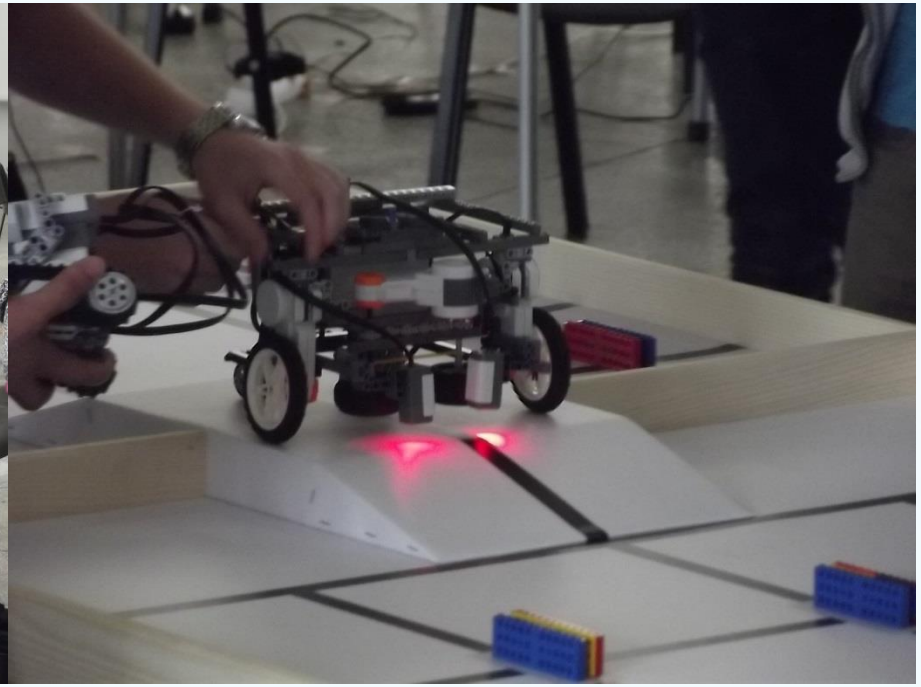


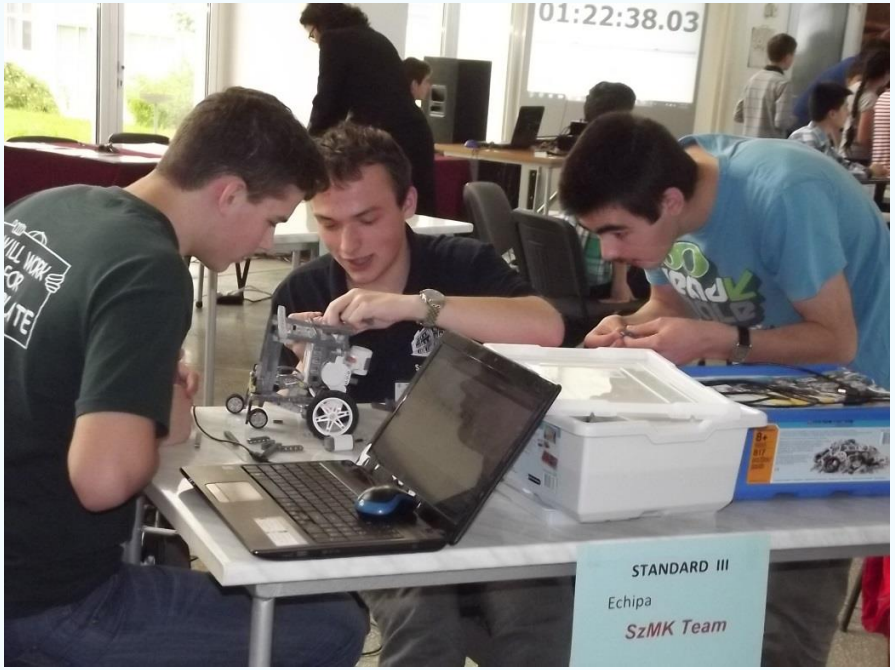
Tudósklub

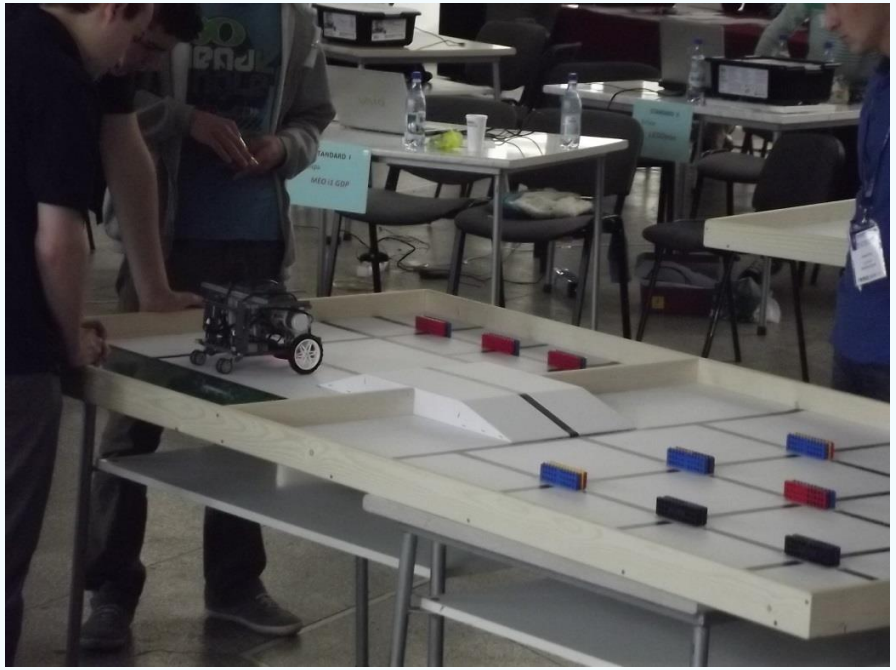
[Így készülnek a robotok]

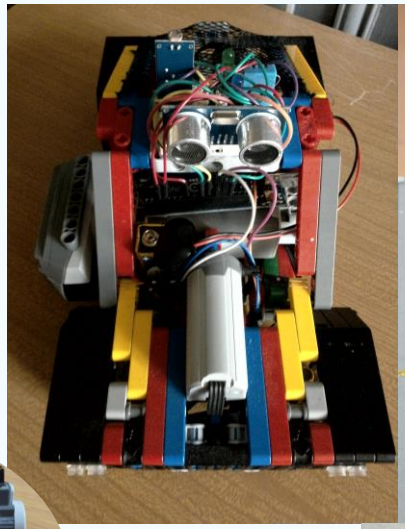
WRO


STANDARD III
Echipa
SzMK Team

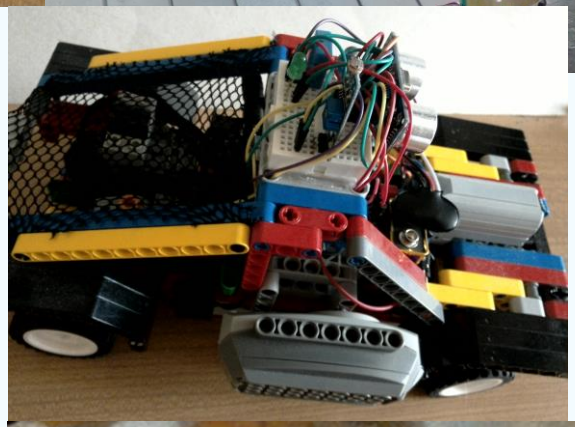



01:22:38.03
STANDARD III
Echipa
SzMK Team

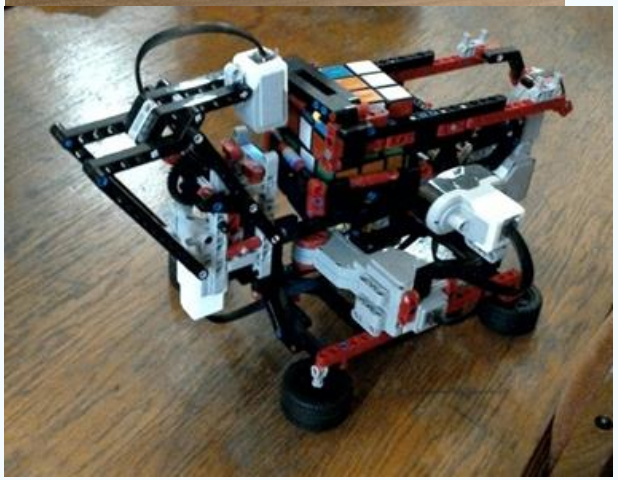


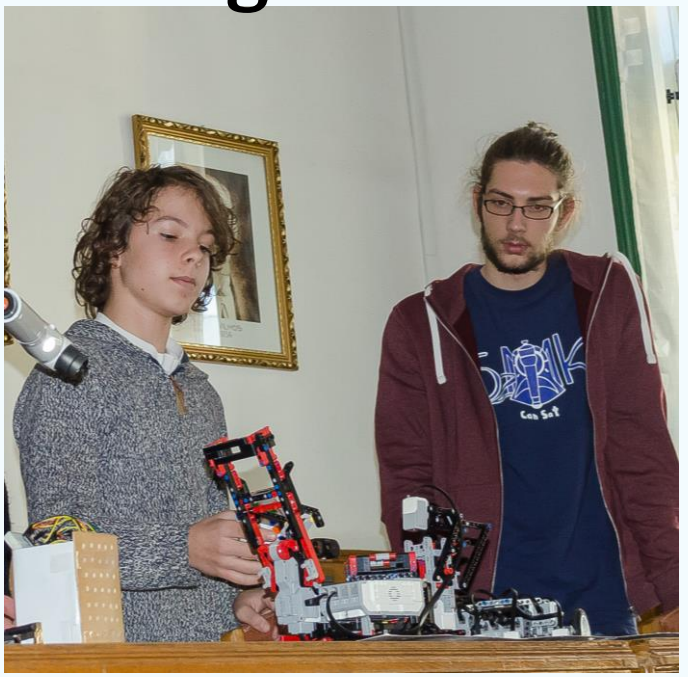


NXT



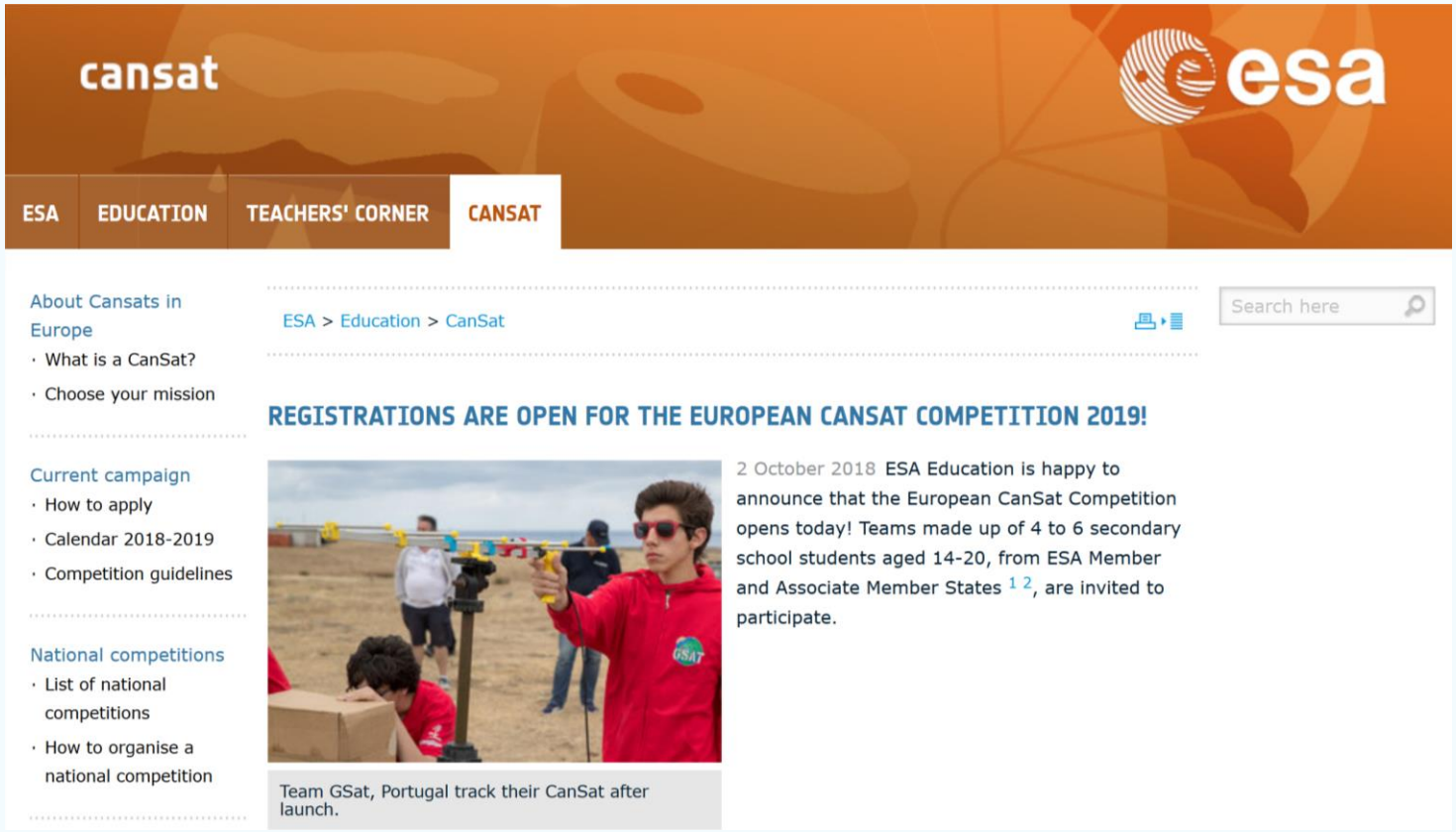
Lego robotok





Hasznos linkek: ARDUINO, CANSAT

https://www.arduino.cc/
https://store.arduino.cc/
https://www.esa.int/Education/CanSat/Registrations_are_open_for_the_European_CanSat_Competition_2019



Köszönöm a figyelmet.

Az előadás elkészítését a Magyar Tudományos Akadémia Tantárgy-pedagógiai Kutatási Programja (471027*)* támogatta.