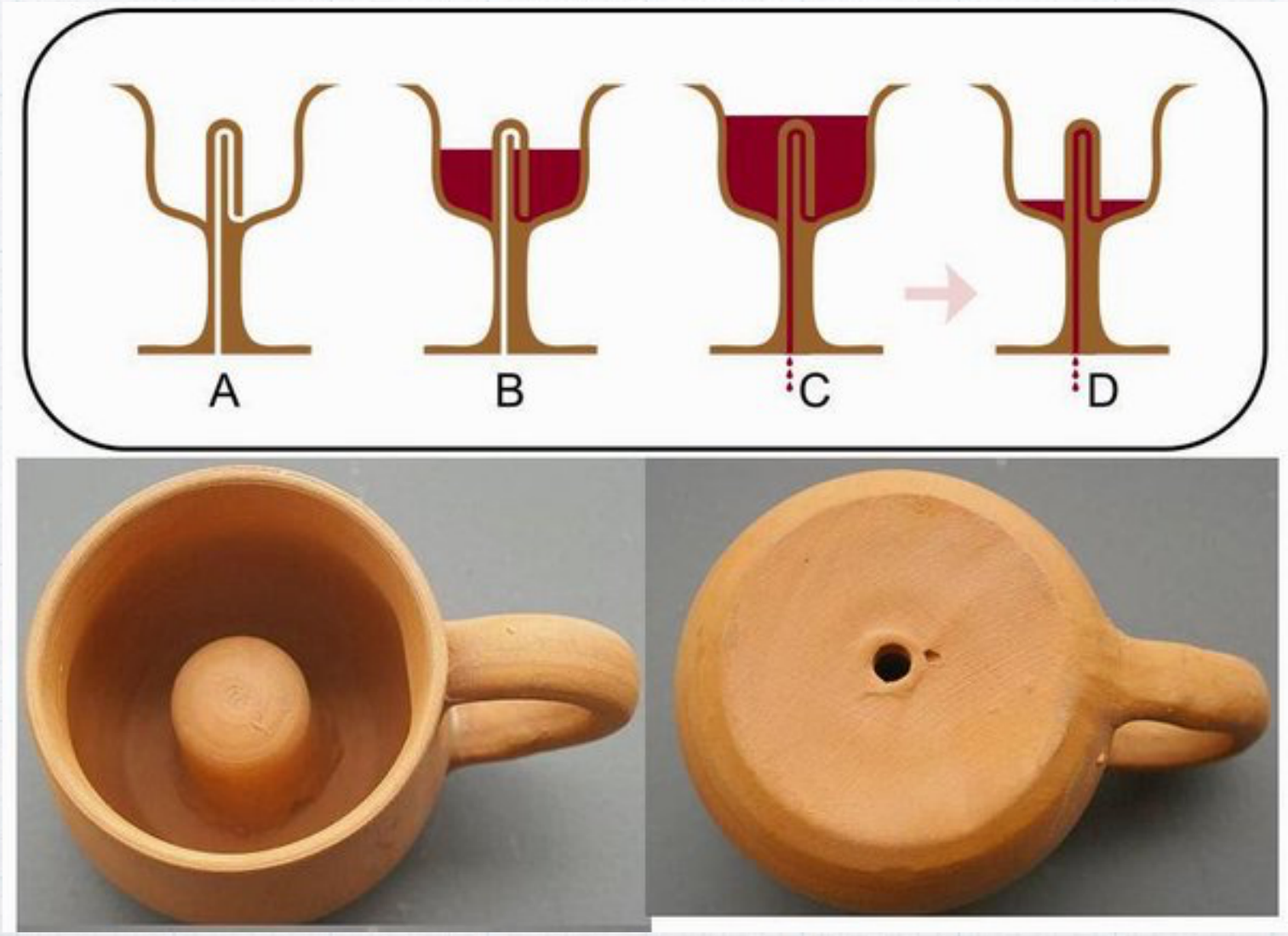
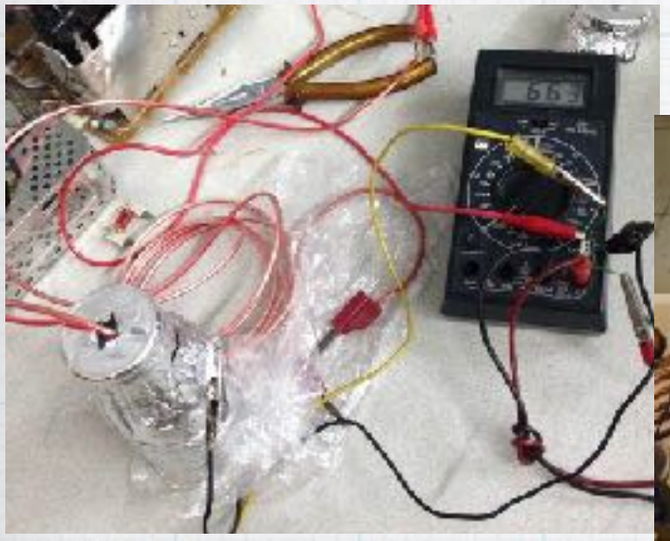
Bilgisayarla 3 gösteri



Gökhan Ünel / UCI & Kıvanç Nurdan/TUBITAK
TTP8 - Şubat 2018

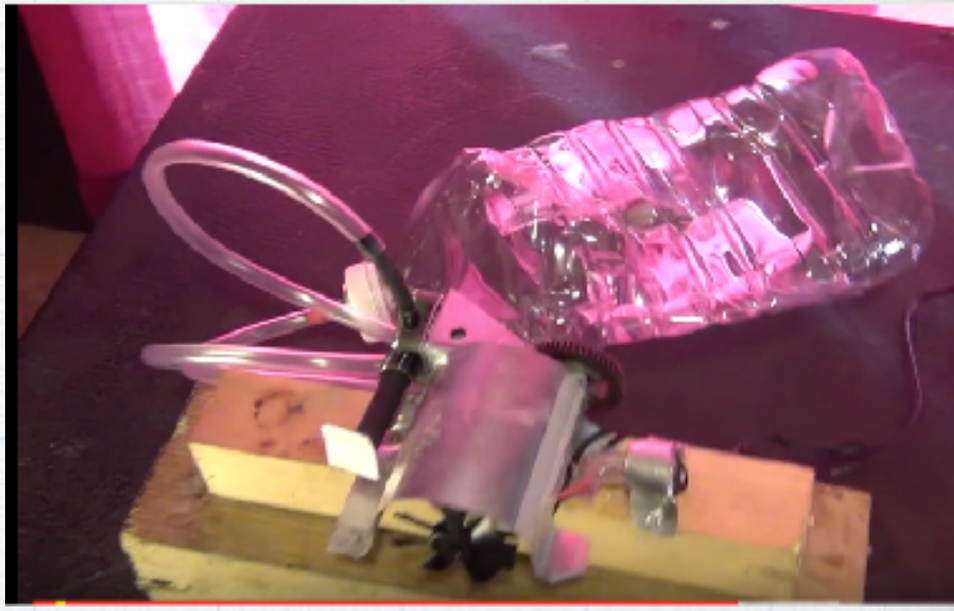
eğlenceli örnekler



Tesla sarımı

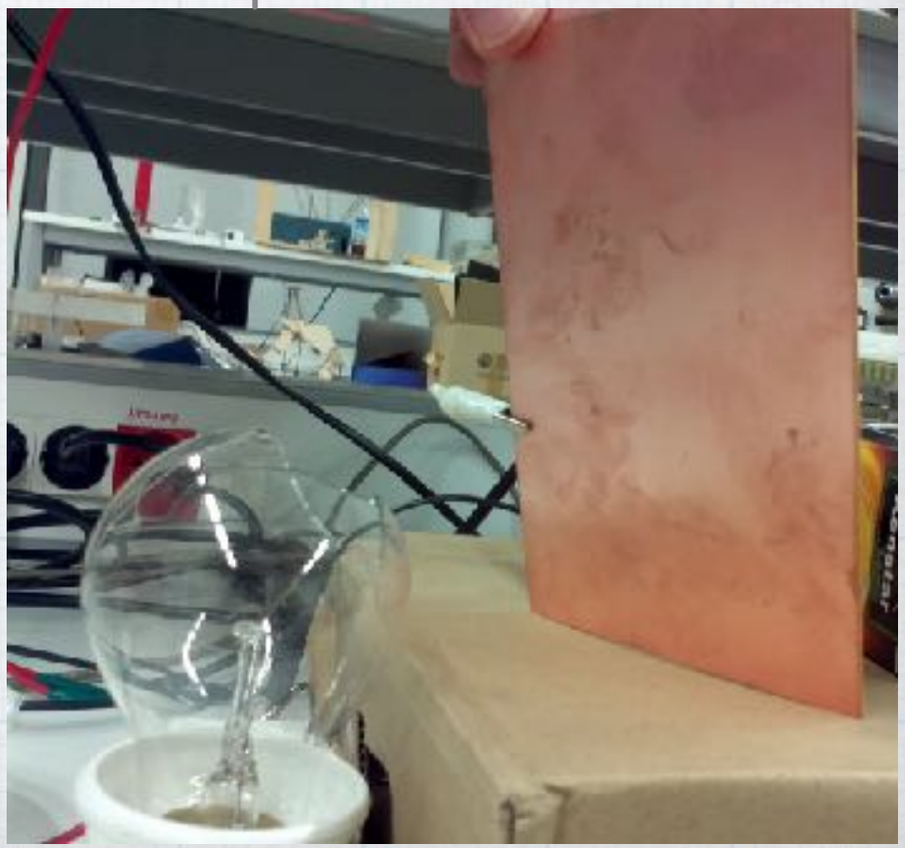
Ayran kutusu, tuzlu su ve aluminyum folyo ile leyden kavanozu = kondansatör

https://www.youtube.com/watch?v=oGb-UwAXicI



30 liralık vakum pompası

Kırık ampül ile elektron üreteci

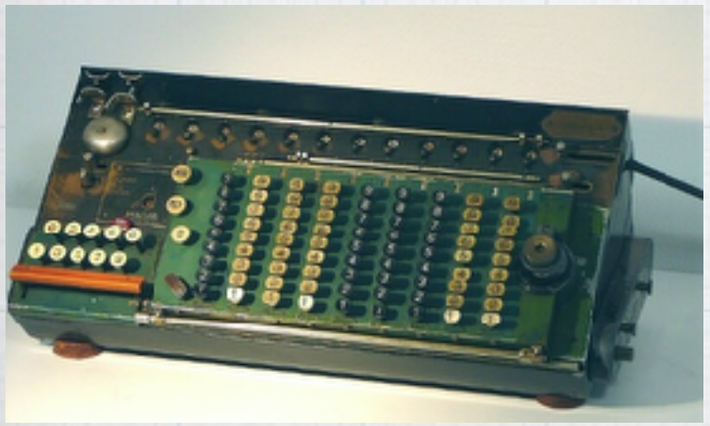


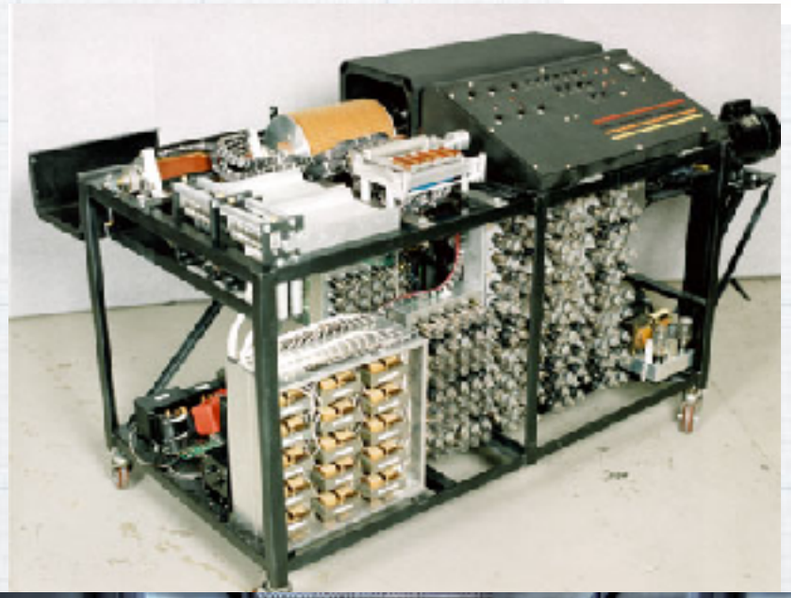
Rubens (1905) tübü

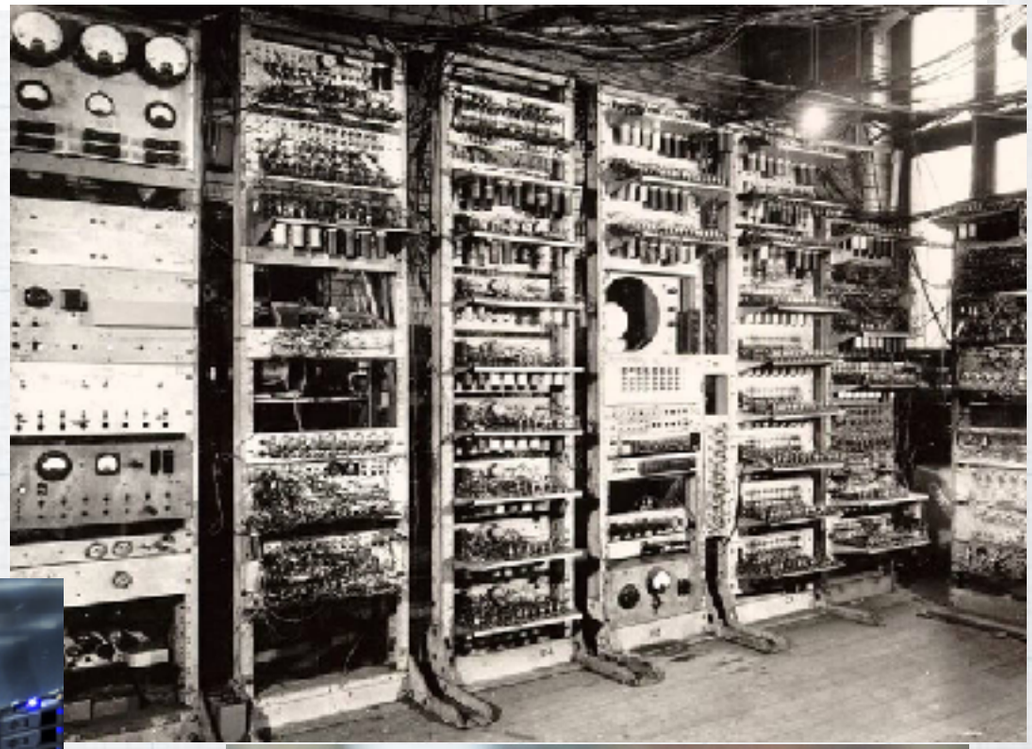
Bilgisayar

* Çevre birimlerle etkileşen bilgisayarlı bir düzenek gençlerin bilime ilgisini arttırabilir.
* Gençlerin bir an önce programlama öğrenmeye başlaması gerekli:
  * Algoritmik düşünce şeklini oturtmak ve geliştirmek için
  * Bilgisayarsız bilim ve mühendislik artık olası değil
* Sade ve çocuklara yönelik bir başlangıç nasıl olmalı?
  * Scratch
* Liselilere yönelik başlangıç nasıl olmalı?
  * c/c++ ve python

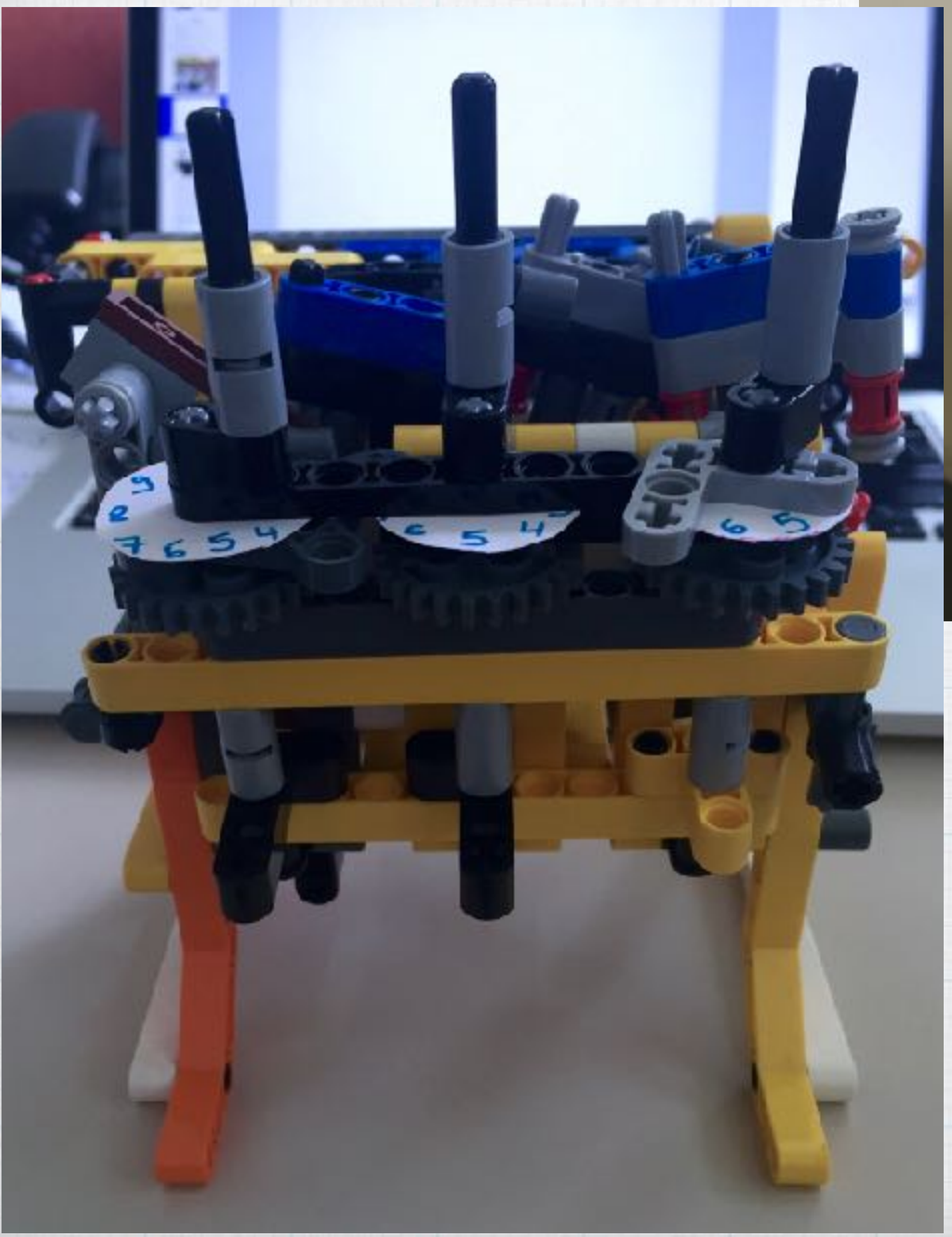
CURTA





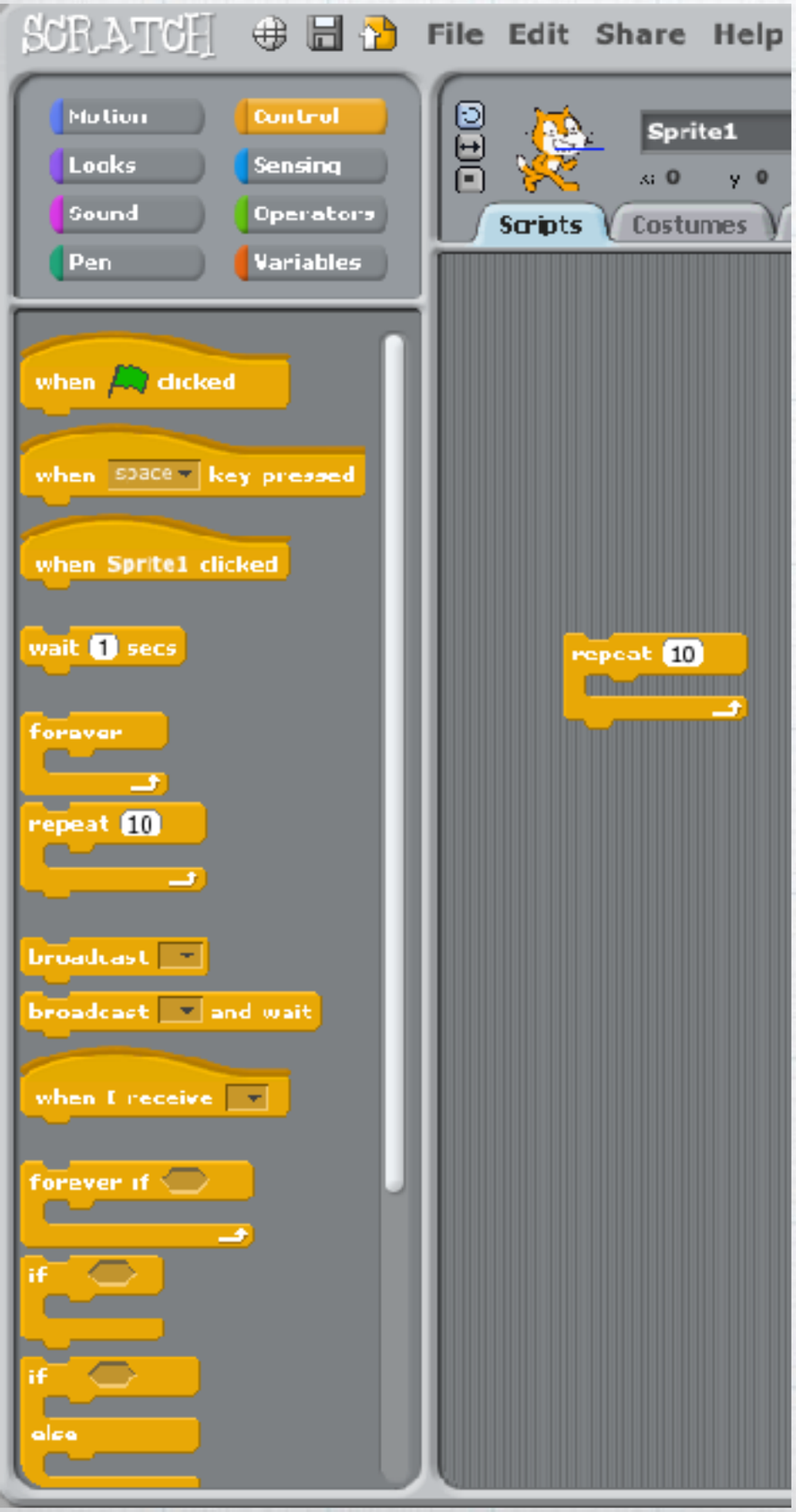


LEGO TECHNIC

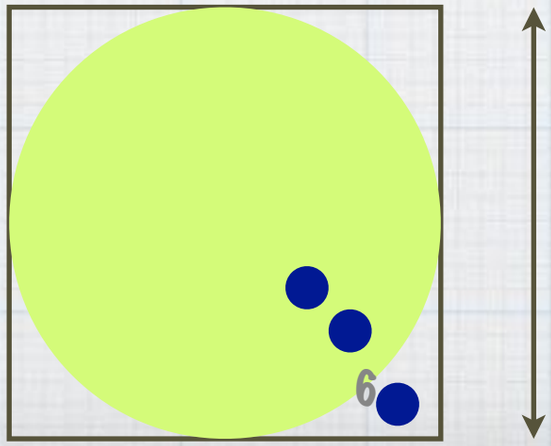


lego ile pascal toplama-çıkarma makinası

scratch dili



- Basit
  - ➡Algoritmayı düşün
  - ➡'Sürükle bırak' yöntemiyle bilgisayara öğret.
    - yazım hatası yapmak imkansız!
  - ➡buradan bedava indirin:
    - ➡http://scratch.mit.edu/
    - ➡https://snap.berkeley.edu/snapsource/snap.html
  - ➡Linux, OSX, Windows için var.
- Güçlü
  - ➡tam bir programlama dili.
  - ➡dışardan bilgi okunabilir.
  - ➡dışarıya bilgi verilebilir.
- Örnek: pi sayısını hesaplayalım.
  - ➡tasadüfi sayı üreterek.



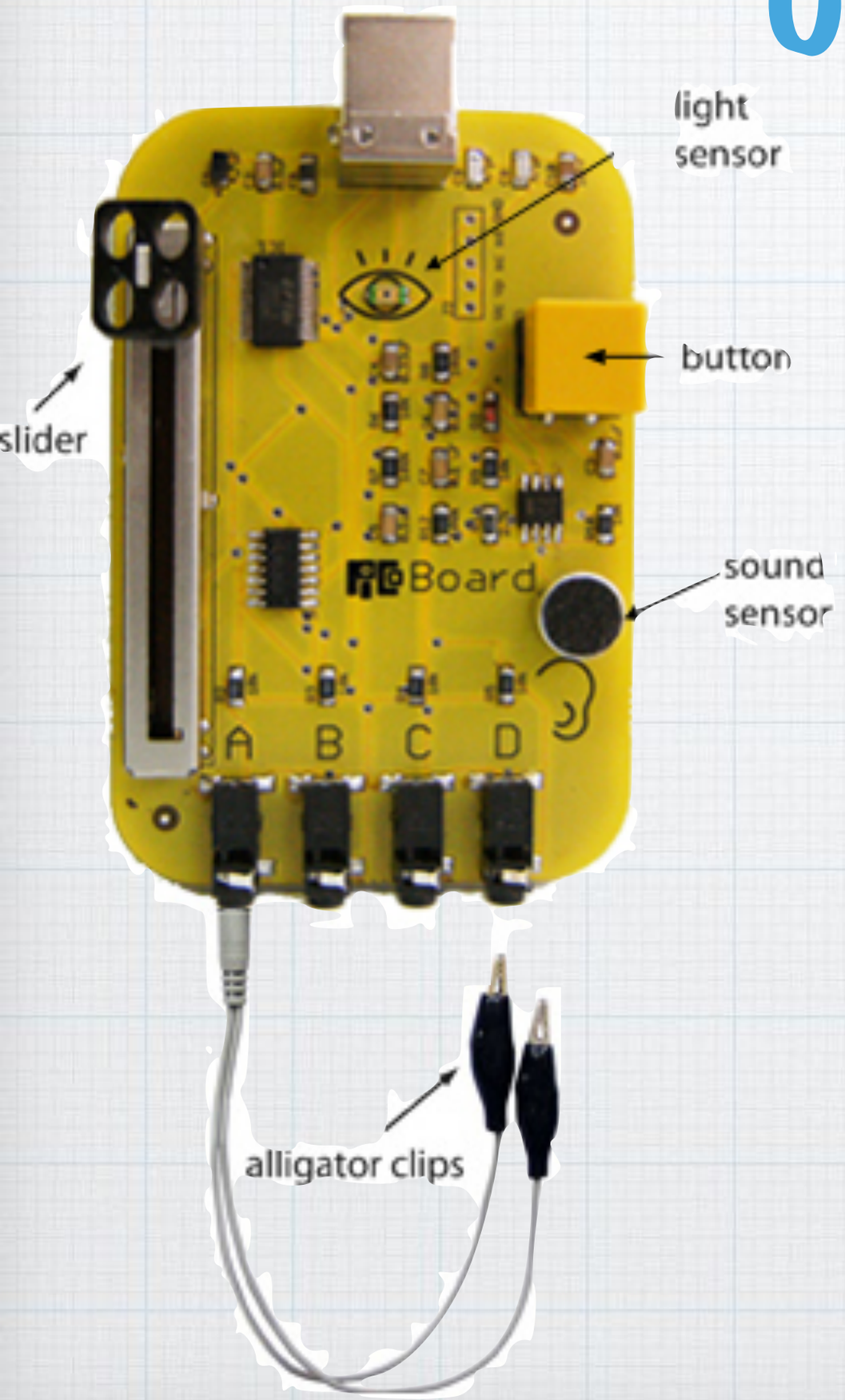
kare kenarı 1 birim → alan=1

daire yarıçapı ½ birim →alan= $\pi r^2 = \pi \frac{1}{4}$

daire kare oranı= $\pi/4$

https://www.youtube.com/watch?v=90q7936zjgw

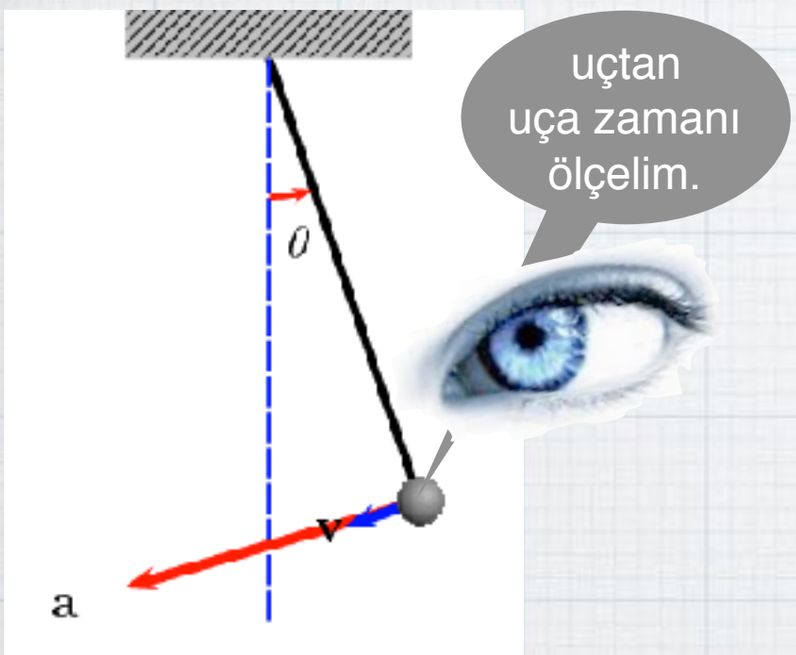
örnek 1: veri alımı



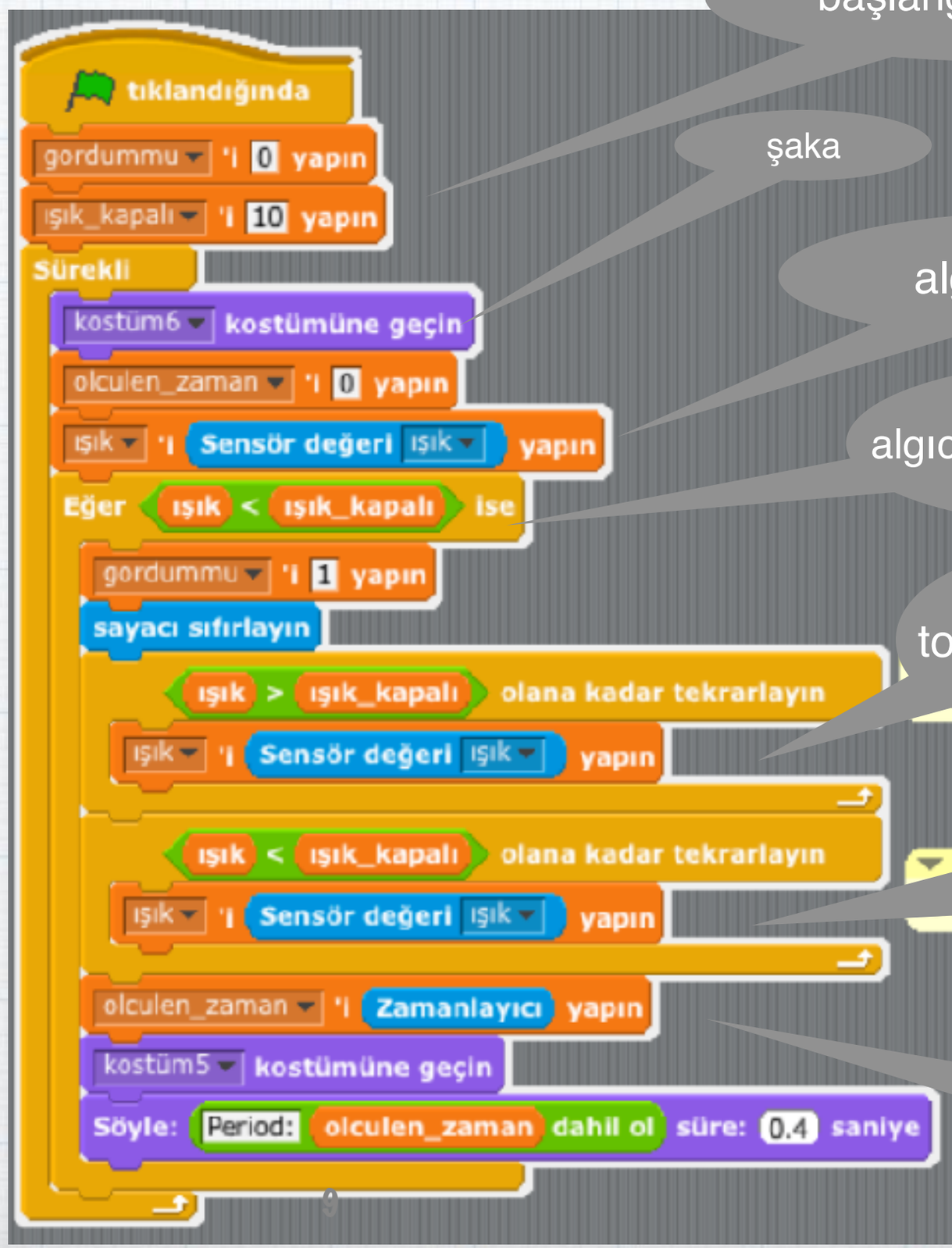
- pico board veri toplama kartı
  - ➡ http://www.picocricket.com/picoboard.html
  - ➡ https://www.sparkfun.com/products/10311
  - ➡ ~50 $
  - ➡ açık devre çizimi: kendiniz yapabilirsiniz.
- Işık, ses, açık-kapalı, 4 direnç okuma
  - ➡ USB üzerinden bilgısayarla bağlantı
  - ➡ çok basit algıçlar
- Bir çok fikri deneyebiliriz.
  - ➡ içinde örnekler var
  - ➡ 3x3 anahtar
  - ➡ **yerçekimi ölçümü…….**

Yerçekimi Ölçümü

- Basit sarkaç kullanalım.
  - ➡ ℓ ve T'yi ölçelim.
  - ➡ g bulunabilir

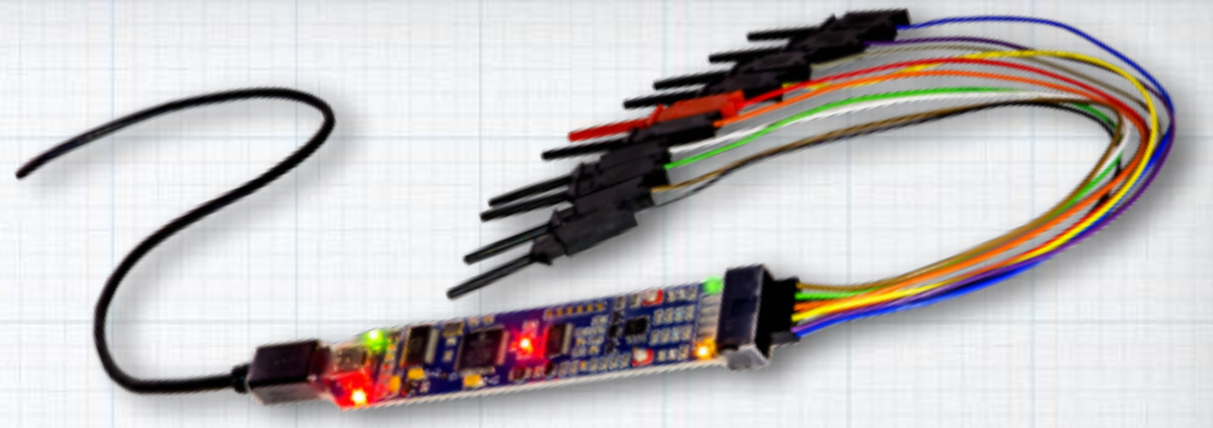


$$T_0 = 2\pi\sqrt{\frac{\ell}{g}}$$



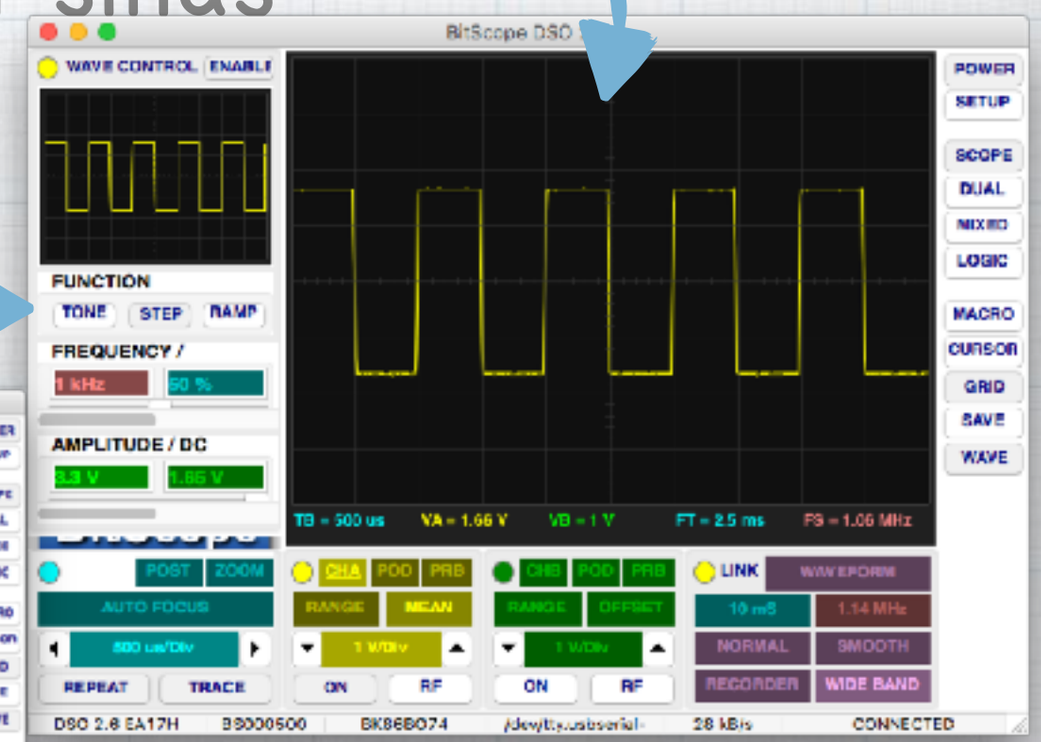
osiloskop

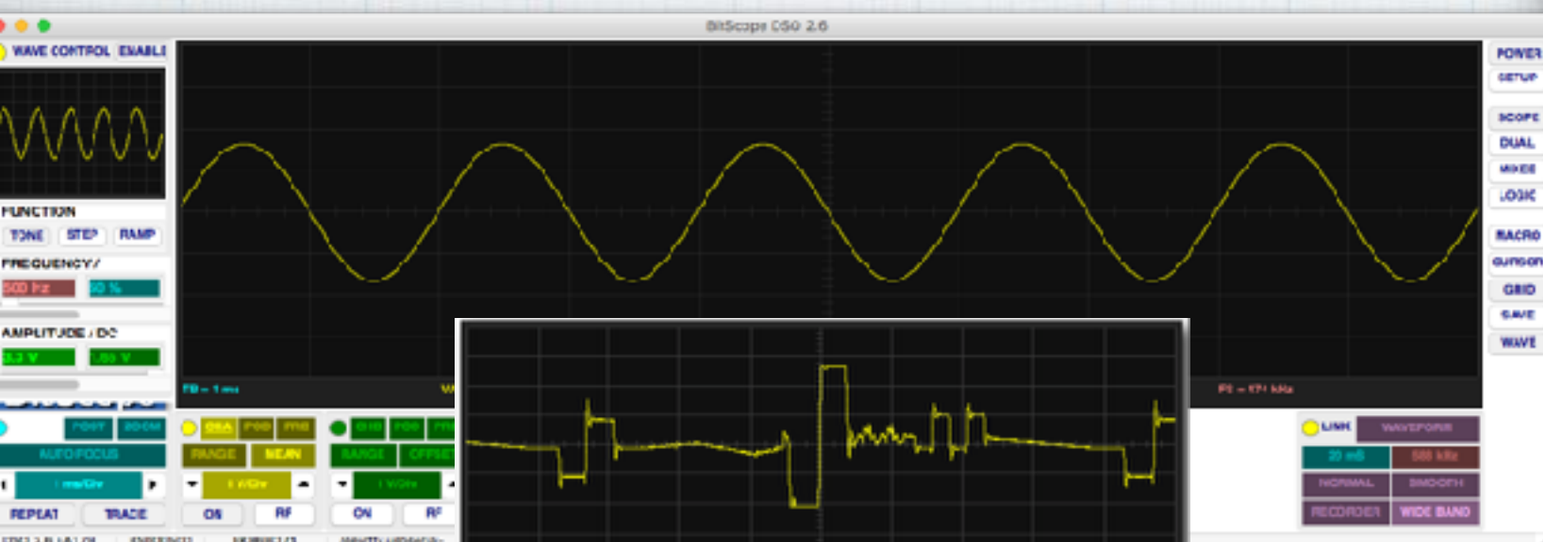
http://www.bitscope.com



* 20 MHz - 2 kanal - USB
* Fonksiyon üreteci: kare-üçgen-sinüs
* Mantık çözücü

145 $ lık osiloskop ve sinyal üreteci: **Bitscope**





Fonksiyon üretecini kendine baktırdım.

devre-transistor-OpAmp...

Örnek 2: Geiger Müller sayacı

- Basit bir yüklü parçacık algıcı

http://www.aliexpress.com/item/Assembled-DIY-Geiger-Counter-Kit-Nuclear-Radiation-Detector-GM-Tube/2009981359.html

➡ ~50 $

➡ kozmik veya ışır (radyoaktif) kaynak

- PC bağlantılı

➡ USB ile bilgisayardan güç alır

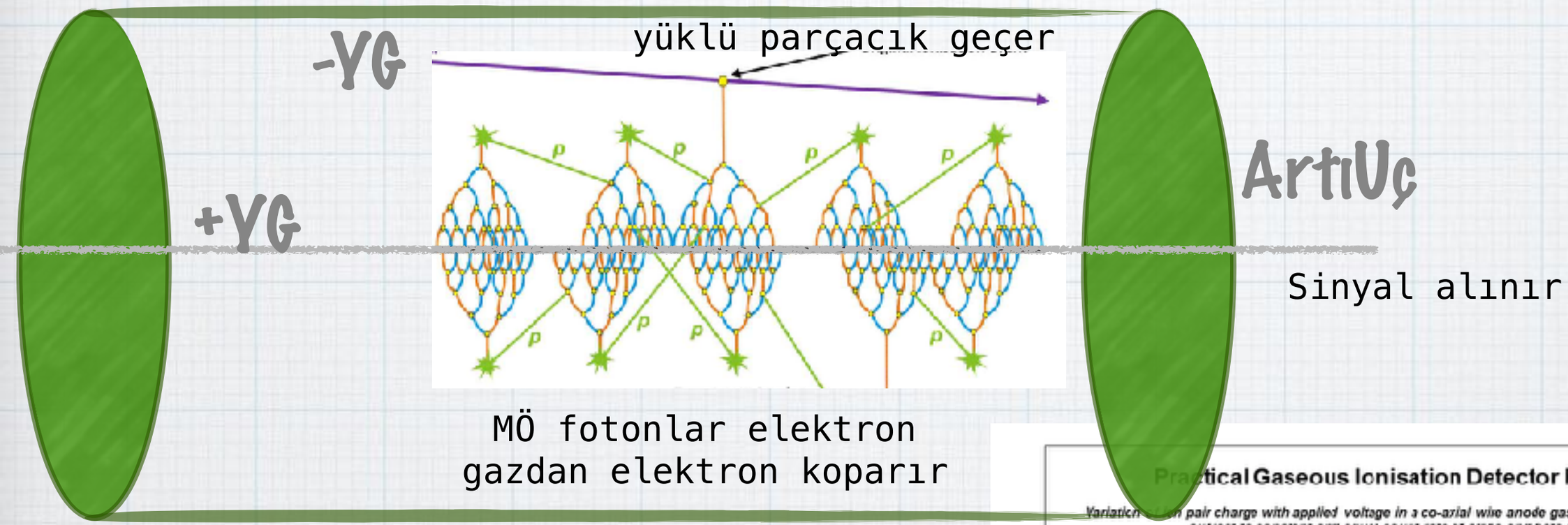
➡ ses veya kulaklık çıkışı ile çıktı verir

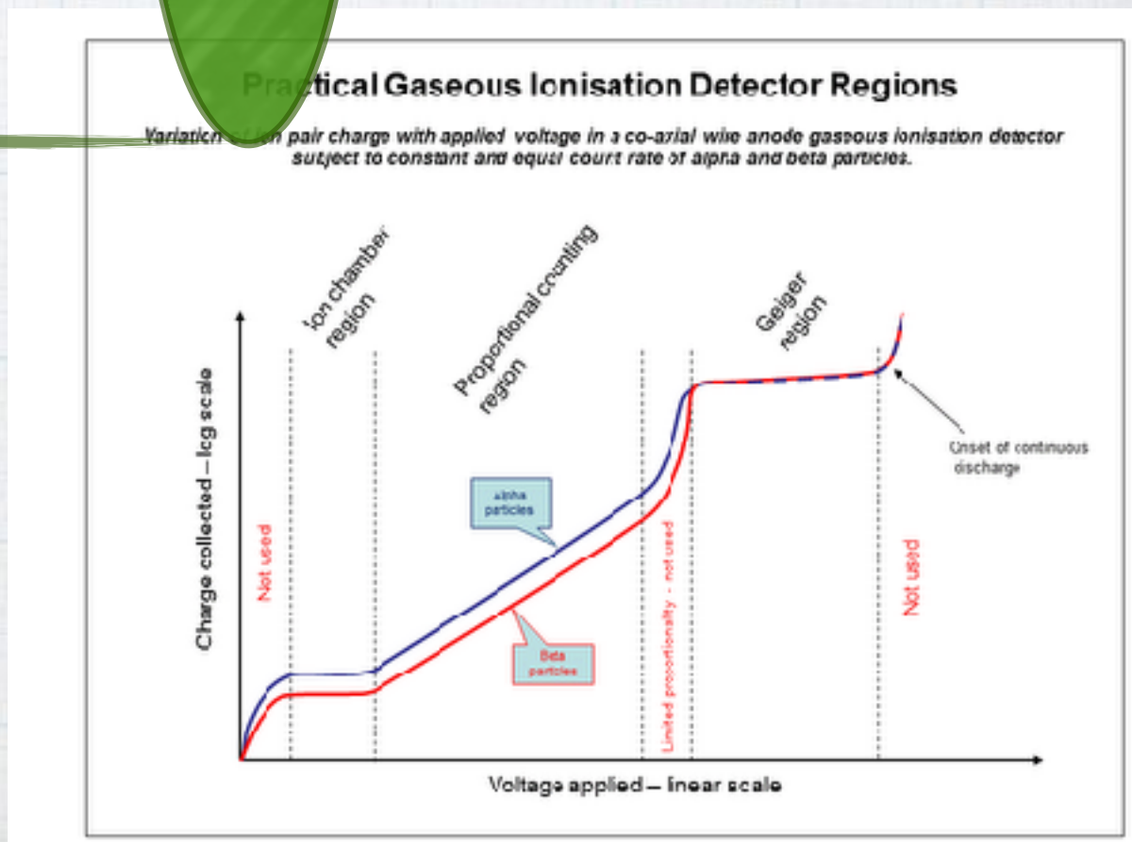
- Bir çok fikri deneyebiliriz.

➡ http://arxiv.org/abs/physics/0701015

geiger tübü

Morötesi fotonlarca iletilen çavlanlar





bizim tüpte Yüksek Gerilim=400V

Kullanılan gaz:
helium, argon, neon

Educational cosmic ray experiments with Geiger counters

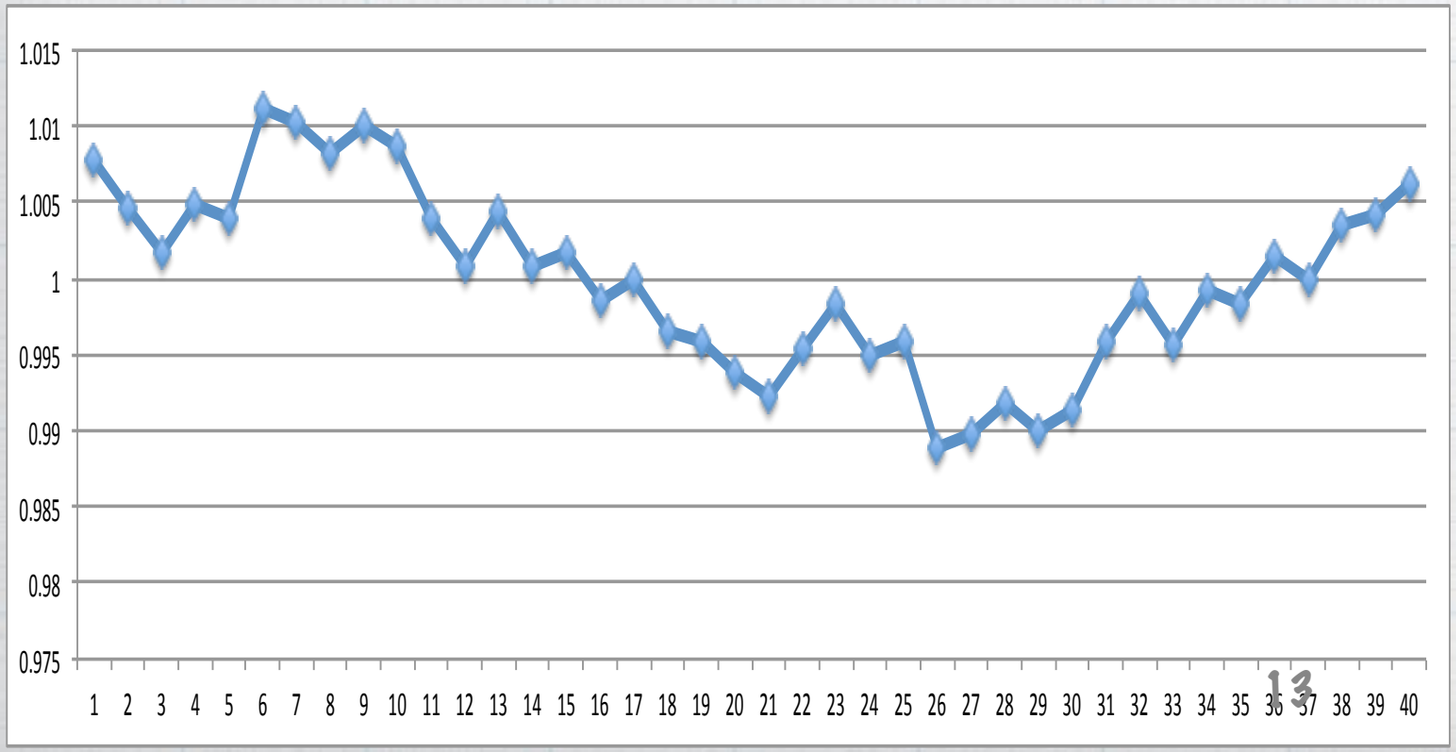
F. Blanco, F. Fichera, P. La Rocca, F. Librizzi, O. Parasole and F. Riggi

INFN and Department of Physics and Astronomy, University of Catania, Via S.Sofia 64, I-95123 Catania, Italy

0701015

Summary. — Experiments concerning the physics of cosmic rays offer to high-school teachers and students a relatively easy approach to the field of research in high energy physics. The detection of cosmic rays does not necessarily require the use of sophisticated equipment, and various properties of the cosmic radiation can be observed and analysed even by the use of a single Geiger counter. Nevertheless, the variety of such kind of experiments and the results obtained are limited because of the inclusive nature of these measurements. A significant improvement may be obtained when two or more Geiger counters are operated in coincidence. In this paper we discuss the potential of performing educational cosmic ray experiments with Geiger counters. In order to show also the educational value of coincidence techniques, preliminary results of cosmic ray experiments carried out by the use of a simple coincidence circuit are briefly discussed.

PACS 01.40.Ej – Science in elementary and secondary school
PACS 01.50.Pa – Laboratory experiments and apparatus
PACS 29.40.-n – Radiation detectors
PACS 96.40.-z – Cosmic rays



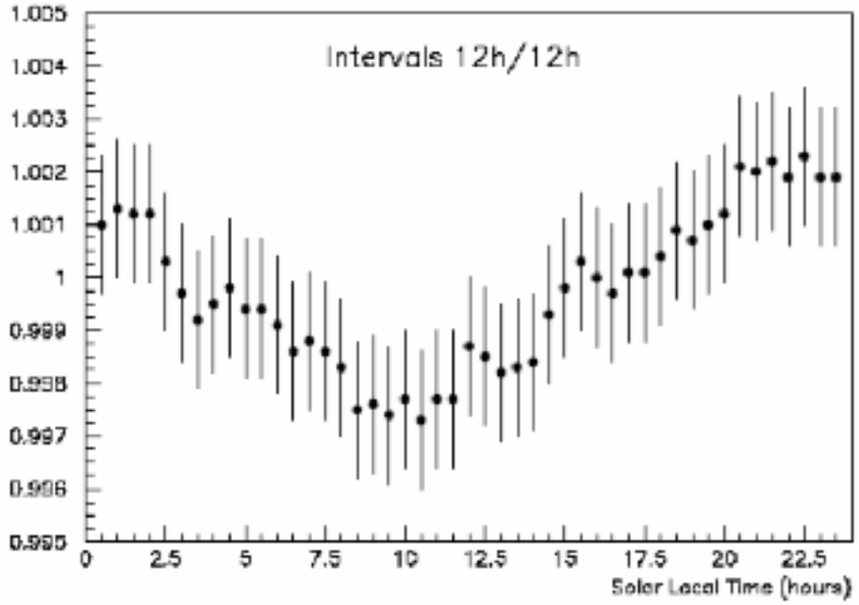
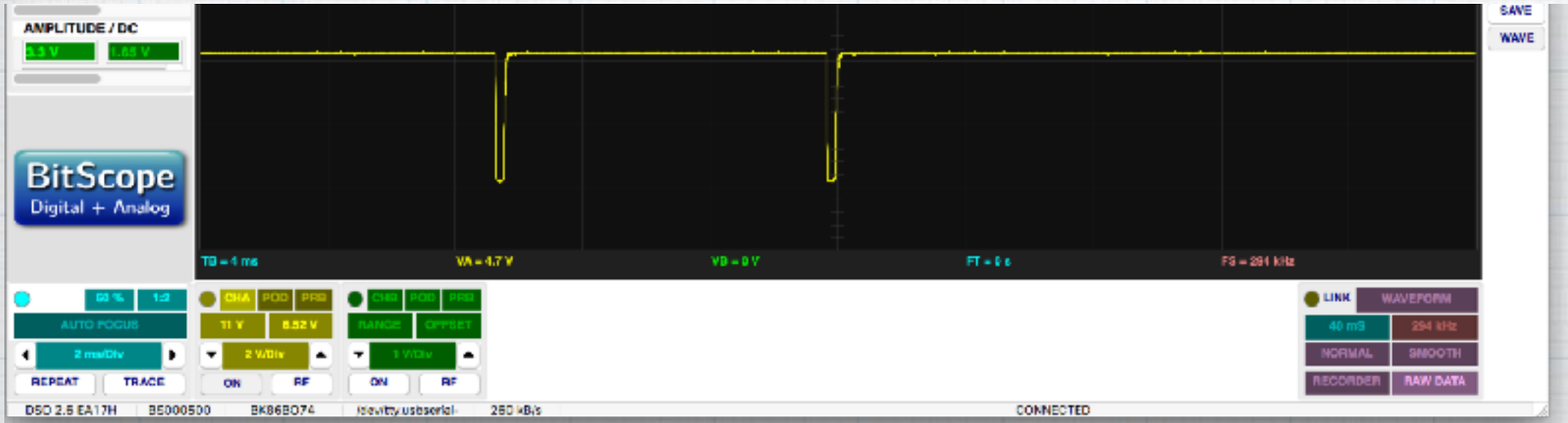
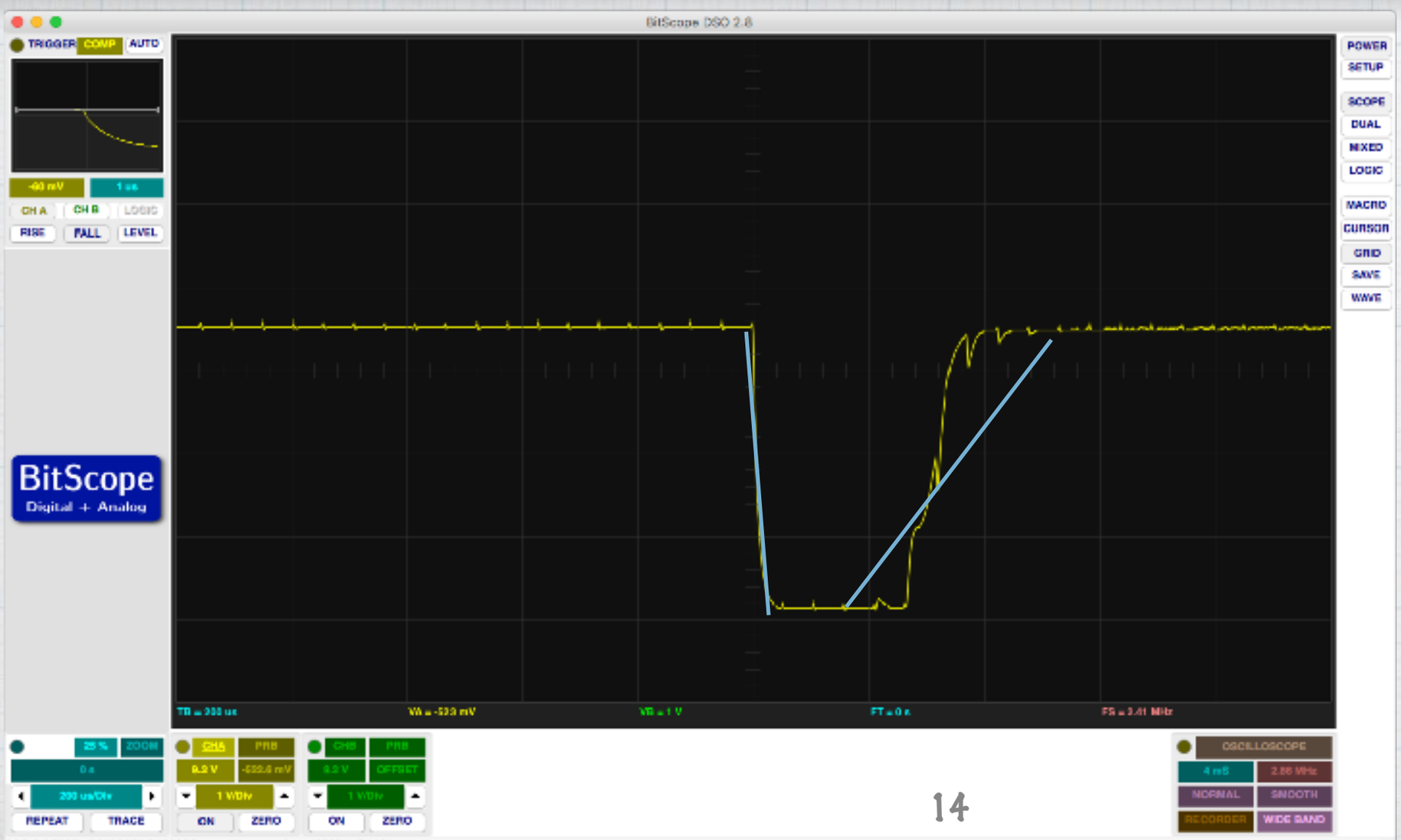


Fig. 4. — Daily analysis of the cosmic counting rate with a Geiger counter. The ratio between the mean hourly flux in a given time interval (12 h) and the corresponding mean flux in the rest of the day is shown, as a function of the centroid of time interval along the day.

GM sinyallerine skop ile bakalım





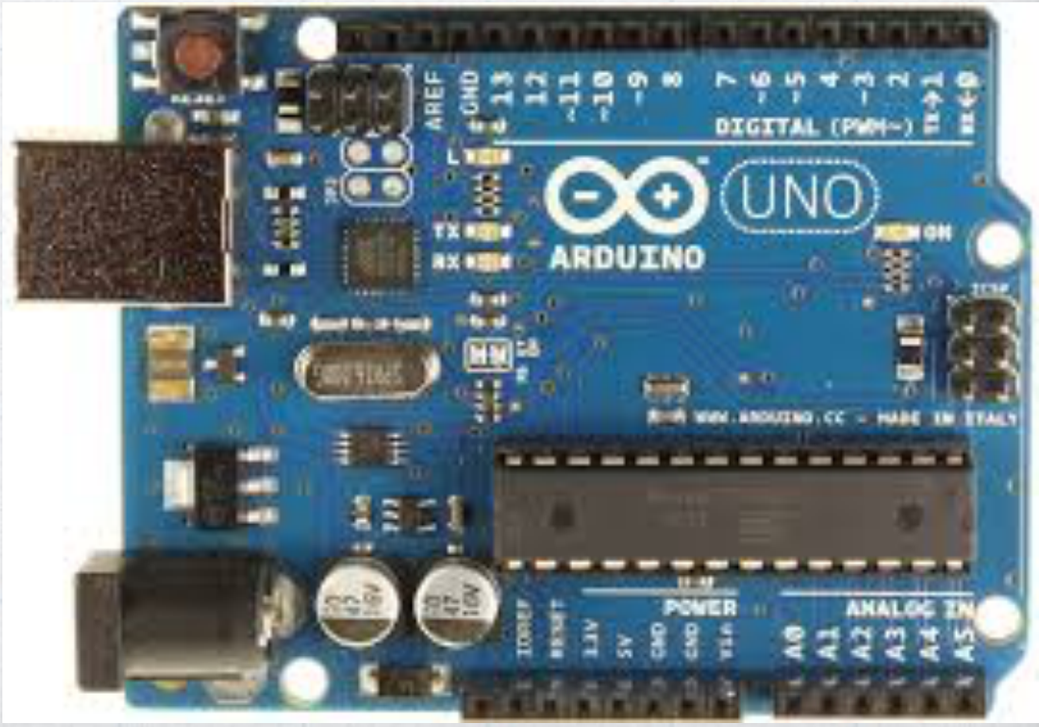
Örnek 3 : Arduino Uno

- Basit veri alımı ve dışarıyı kontrol için

https://www.arduino.cc/en/Main/arduinoBoardUno

➡ yaklaşık 40 YTL

- PC bağlantılı
  - ➡ USB ile bilgisayardan güç ve komut alır, aldığı verileri iletir.
  - ➡ C/C++ veya **scratch** ile kullanılır
    - ➡ Arduino yazılımı: https://www.arduino.cc/en/main/software
    - ➡ Scratch gibi yazılım: http://s4a.cat
      - ➡ buradan 2 kütük indirin: 1) S4A programı 2) Arduino bellenim (firmware).
    - ➡ 6 kanal analog giriş
    - ➡ 14 kanal sayısal giriş & çıkış

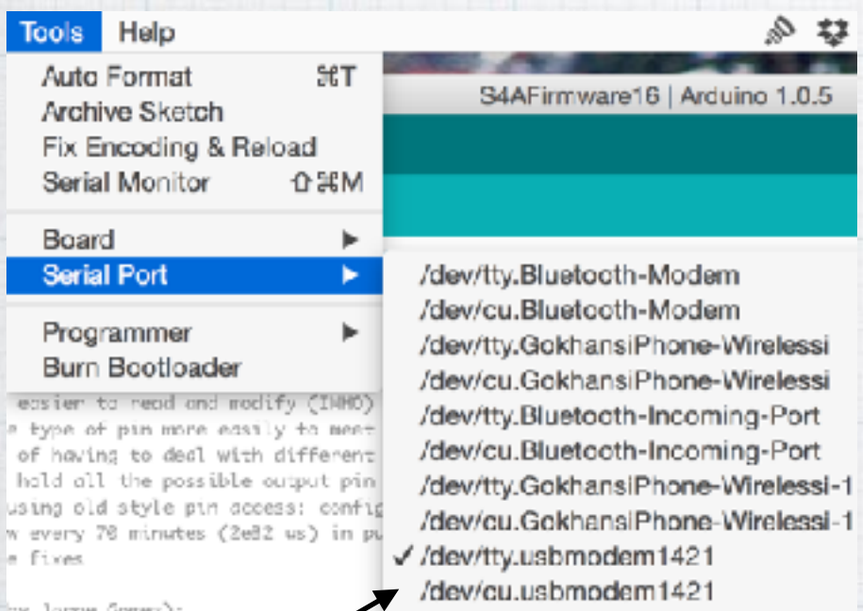


- Bir çok fikri deneyebiliriz.
  - ➡ Veri sayısallaştırmak
  - ➡ Motor çevirmek
  - ➡ Muzlardan piyano (kendiniz araştırın)

derleme

bellenim

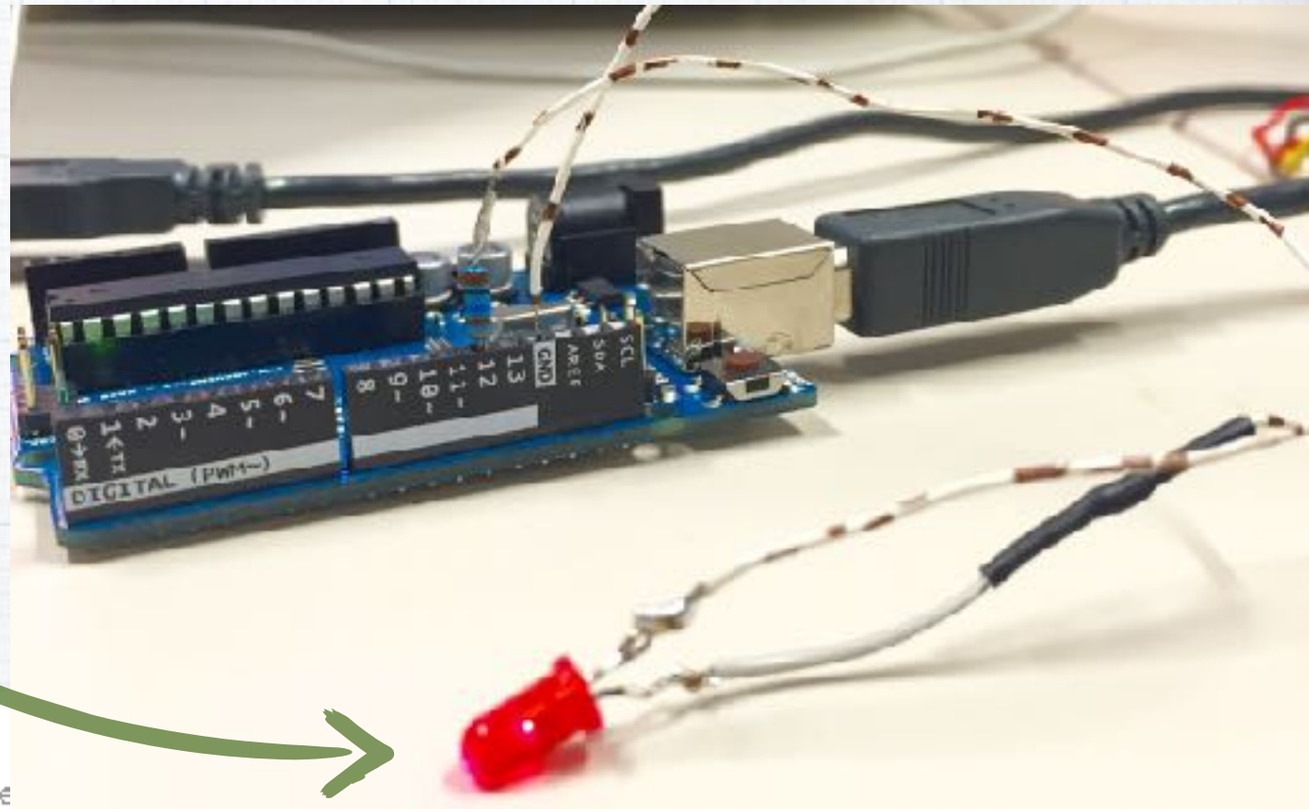
yükleme



usb bağlantı

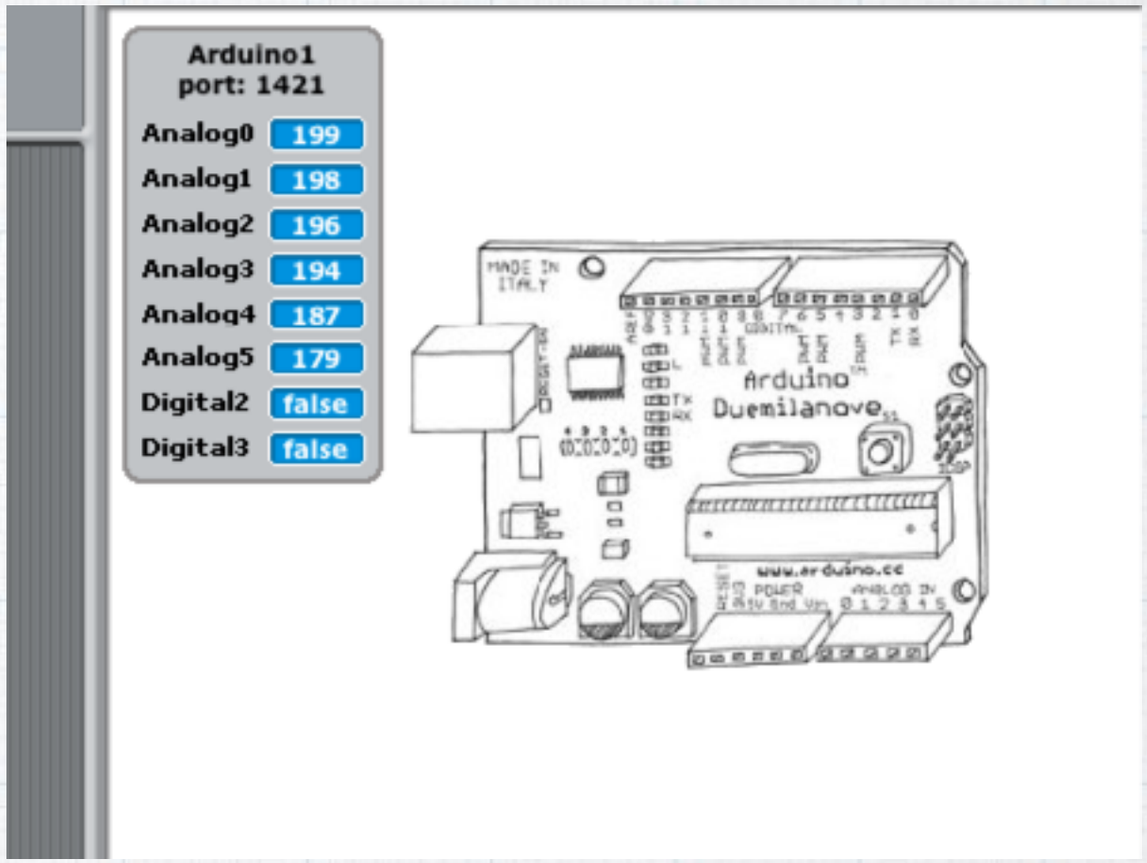
Artık Arduino Uno, S4A ile kullanılabilir halde....

Basit örnek: LED yakıp söndürmek

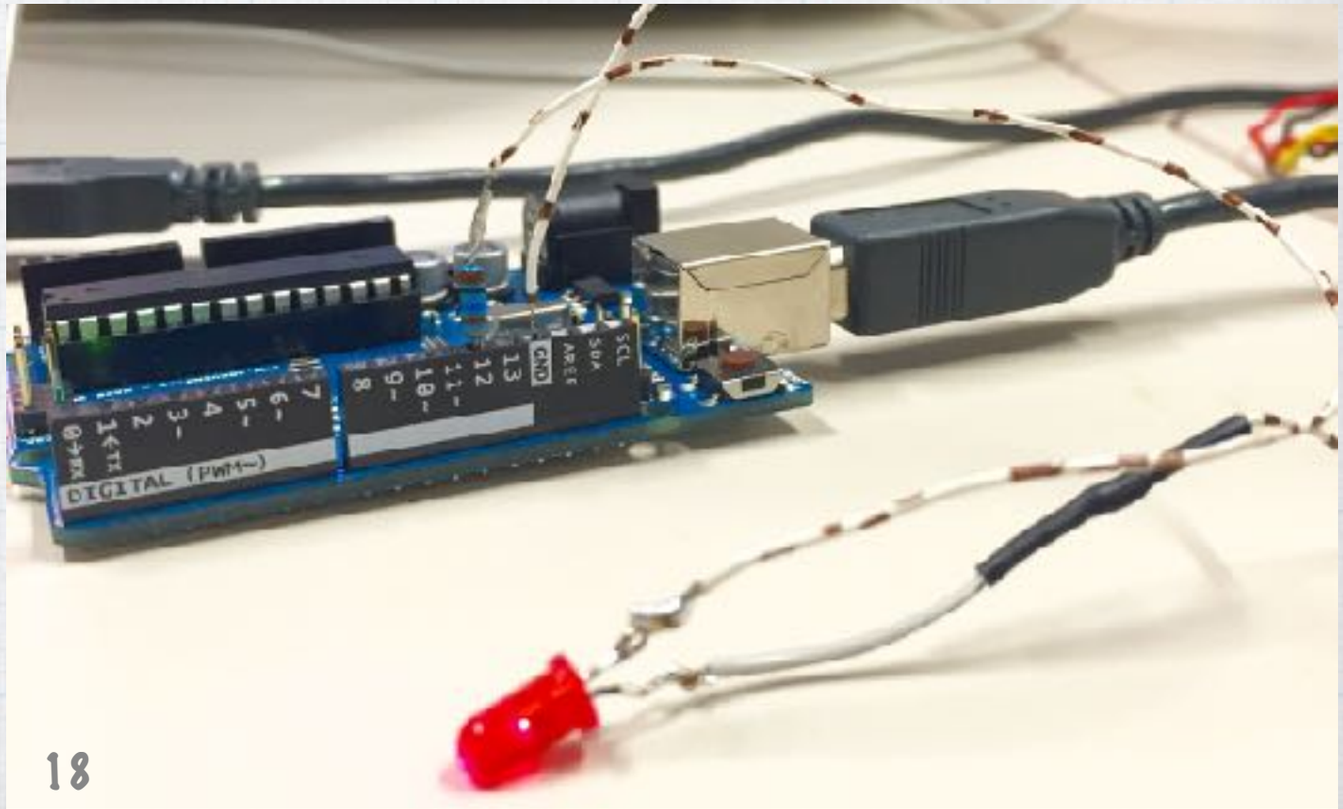



```
/*
  Blink
  Turns on an LED on for one second, then off for one second, repe

  This example code is in the public domain.
 */

// Pin 13 has an LED connected on most Arduino boards.
// give it a name:
int led = 13;

// the setup routine runs once when you press reset:
void setup() {
  // initialize the digital pin as an output.
  pinMode(led, OUTPUT);
}

// the loop routine runs over and over again forever:
void loop() {
  digitalWrite(led, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000);               // wait for a second
  digitalWrite(led, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);               // wait for a second
}
```

S4A : scratch'ın aynısı ortam



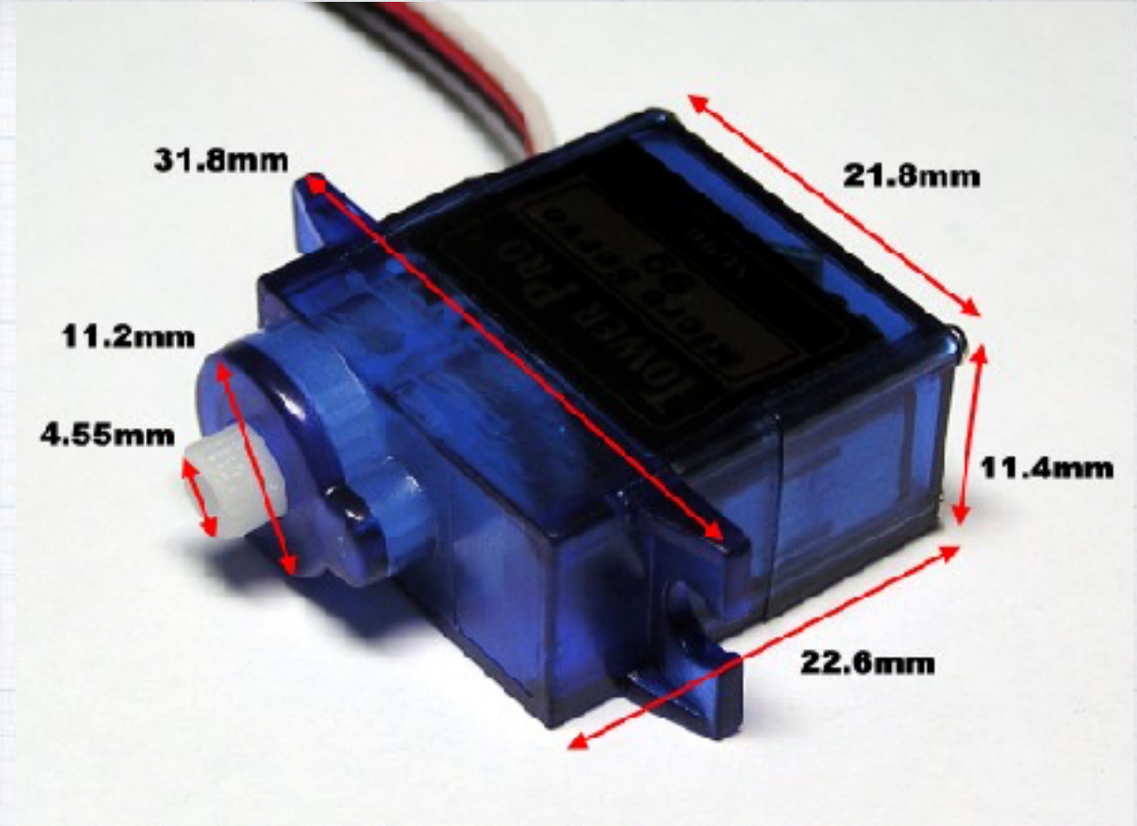
Örnek: LED yakıp söndürmek



Alet: Açı Motoru

0 ile 180 derece arası dönen motor servo

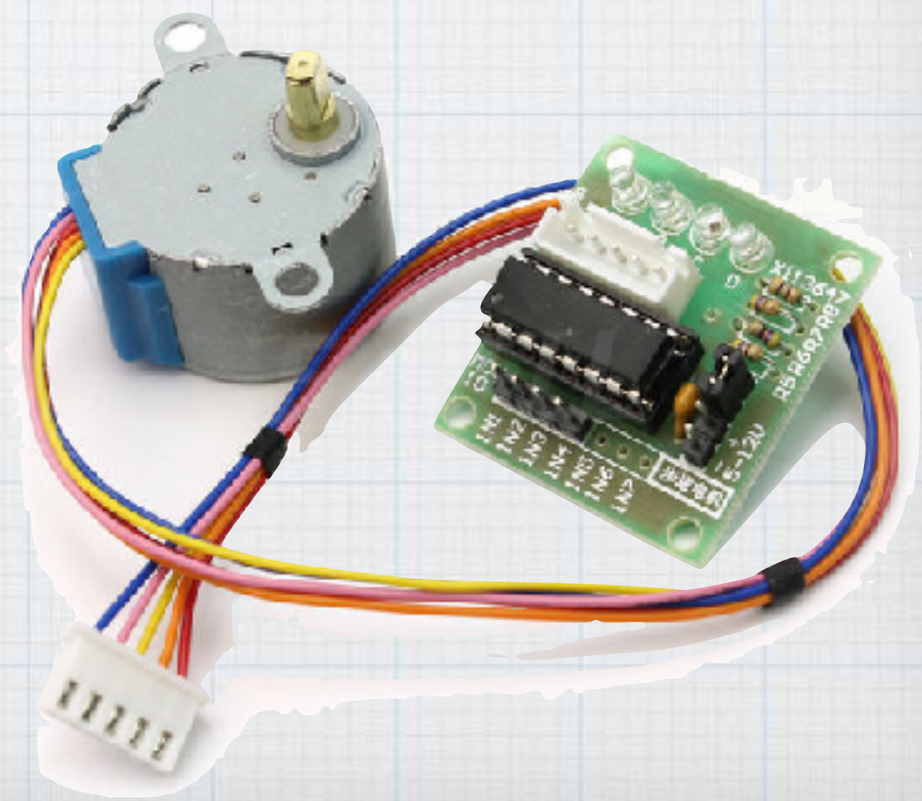
3 bağlantı: 5V, GND, Sinyal



Alet: Adım Motoru

5 bağlantı: Ortak, 4 Sinyal

Belli bir adım sayısı ile kesin bir konuma gitmek. örk:yazıcı

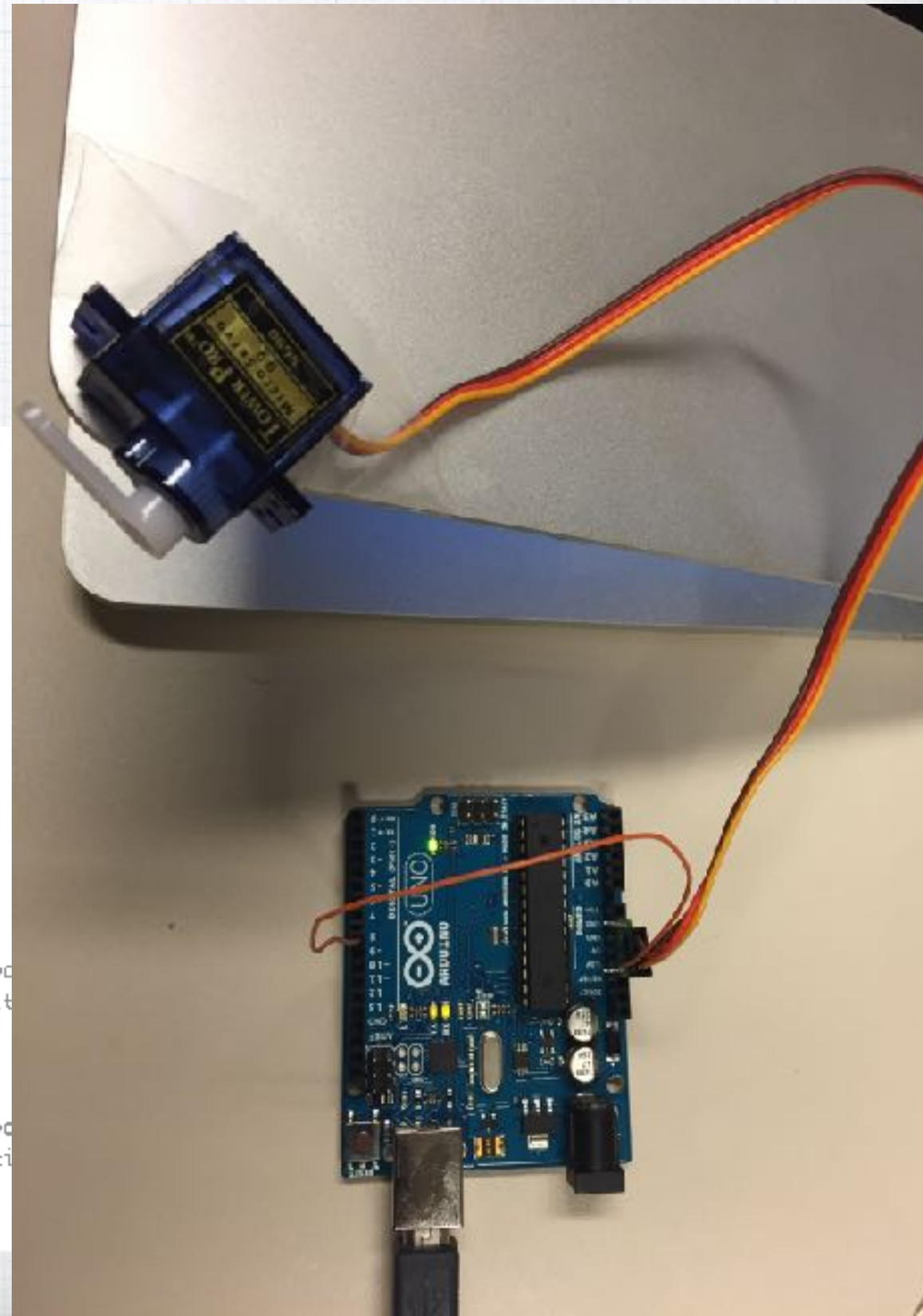


belli bir açıya gelmek

arabanın aynasını/koltuğunu ayarlamak
pencere/kapı açıp kapatmak...

yazılım:

```
#include <Servo.h>

Servo myservo;  // create servo object to control a servo
                // a maximum of eight servo objects can be created

int pos = 0;    // variable to store the servo position

void setup()
{
  myservo.attach(9);  // attaches the servo on pin 9 to the servo object
}


void loop()
{
  for(pos = 0; pos < 180; pos += 20)  // goes from 0 degrees to 180 degrees
  {                                   // in steps of 1 degree
    myservo.write(pos);               // tell servo to go to position in variable 'po
    delay(250);                        // waits 15ms for the servo to reach the posit
  }
  for(pos = 180; pos>=1; pos-=5)      // goes from 180 degrees to 0 degrees
  {
    myservo.write(pos);               // tell servo to go to position in variable 'po
    delay(15);                        // waits 15ms for the servo to reach the positi
  }
}
```

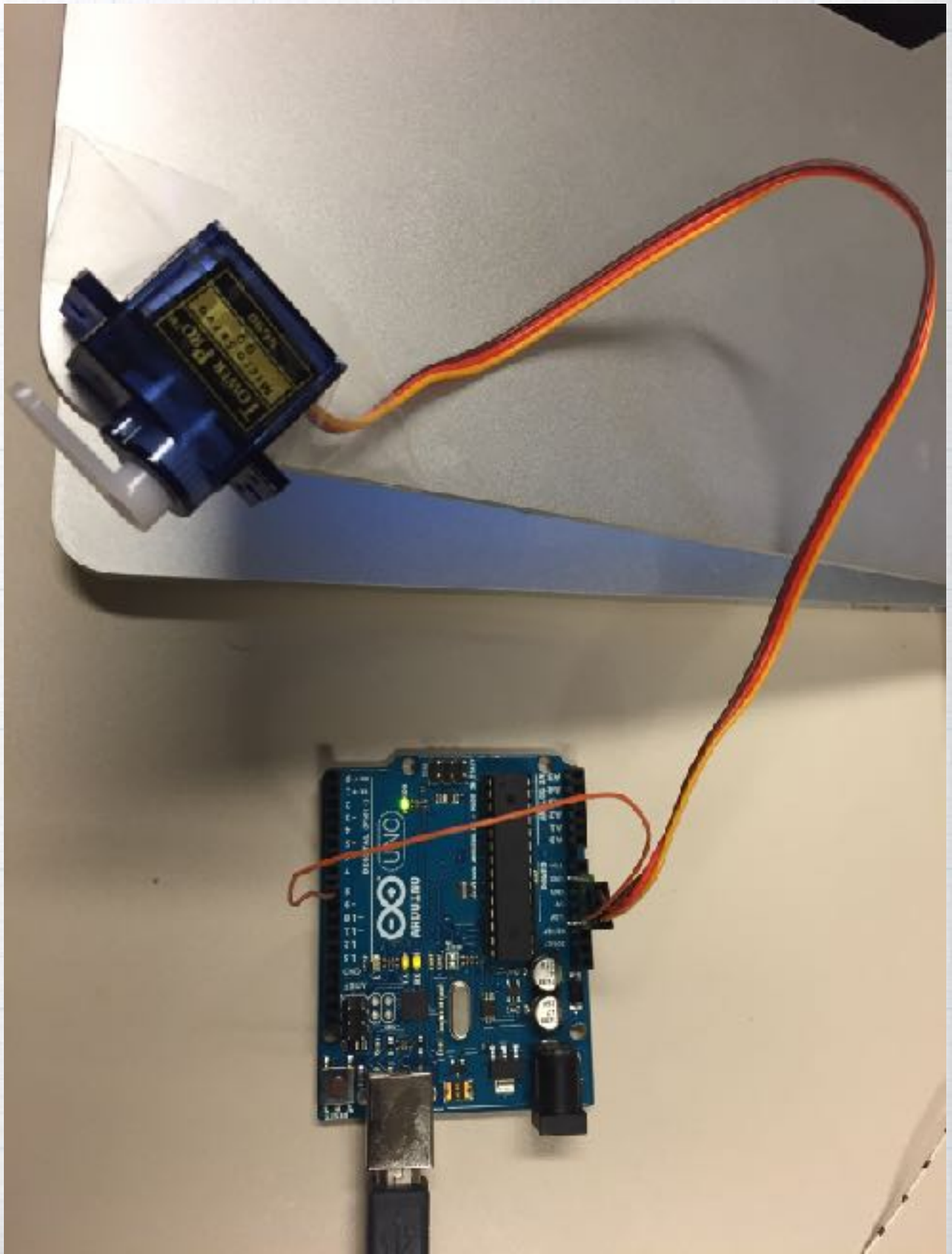


belli bir açıya gelmek

arabanın aynasını/koltuğunu ayarlamak
pencere/kapı açıp kapatmak

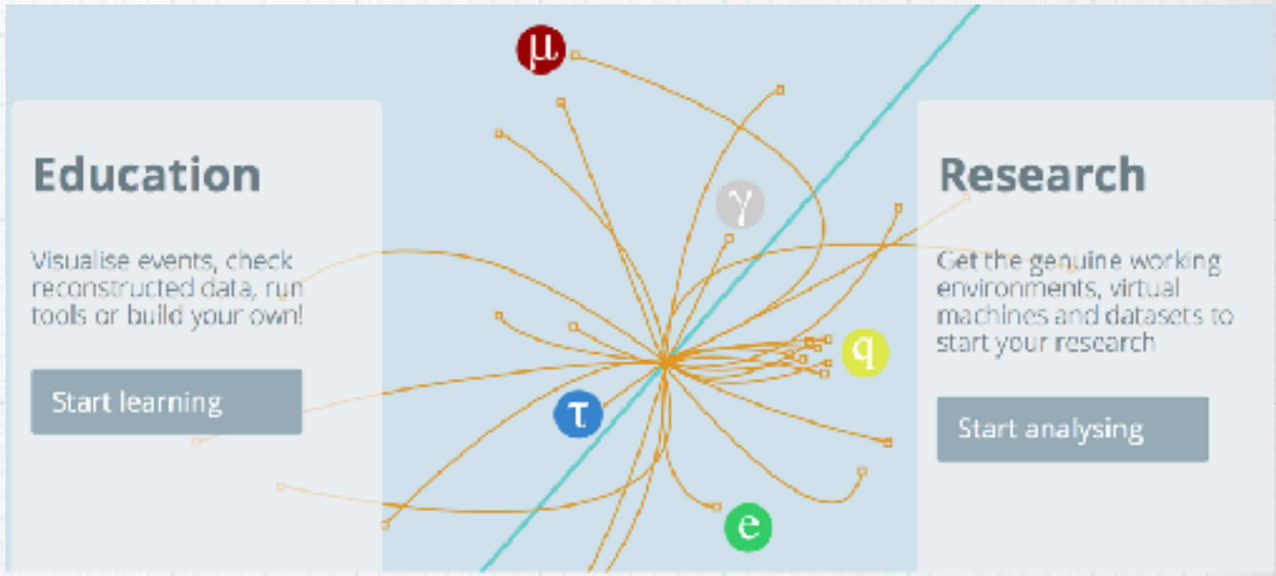
....

yazılım:



veri çözümlemesi

* http://opendata.cern.ch



Showing records 1 to 10 out of 19 results.

/MuEG/Run2011A-12Oct2013-v1/AOD

MuEG primary dataset in AOD format from RunA of 2011. Run period from run number 160404 to 173692.

Collection CMS-Primary-Datasets | DOI 10.7483/OPENDATA.CMS.X7AM.49VT

/MuHad/Run2011A-12Oct2013-v1/AOD

MuHad primary dataset in AOD format from RunA of 2011. Run period from run number 160404 to 173692.

Collection CMS-Primary-Datasets | DOI 10.7483/OPENDATA.CMS.B57J.DPSR

/MuOnia/Run2011A-12Oct2013-v1/AOD

MuOnia primary dataset in AOD format from RunA of 2011. Run period from run number 160404 to 173692.

Collection CMS-Primary-Datasets | DOI 10.7483/OPENDATA.CMS.FZ5U.TTXP

/MultiJet/Run2011A-12Oct2013-v1/AOD

MultiJet primary dataset in AOD format from RunA of 2011. Run period from run number 160404 to 173692.

Collection CMS-Primary-Datasets | DOI 10.7483/OPENDATA.CMS.8N95.GCTN

CMS Outreach Exercise 2010

Some intro text here. This repo contains two examples:

a) the TwoLeptons analysis: Z -> ll

b) the FourLeptons analysis: ZZ -> llll

Both examples exercises running on 2010 data, but not directly in the A

The exercise runs over tuples created following the Physics Analysis To
details on the pattuples generation are in the pattuple repository: https:

From now on it is assumed that you will work on a VM properly context

Creating the Working Area

This step is only needed the first time.

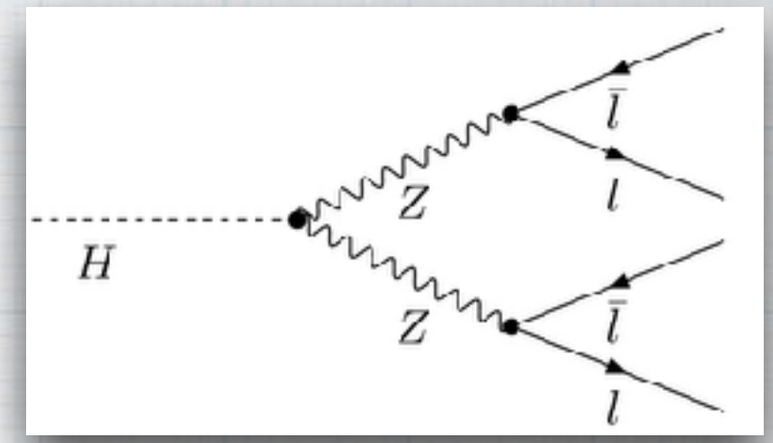
```
source /cvmfs/cms.cern.ch/cmsset_default.sh
cmsrel CMSSW_4_2_8
cd CMSSW_4_2_8/src
git init
git remote add origin https://github.com/ayrodrig/OutreachExerci
git fetch origin
git checkout master
scram b
```

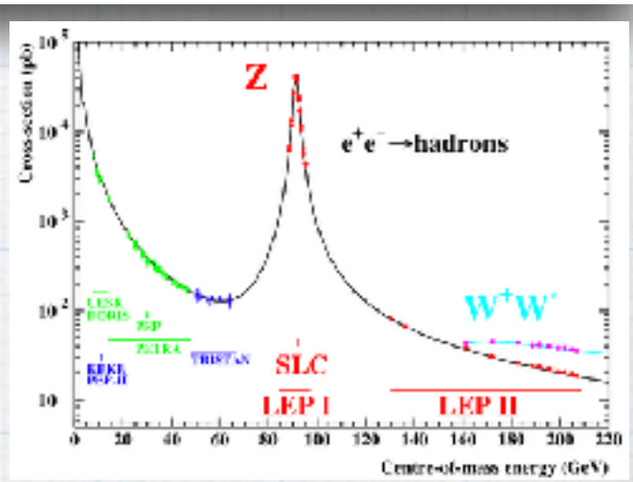
CutLang V2

https://arxiv.org/abs/1801.05727

$H \rightarrow Z Z$

$Z \rightarrow \ell \ell$

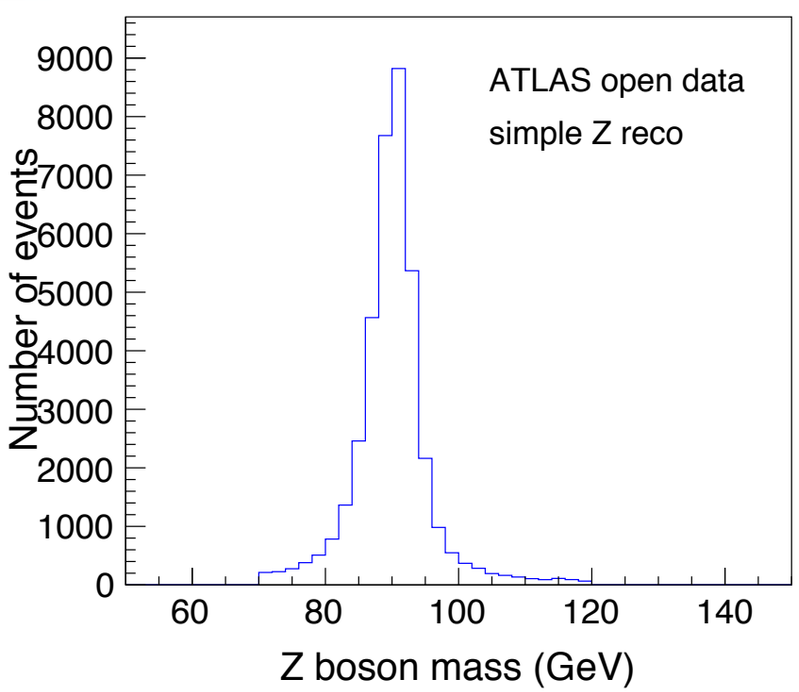




* Kolayca veri analizi yapabilmek için dil.
  * Linux ve Mac makinalarda denendi
  * ATLAS ve CMS OpenData uyumlu
  * ROOT ve g++ gerektiriyor

ROOT Data Analysis Framework

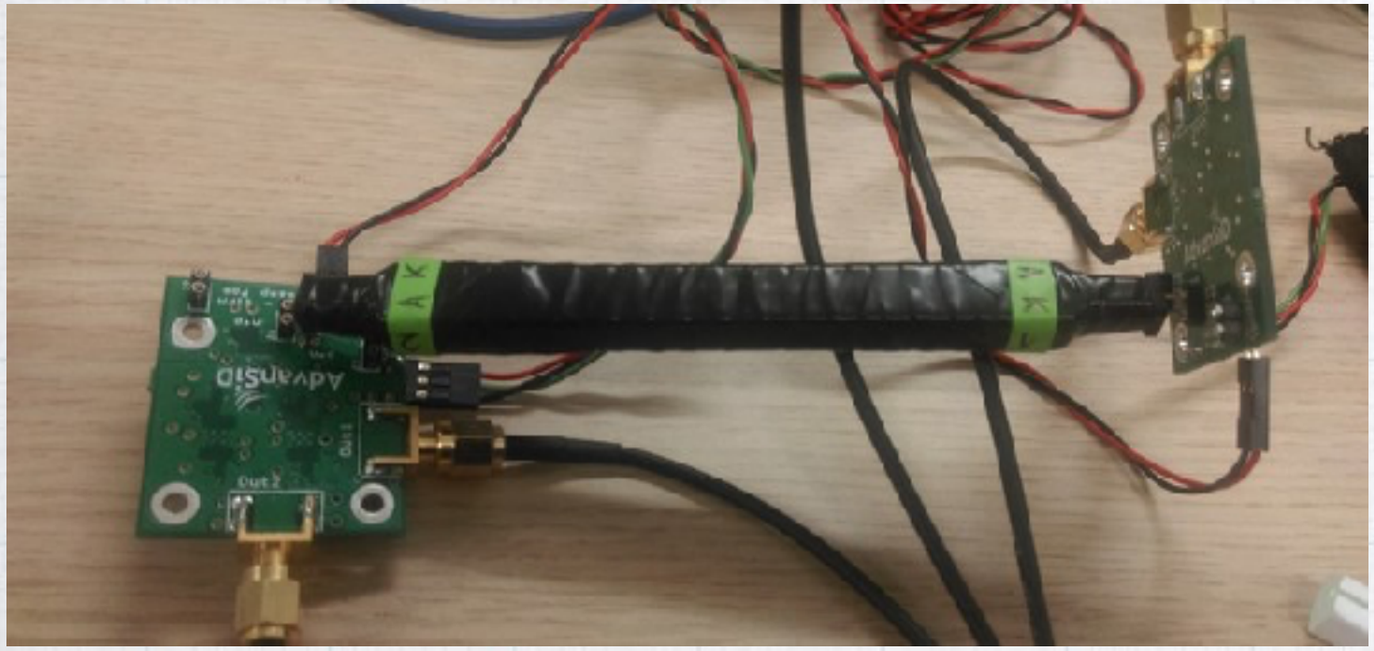
root.cern.ch




```
minpte  = 15.0  # min pt of electrons
minptm  = 15.0  # min pt of muons
minptj  = 15.0  # min pt of jets
maxetae = 2.47  # max pseudorapidity of electrons
maxetam = 2.5   # max pseudorapidity of muons
maxetaj = 5.5   # max pseudorapidity of jets

TRGm = 0 #     muon Trigger Type: 0=dont trigger, 1=1st trigger (
TRGe = 2 # electron Trigger Type: 0=dont trigger, 1=1st trigger (

###### DEFINITIONS
def       "mLL : { LEP_1 LEP_0 }m"
def       "qLL : { Zreco }q"          #note the nested definition
def       "Zreco : LEP_0 LEP_1 "

###### Very simple Reconstruction
cmd      "ALL "            # to count all events
cmd      "nLEP == 2 "      # events with only leptons
cmd      "mLL [] 70 120 " # a mass window for Z candidate
cmd      "qLL == 0 "       # reconstructed object should be neutra
cmd      "FillHistos "
histo    "Zlm , Leptonic Z best combi (GeV), 50, 50, 150,  mLL  "
```

Cosmic π 🍰

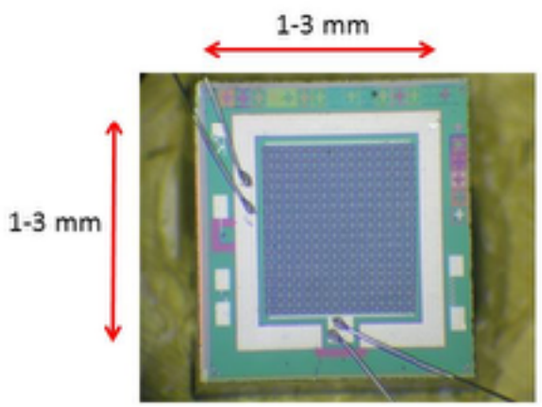
https://www.raspberrypi.org/blog/raspberry-pi-cosmic-ray-detector-from-cern/

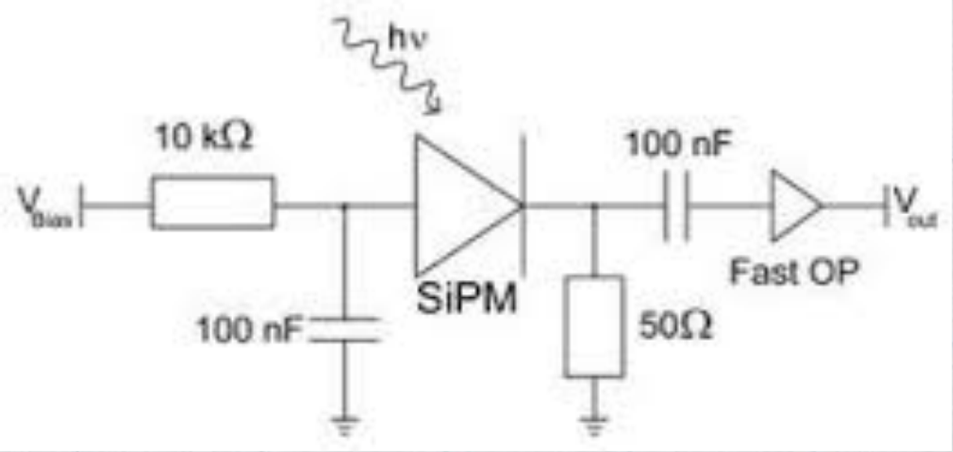


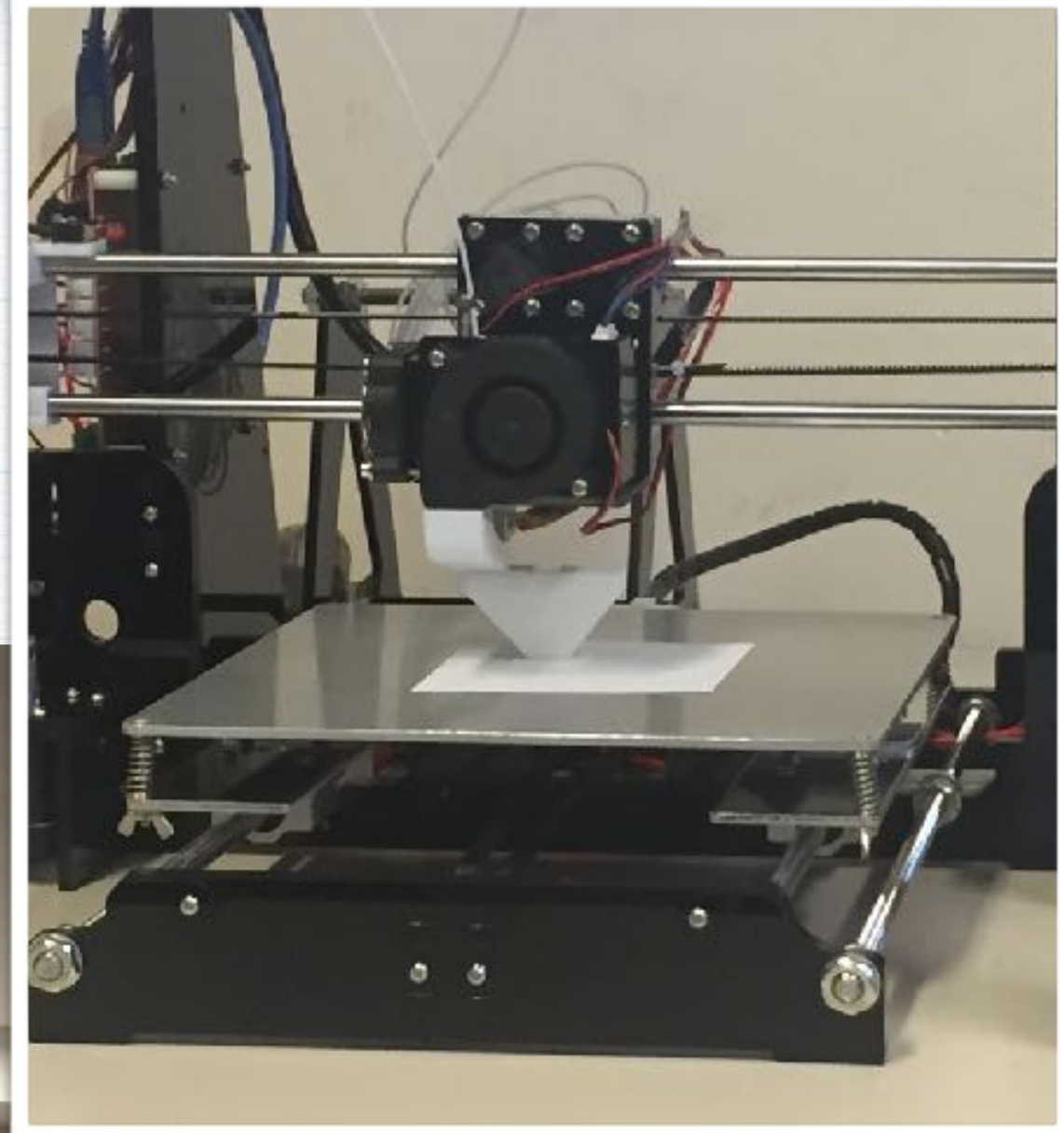
http://www.hamamatsu.com/eu/en/product/category/3100/4004/index.html?gclid=CNr-l7Dc8dECFfQW0wodJ_QLpw

Silicon Photo-Multiplier (SiPM)

- Compact Device
- Operating voltage (30-120V)
- Resolution - Single photon detection
- Response time – ~100 ps
- High gain - 10^6
- High Quantum Efficiency – 90%
- High Photon Detection Efficiency – 60%





- Fizik deneysel bir bilimdir.
- Alet işler el övünür.

http://expeyes.in