



Vhodno izhodne naprave

Laboratorijska vaja 2 - VP 1
Uvod, tipala, TinkerCad osnove

VIN projekt - VP1: Uvod, tipala, TinkerCad osnove

- Uvod v VIN projekt
- Tipala
- Spoznavanje TinkerCad-a
- Domača naloga

VIN projekt - VP1: Uvod, tipala, TinkerCad osnove

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VIN projekt

■ Izhodišči

- Spoznavanje **delovanja vhodno izhodnih naprav**
 - Povezave: Mikrokrmilnik, tipala, tipke, LED diode, ...
- Analiza/izvedba **komunikacije** med vgrajenimi sistemi oz. tipali
 - 1-Wire, SPI, I2C, RS232, CANBUS, RS485, MODBUS, ...

■ Metode:

- **Tinkercad** simulacija in priprava kode (po potrebi)
- Izvedba **na pravem sistemu**
 - Osciloskop, STM32, tipala, „breadboard“, prototipi – npr. „pametna hiška“

■ Predstavitev, poročilo:

- **živa predstavitev 5min**
- **poročilo** v obliki gradiva
- **video (do 2min) in grafična predstavitev („poster“, skica)**

VIN Projekt – Delo MS Teams

VIN-VSP 2020-21 Notebook

- Welcome
- Collaboration Space
 - Using the Collaboration Space
- Predavanja Notes
- LAB vaje Notes
- VIN Projekt
- Content Library
 - Using the Content Library
 - Predavanja
 - LAB Vaje
 - VIN Projekt**
- Teacher Only
 - Using the Teacher Only Space
 - STM32F4 DISCOVERY
 - CubeIDE
 - Sensors
 - Atanasoski, Radoslav
 - Blagovič, Nik Sebastijan
 - BRODNIK, MATEJ
 - ČELIKOVIČ, DINO
 - ČATIĆ, ADIAN
 - DUDIĆ, VELJKO

Platforme

- STM32F407G-DISC1
- 32F769IDISCOVERY
- STM32MP157C-DK2
- STM32MP157x

Praktični Izzivi

- Model Hiške
- Arduino Smart Home Kit**
- CANBUS - IEX modul

TinkerCAD - Simulator

- Navodila, prijava
- Uvodna vaja

STM32F407 Discovery Delo

- STM32Duino (Arduino IDE)
- Getting started
- API
- GitHub
- Stm32 Libraries, examples
- SW Upgrade
- Cube IDE (ST)

Arduino Delo

- Dodatna gradiva, viri

Arduino Smart Home Kit

torek, 02. marec 2021 10:43



Še nekaj **dodatnih izhodišč** za tiste, ki vas delo z mikrokrmilniki in senzorji zanima (vsako opravljeno in dokumentirano delo se tudi šteje kot dodatne naloge):

- Preveri delovanje **IR senzorja razdalje GP2D12** (razdaljo sporoča preko analognega izhoda – torej z vrednostjo napetosti):
 - https://www.swanrobotics.com/projects/gp2d12_project/
 - https://engineering.purdue.edu/ME588/SpecSheets/sharp_gp2d12.pdf
- Za mikrokrmilnik obstaja cela **zbirka različnih senzorjev (37)** in je na voljo v priročnem kompletu. Kar nekaj senzorjev lahko priključite na krmilnik Arduino na enak način, kot smo naredili v nalogi 5.b, ali pa se seveda lahko inspirirate z objavljenimi projekti na spletu. Gradiv je res veliko.

Simulacija: TinkerCad

Classes

Gallery

Blog

Learn

Teach

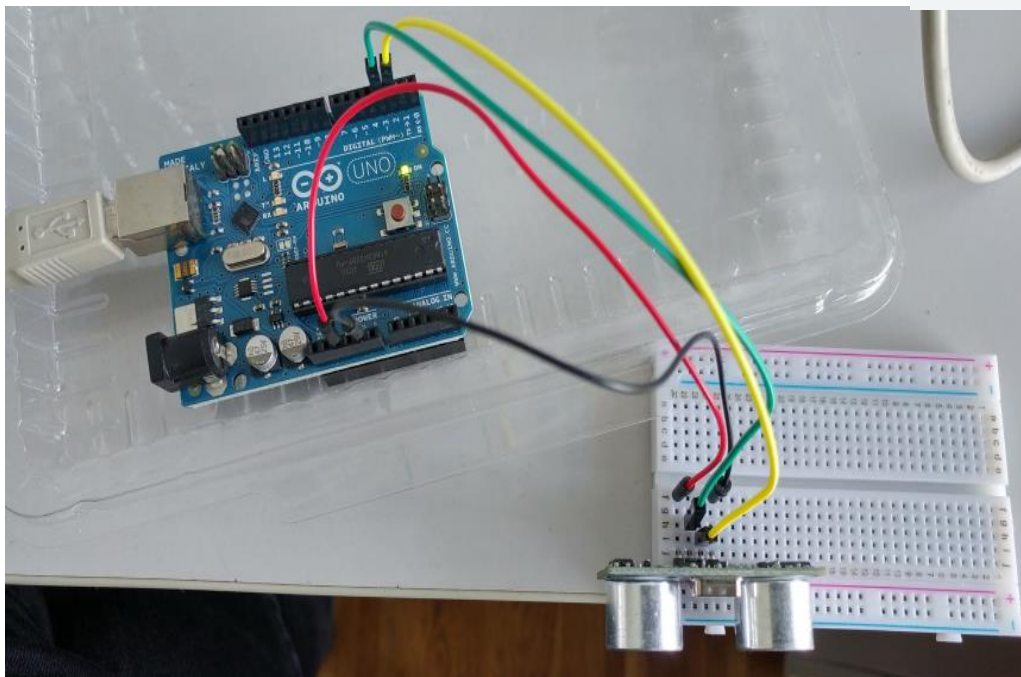
Q



Serial Monitor

Distance (cm) : 106
Distance (cm) : 103
Distance (cm) : 94
Distance (cm) : 88
Distance (cm) : 84
Distance (cm) : 84
Distance (cm) : 84

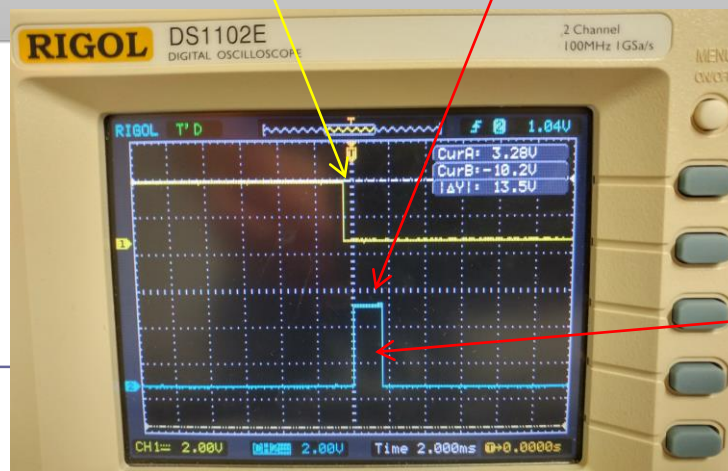
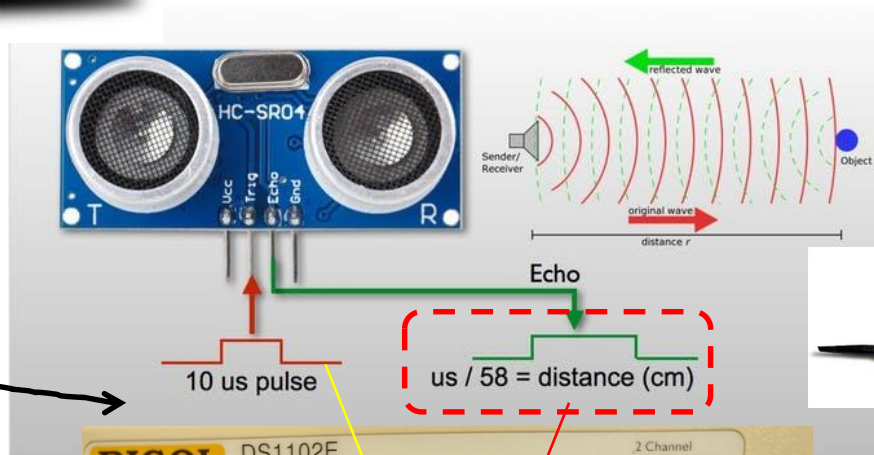
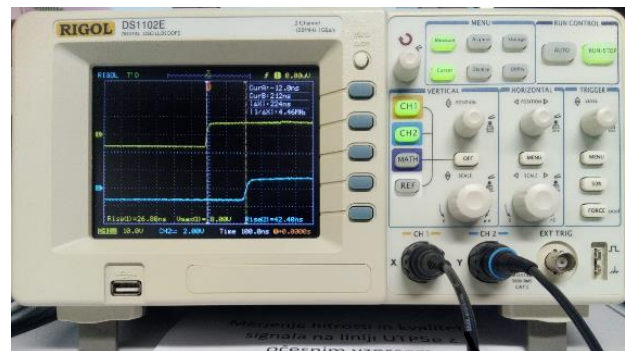
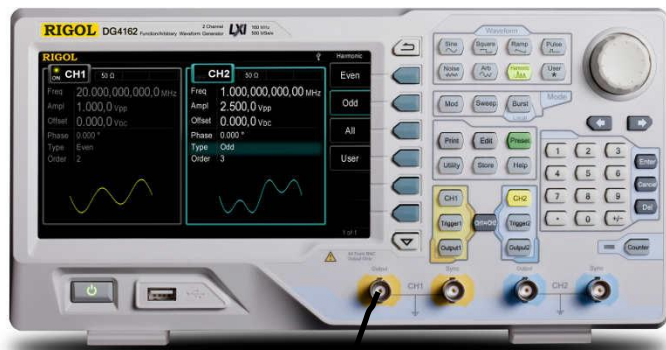
<https://www.tinkercad.com/>



Text

```
12  
13 void loop() {  
14   digitalWrite(trigger_Pin, LOW); //  
15   delay(1);  
16   digitalWrite(trigger_Pin, HIGH);  
17   delayMicroseconds(10); //Mak  
18   digitalWrite(trigger_Pin, LOW);  
19  
20   duration = pulseIn(echo_Pin, HIGH);  
21   distance = duration * 0.017; //((34  
22   /* Speed of the sound in Air = 340 m/  
23   * multiply it by 100 to get the data  
24   * divide by 1,000,000 as duration is  
25   * divide by 2 as ultrasound signal t  
26   */  
27   Serial.print("Distance (cm) : ");  
28   Serial.println(distance);  
29   delay(100);  
30 }
```


Praktična izvedba (meritev)



Oscilloskop - nastavitve
Measure -> Time -> Width

Zanimivi projekti

■ Bi-Directional Visitor Counter Using Single Ultrasonic Sensor With LCD on TinkerCad

- Z naslova <<https://www.instructables.com/id/Bi-Directional-Visitor-Counter-Using-Single-Ultras/>>

■ Water Level Indicator Using Arduino in TinkerCad

- Z naslova <<https://www.instructables.com/id/Water-Level-Indicator-Using-Arduino-in-TinkerCad/>>

■ Password Protected Door Lock on Tinkercad

- Z naslova <<https://www.instructables.com/id/Password-Protected-Door-Lock-on-Tnikercad/>>

■ Interfacing Relay With Arduino in TinkerCad

- Z naslova <<https://www.instructables.com/id/Interfacing-Relay-With-Arduino-in-TinkerCad/>>

■ Piano Sounds Using Arduino on TinkerCad

- Z naslova <<https://www.instructables.com/id/Piano-Sounds-Using-Arduino-on-TinkerCad/>>

Zanimivi projekti

60+ Arduino Projects, Tutorials and Guides

The Arduino is a microcontroller board that you can program to read information from the world around you and to send commands to the outside world (inputs and outputs). The Arduino is a great tool to start into electronics and programming and it is used worldwide by makers, students and even engineers.

Get started with Arduino: we have more than *60 free Arduino Tutorials and Project ideas* and a premium eBook with 25 great projects: [Arduino Step-by-step Projects](#). Using the next quick links, you'll find all our Arduino Guides with easy to follow step-by-step instructions, circuit schematics, source code, images and videos.

<https://randomnerdtutorials.com/projects-arduino/>

Predlog pristopa k projektu :

- Raziščem delovanje osnovnih senzorjev (literatura)
 - Primer:
 - <https://www.circuito.io/blog/arduino-sensors-explained/>
- Naredim nekaj poskusnih projektov v TinkerCadu (po potrebi)
 - spoznam se z okoljem
 - preizkusim nekaj osnovnih povezav
 - preizkusim napredne projekte s komunikacijo (mikrokrmilnik <-> tipalo)
- Fokusiram temo za svoj projekt
 - Iskanje po spletu, pregled izpostavljenih zanimivih projektov
 - Osnovna ideja sistema:
 - 1 mikrokrmilnik (STM32) kot centralni del sistema
 - Simulator: Arduino povezan na vsaj 3 tipala (simulator) in komunicira z glavnim (ena od serijskih komunikacij)
 - Izvedba: STM32, povezan na nekaj tipal in komunicira ali prikazuje rezultate (USB, LCD, serijski vmesnik, ...)
 - Nadgradnje sistema (neobvezno)
 - Veliko idej, več mikrokrmilnikov, komunikacijski sistem (RS485, Canbus), povezava s PC (in naprej), ...
- Izvedba projekta (TinkerCad, CubeIDE), poročilo in predstavitev

Literatura (za praktično delo):

■ Valvano: Embedded Systems - Shape The World

☐ knjiga (tudi PDF)

☐ spletne vsebine:

■ EdX course:

☐ <https://www.edx.org/course/embedded-systems-shape-world-utaustinx-ut-6-03x>

☐ <https://www.edx.org/course/embedded-systems-shape-the-world-multi-threaded-in>

■ Ebook:

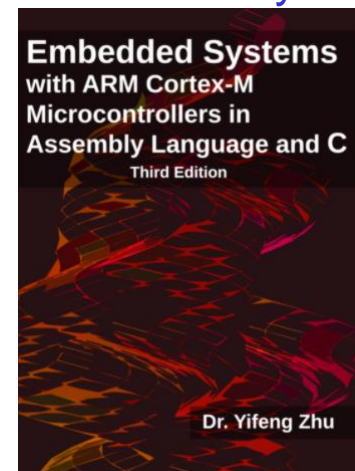
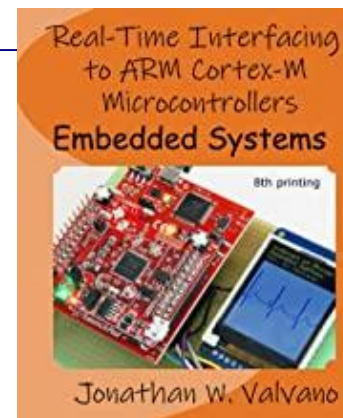
☐ <http://users.ece.utexas.edu/~valvano/Volume1/E-Book/>

■ Zhu: Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C

☐ Knjiga

☐ Spletne vsebine (tudi youtube tutoriali) :

■ <https://web.eece.maine.edu/~zhu/book/>



VIN projekt – izzivi

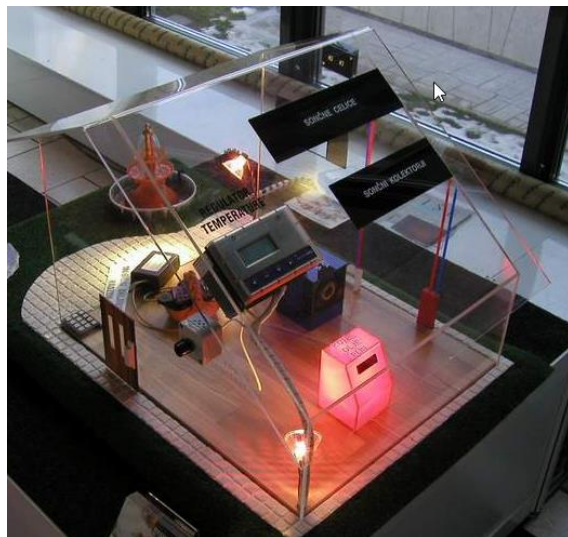
- Praktična realizacija projektov:
 - Npr. CANBus
- Praktični projekti – hiška :

Model je mišljen predvsem kot ena od idej za praktično izvedbo vaših projektov. Hiška je na poti na fakulteto in bo prisotna v našem laboratoriju.

Nabavil sem nekaj miniaturnega pohištva, da bo zgledalo bolj realno.

Ideja je hiško osvežiti, dodati nove naprave (razsvetljava, tipala) in narediti nek demo projekt/model pametne hiše

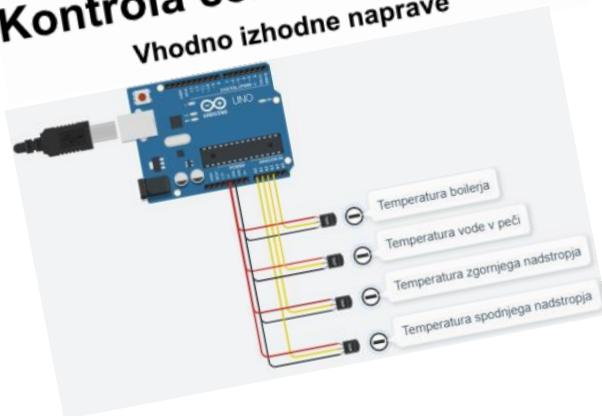
Nekaj slik :



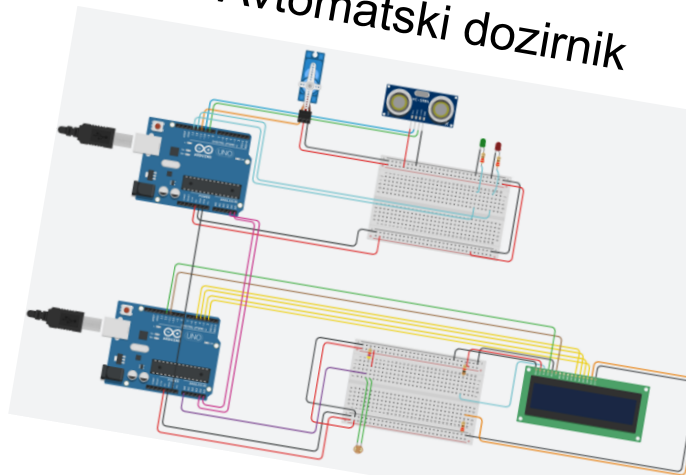
VIN Projekt – Simulacije – primeri

TinkerCad

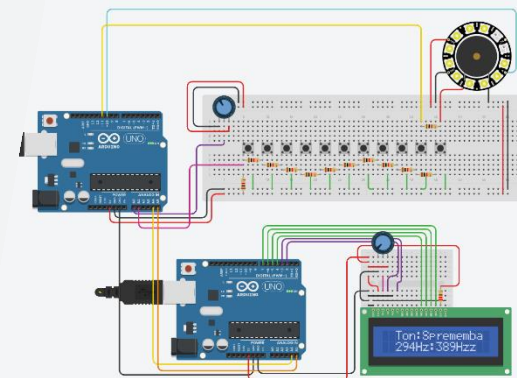
Arduino projekt,
Kontrola centralne kurjave
Vhodno izhodne naprave



Avtomatski dozirnik

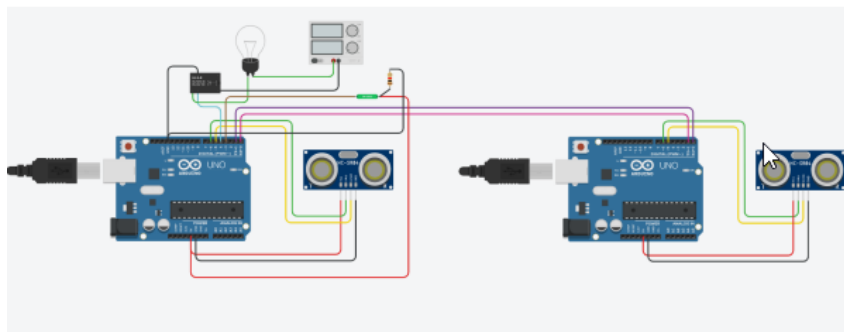


Mini Piano



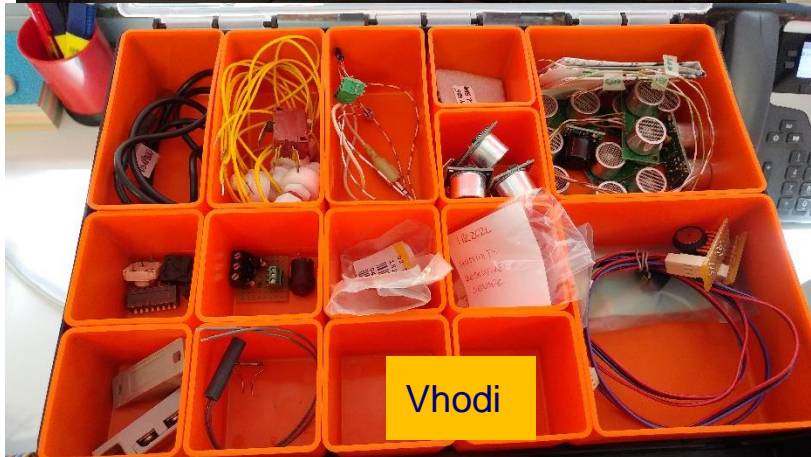
SENZOR ZA ZAPORNICO

Varnostni sistem za preprečitev zaprtja parkirne zapornice v primeru, da je pod njo objekt.



A collection of electronic components and kits. At the top left is a box of 500 resistors. Below it is a bag of 100 resistors. To the right is a box of 100 resistors. In the center is a breadboard with a circuit. To the right of the breadboard is a box of 100 resistors. At the bottom is a box of 100 resistors. On the right side is a box of 100 resistors. At the bottom right is a box of 100 resistors.

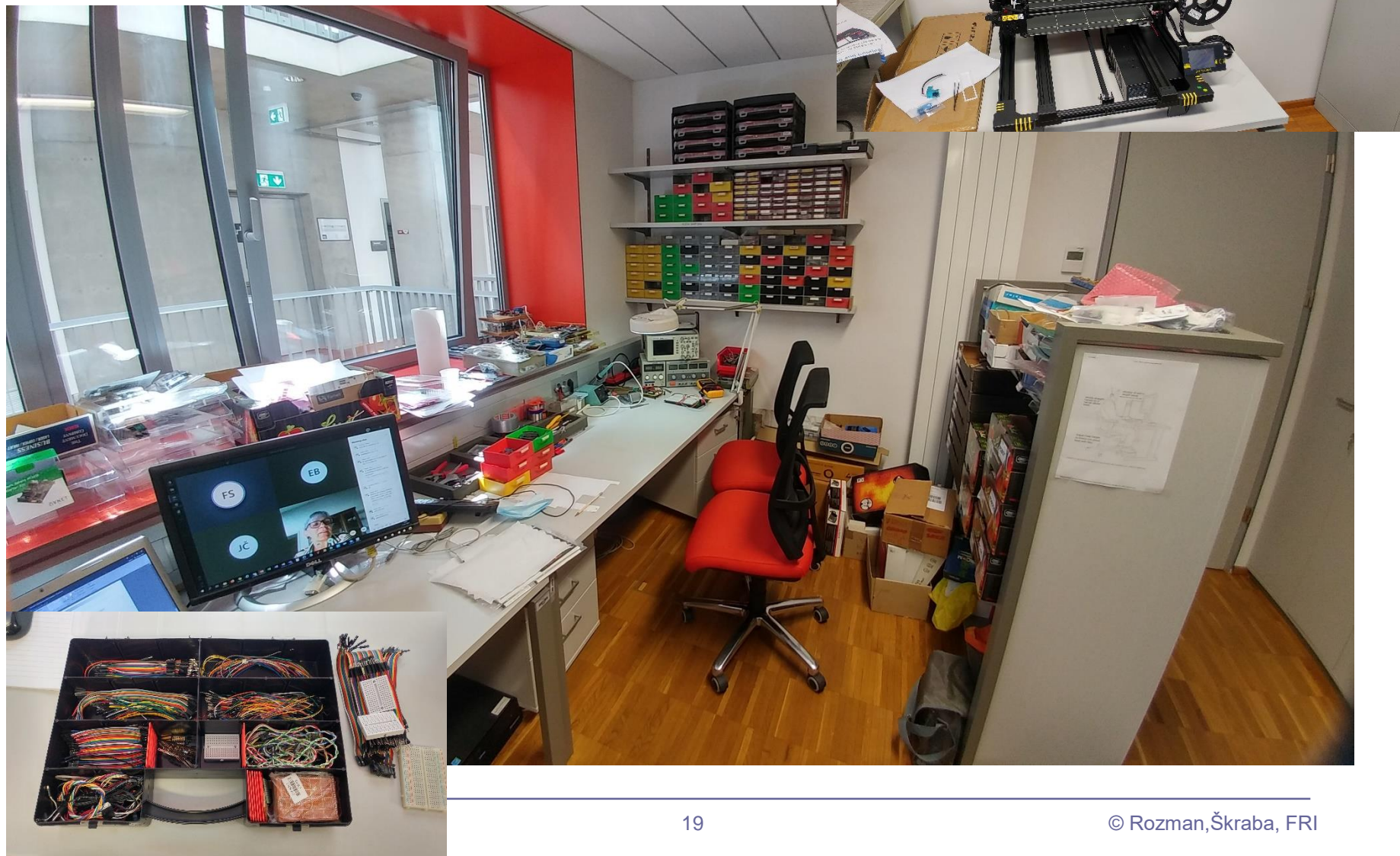
VP1: Uvod v VIN projekt







Predstavitev LAB-a



VP1: Uvod v VIN projekt – FRI Frižider



A photograph showing a large collection of Arduino boards and components. In the foreground, several black boxes with the 'seed studio Open Hardware Facilitator' logo are arranged. Behind them, numerous Arduino boards are laid out on a blue cutting mat. These include several UNO R3 boards (some in clear plastic bags with labels, others out of bags), Nano V3 boards, and various shields like the Ethernet shield and the Pro Mini. Some boards are still in their original packaging. The background is a light-colored wooden surface.



FRIžider - Tipala



VIN projekt - VP1: Uvod, tipala, TinkerCad osnove

- Uvod v VIN projekt

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- Domača naloga

Tipala

Namen :

- Temperaturna tipala
- Tipala oddaljenosti
- Tipala MEMS (Micro-ElectroMechanical Systems)
- Tipala svetlobe
- Tipala dotika/pritiska

Priključitev :

- Analogni (uporovni, napetostni, tokovni)
- Digitalni:
 - 1/0 (tipka, PIR, Reed, Tilt, ...)
 - Komunikacija (I2C, SPI, WiFi, 1-Wire, ...)

HOW ARDUINO SENSORS ACTUALLY WORK

<https://www.circuito.io/blog/arduino-sensors-explained/>

Temperature sensors



DHT22/11



am2320



BME680



DS18B20



DS18B20 Waterproof



TMP102

Distance sensors



LIDAR lite 3



HC-SR04



IR LED



MAX30105



A1302

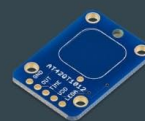


GP2Y0A02YK0F

Force/Load sensors



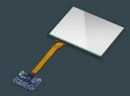
Force sensitive resistor



AT42QT1012



HX711



resistive touch screen



MPR121



TTP223B

MEMS sensors



ADXL335



ADXL345



ITG-3200



HMC5883L



LSM9DS1



MPU-6050

Light sensors



ISL29125



GUVA-S12SD



SI1145



LDR



ML8511



TCS34725

VIN projekt - VP1: Temperaturna tipala

Vrste :

- Termistorji
 - ☐ temp. odvisna snov
- „Thermocouples“
 - Spoji kovin
 - Večji razpon, manjša natančnost
- RTD („Resistance Temp. Detector“)
 - Navitje prevodnega (temp. odv.) materiala



Priključitev :

- ☐ Uporovni
- ☐ Digitalni:
 - Komunikacija (I2C, SPI, 1-Wire, ...)

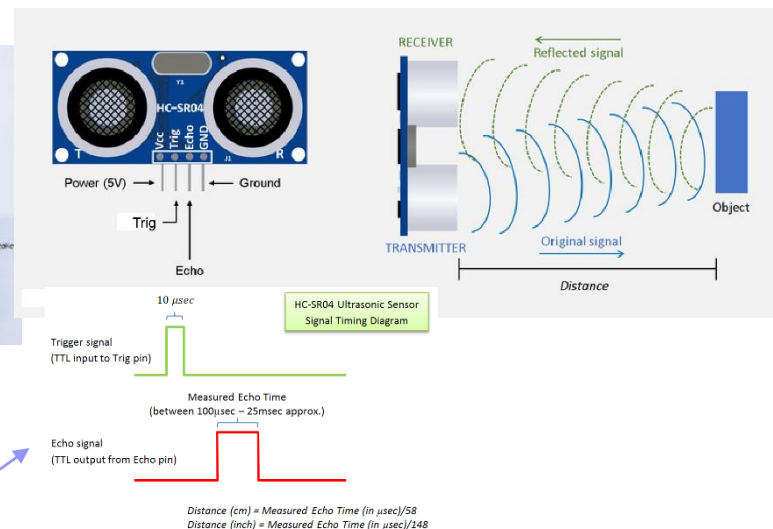
VIN projekt - VP1: Tipala oddaljenosti

Vrste :

- LIDAR
 - laser
- UZ tipala
 - Ultrazvok (npr. HC-SR04)
- IR LED tipala
 - IR svetloba, manjše razdalje
- Hall
 - Bližina magneta (brezkontaktni)

Priključitev :

- Analogni (Hall)
- Digitalni:
 - TOF (Time-of-Flight) meritev časa



VIN projekt - VP1: Tipala MEMS

Vrste :

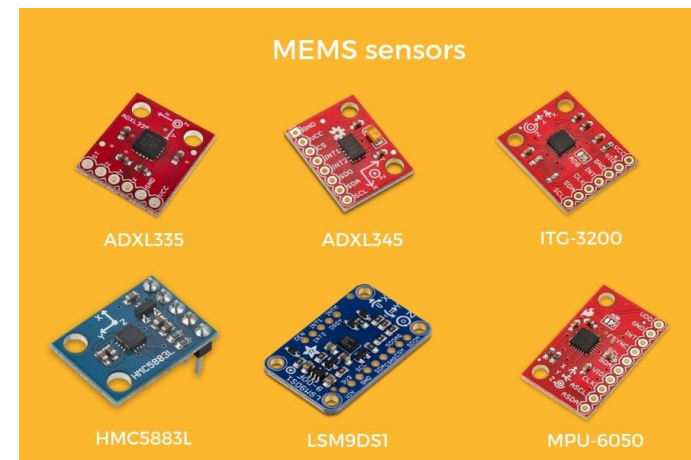
- Pospeškometri
 - Merijo pospeške v oseh
- Žiroskopi („Gyro sensors“)
 - Spremembe v kotni hitrosti (izračun kotov)
- Magnetometri
 - Merijo magnetno polje v 3 oseh

Priključitev :

- Analogni
- Digitalni
 - Protokoli (I2C, SPI, ...)

Pogosto skupaj:

- IMU („Inertial Measurement Unit“)
 - pospeškometer + žiroskop



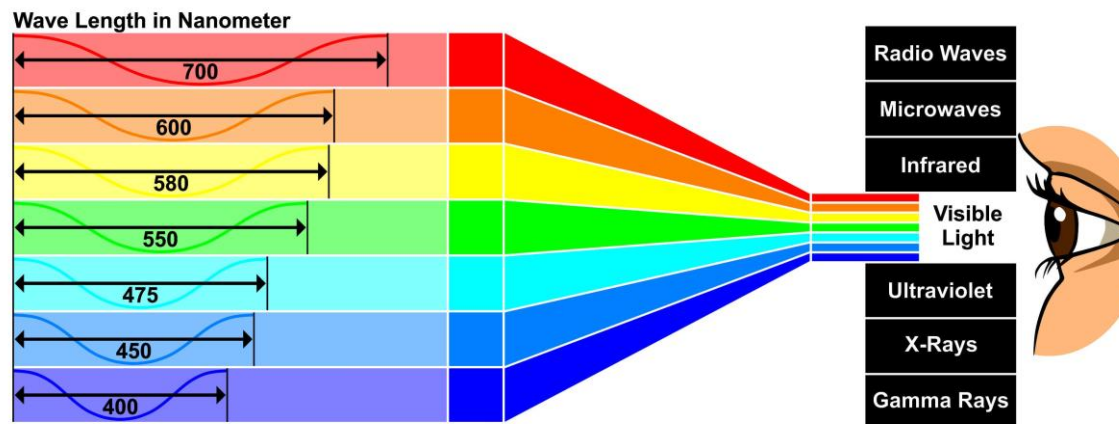
VIN projekt - VP1: Tipala svetlobe

Vrste :

- LDR
 - Uporovno tipalo
- RGB
 - Meri „barvo“ odboja
- Specifične meritve
 - Npr. „vidni“ ali drugi spektri

Priključitev :

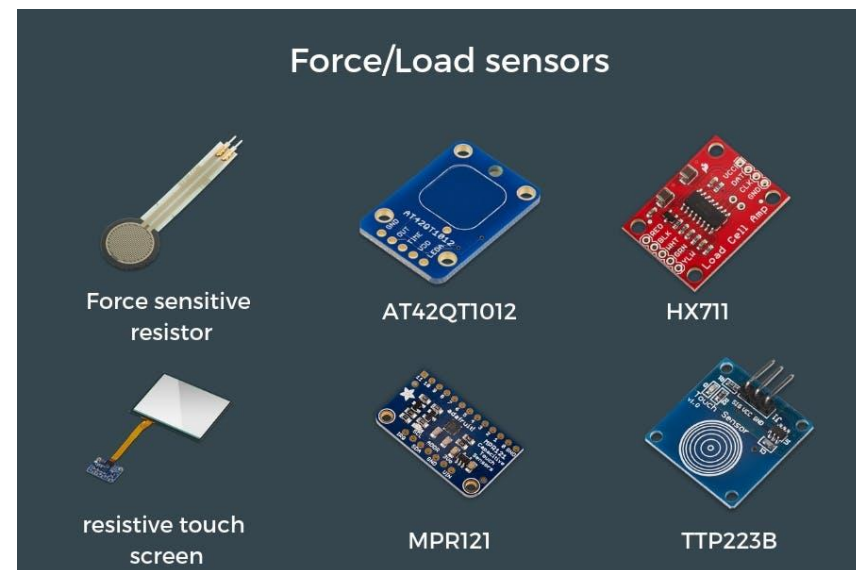
- Analogni (upornost, napetost)
- Digitalni
 - Protokoli (I2C, SPI, ...)



VIN projekt - VP1: Tipala dotika/pritiska

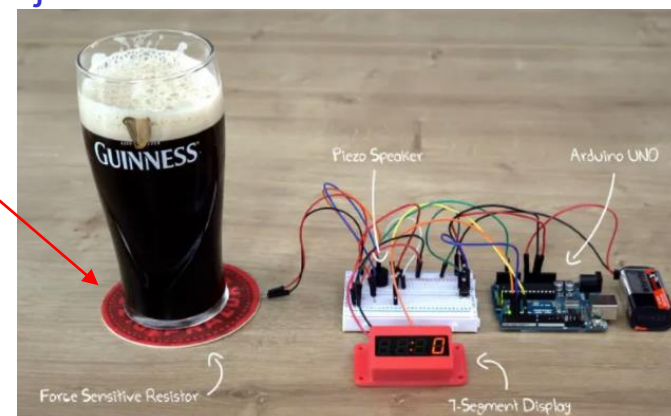
Vrste :

- Površine „na dotik“
 - uporovne
 - kapacitivne
- FSR („Force Sensing Resistor“)
 - Prevodna „goba“
 - večji pritisk → večja prevodnost
- „Load Cell“
 - bolj natančne, večji razpon obremenitev, dražje



Priključitev :

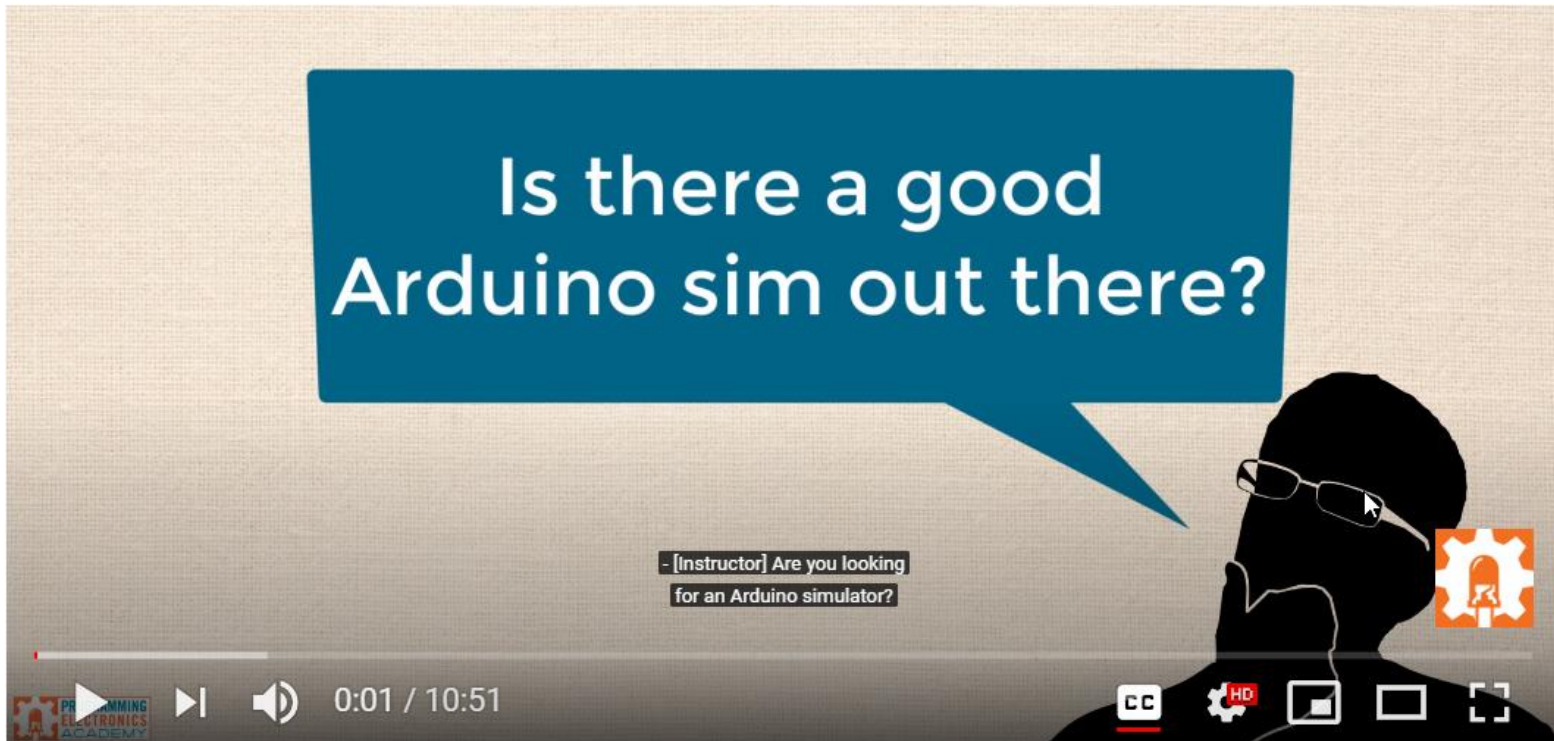
- Analogni
- Digitalni
 - Protokoli (I2C, SPI, ...)



VIN projekt - VP1: Uvod, tipala, TinkerCad osnove

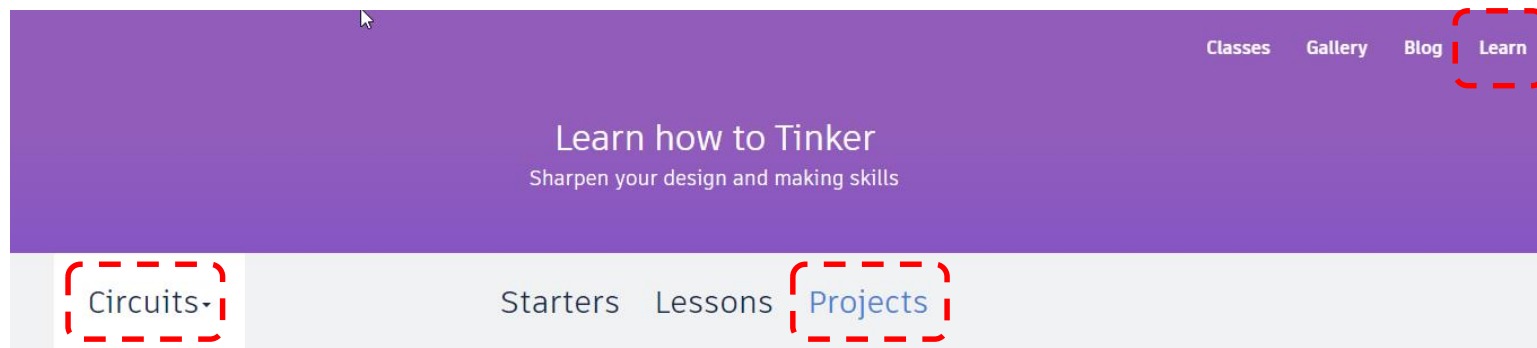
- Uvod v VIN projekt
- Tipala
- Spoznavanje TinkerCad-a
- Domača naloga

The Arduino Simulator you've been looking for!

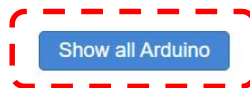
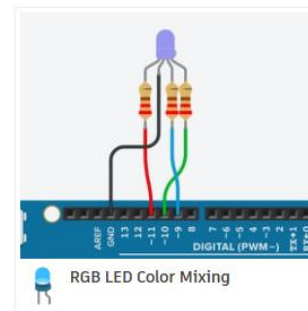
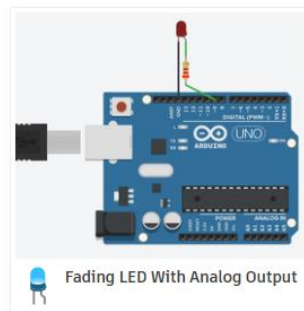
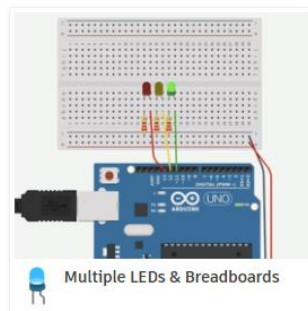
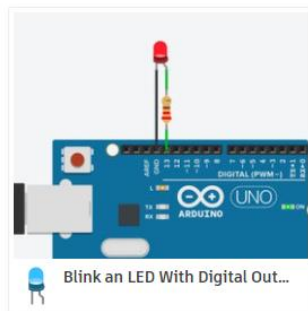


Z naslova <<https://www.youtube.com/watch?v=6uz1sCA9joc>>

TinkerCad – učenje, primeri

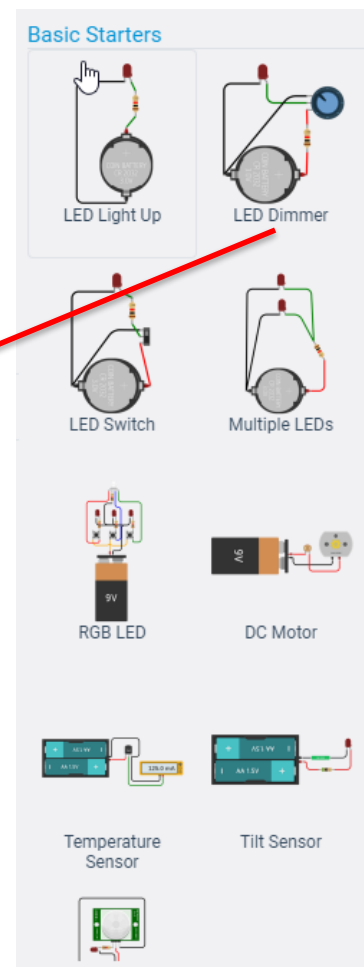
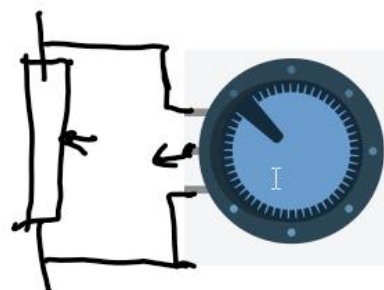
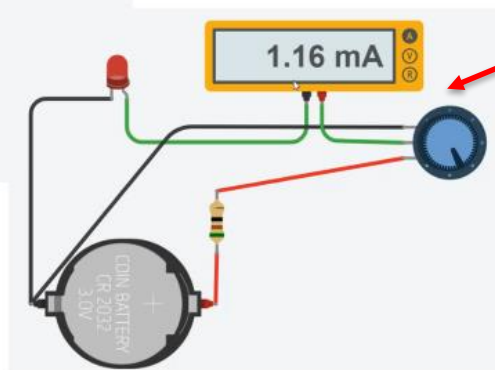
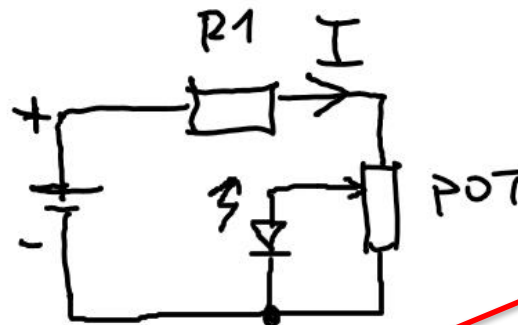
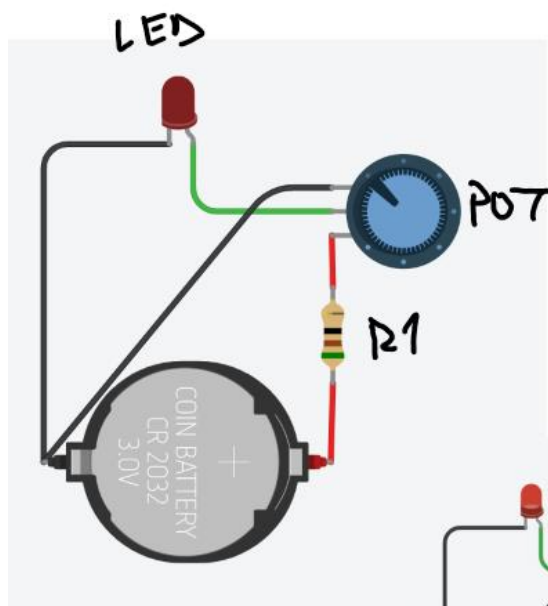


Learn Arduino with our easy-to-follow lessons that set you on the fast path to coding and prototyping your own projects.



VIN projekt: TinkerCad

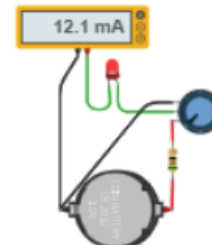
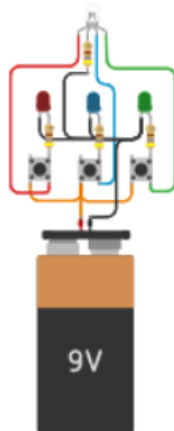
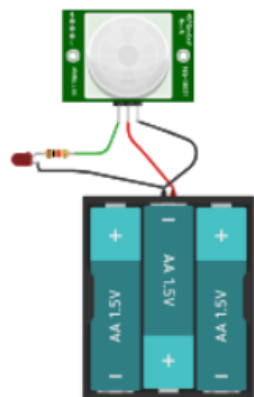
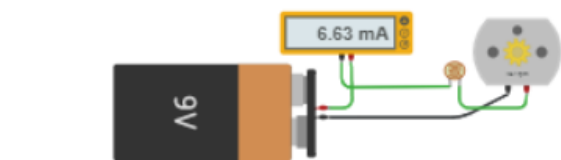
Osnovni elementi in preproste vezave



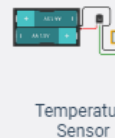
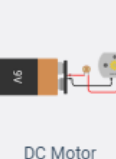
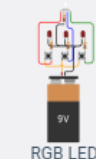
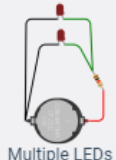
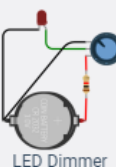
VIN projekt: TinkerCad

Osnovni elementi in preproste vezave

VIN Osnovni elementi in preproste povezave



Basic Starters



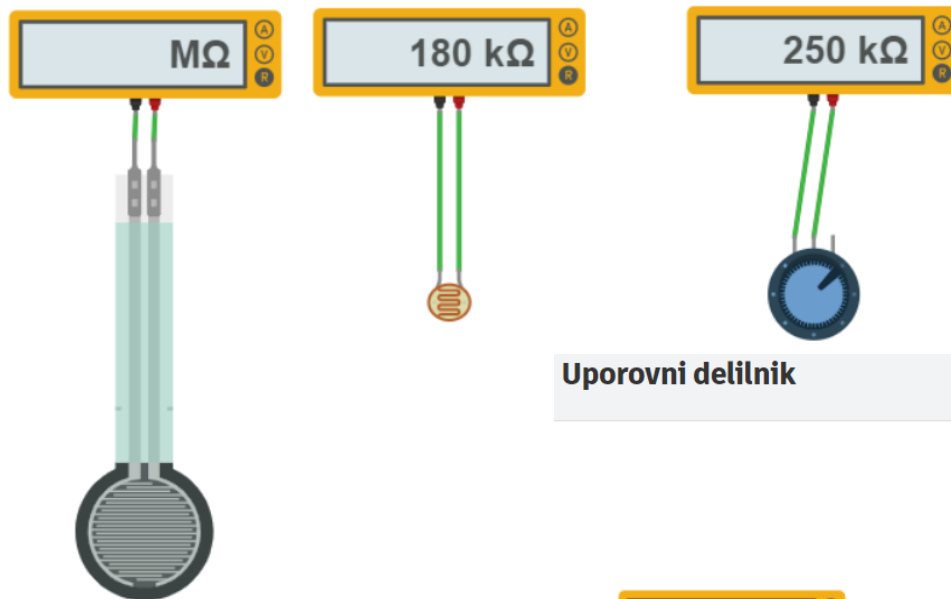
Z naslova <<https://www.tinkercad.com/things/aVrm76VMZSV-vin-osnovni-elementi-in-preproste-povezave>>

VIN projekt : TinkerCad

Uporovna tipala in delilnik napetosti

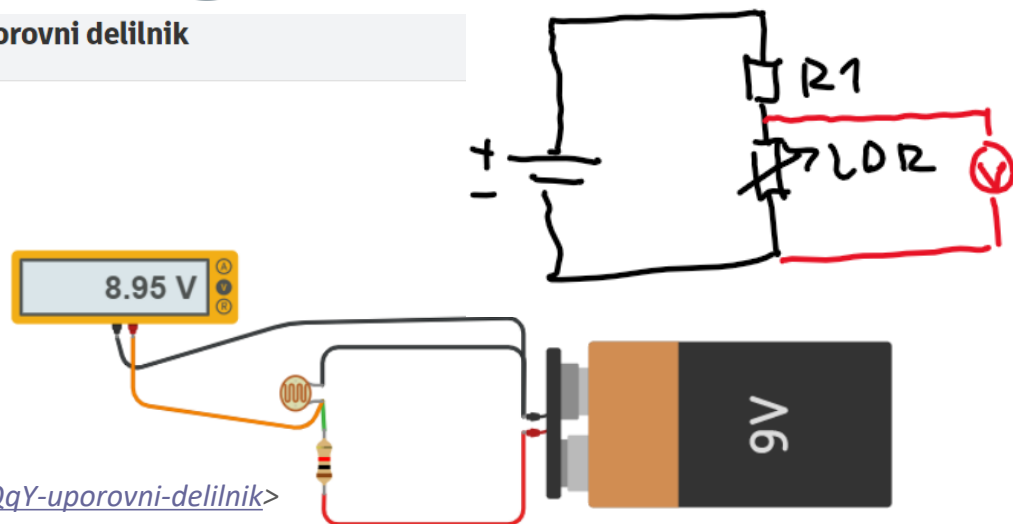
Uporovna tipala

Z naslova <<https://www.tinkercad.com/things/gRnhGlsvr0z-uporovna-tipala>>



Uporovni delilnik

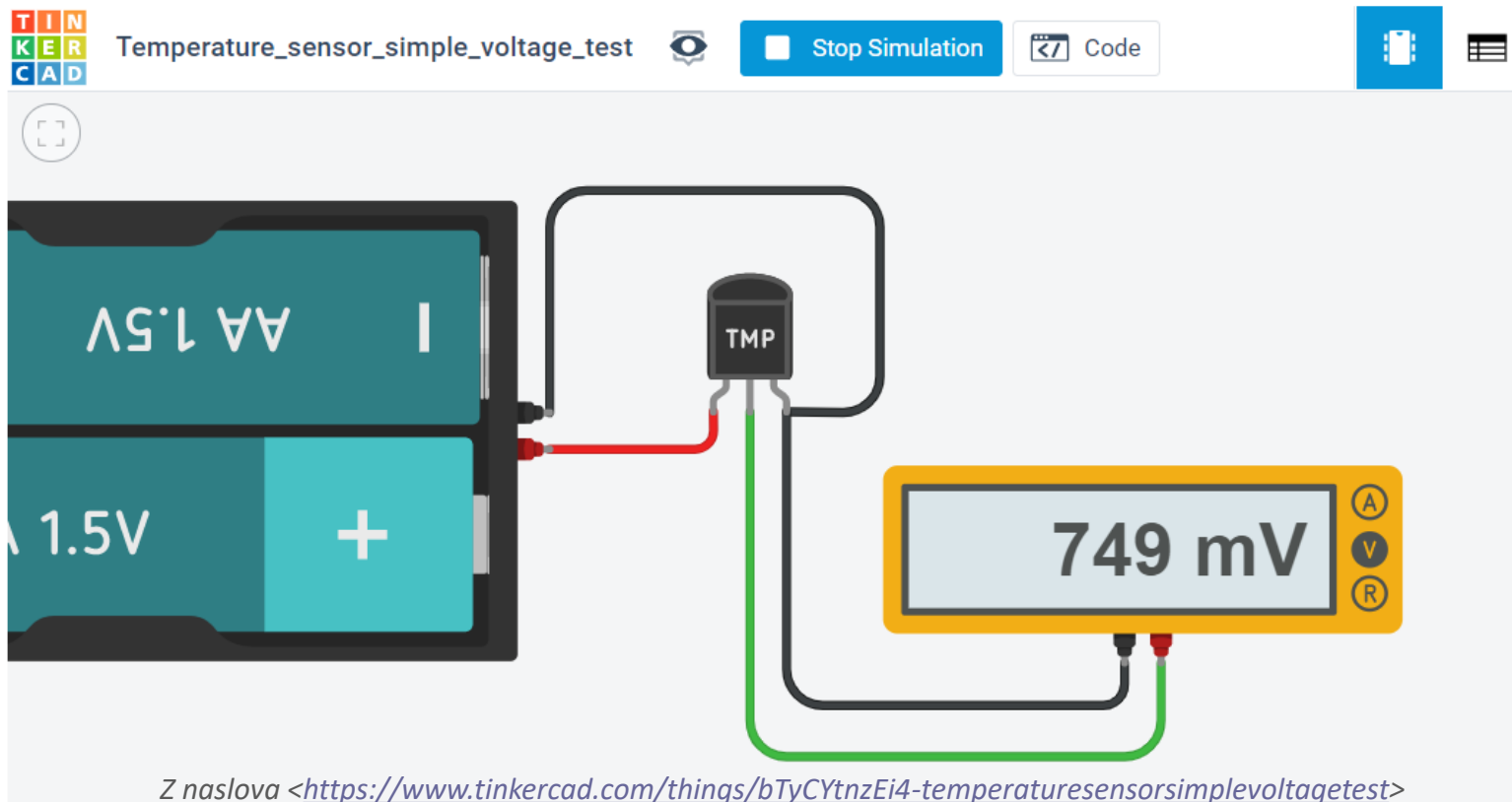
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VIN projekt : TinkerCad

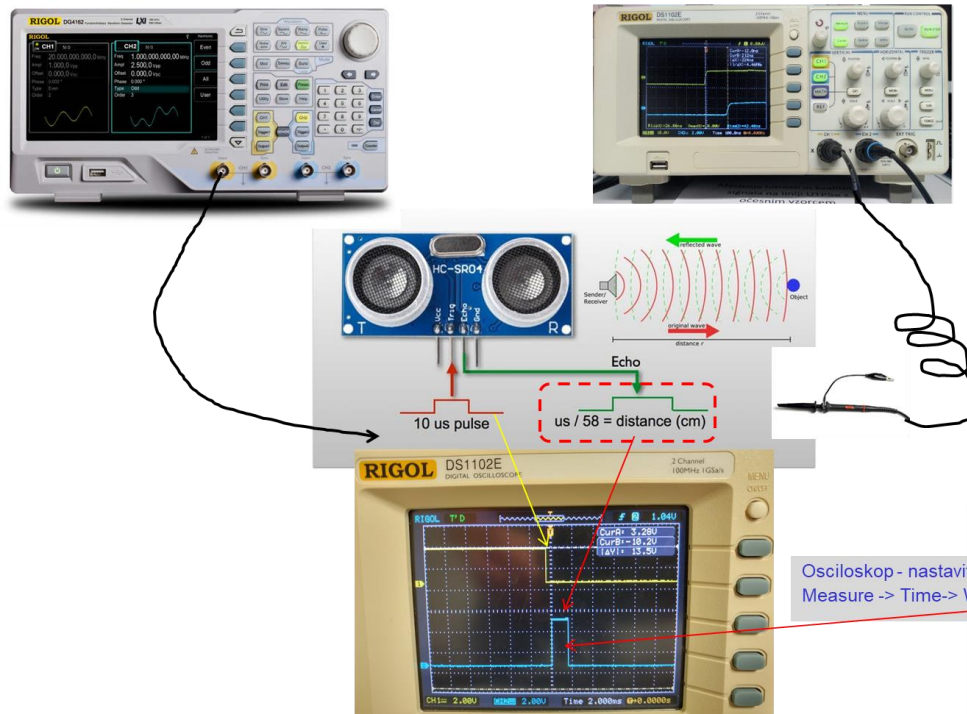
Uporovna tipala in delilnik napetosti

Temperature_sensor_simple_voltage_test

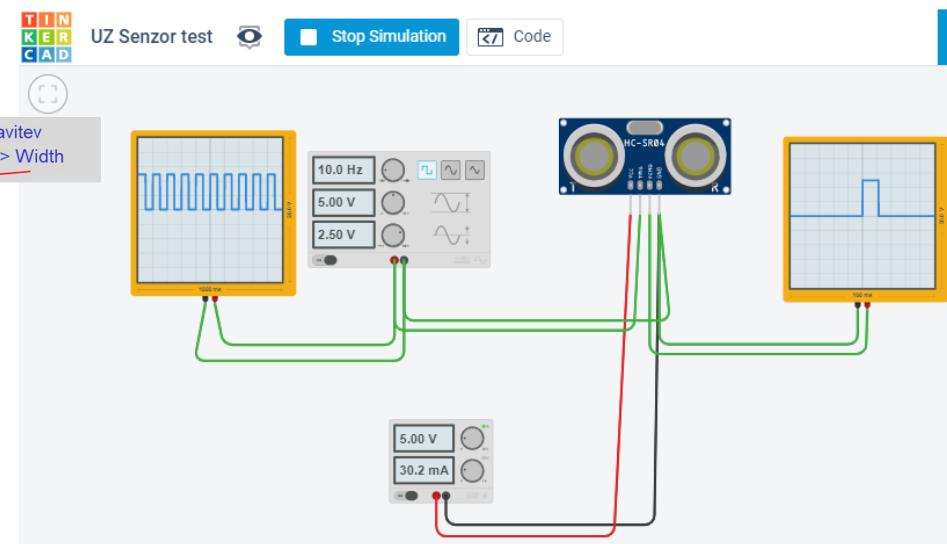


UZ senzor in HC-SR04

LAB Preizkus



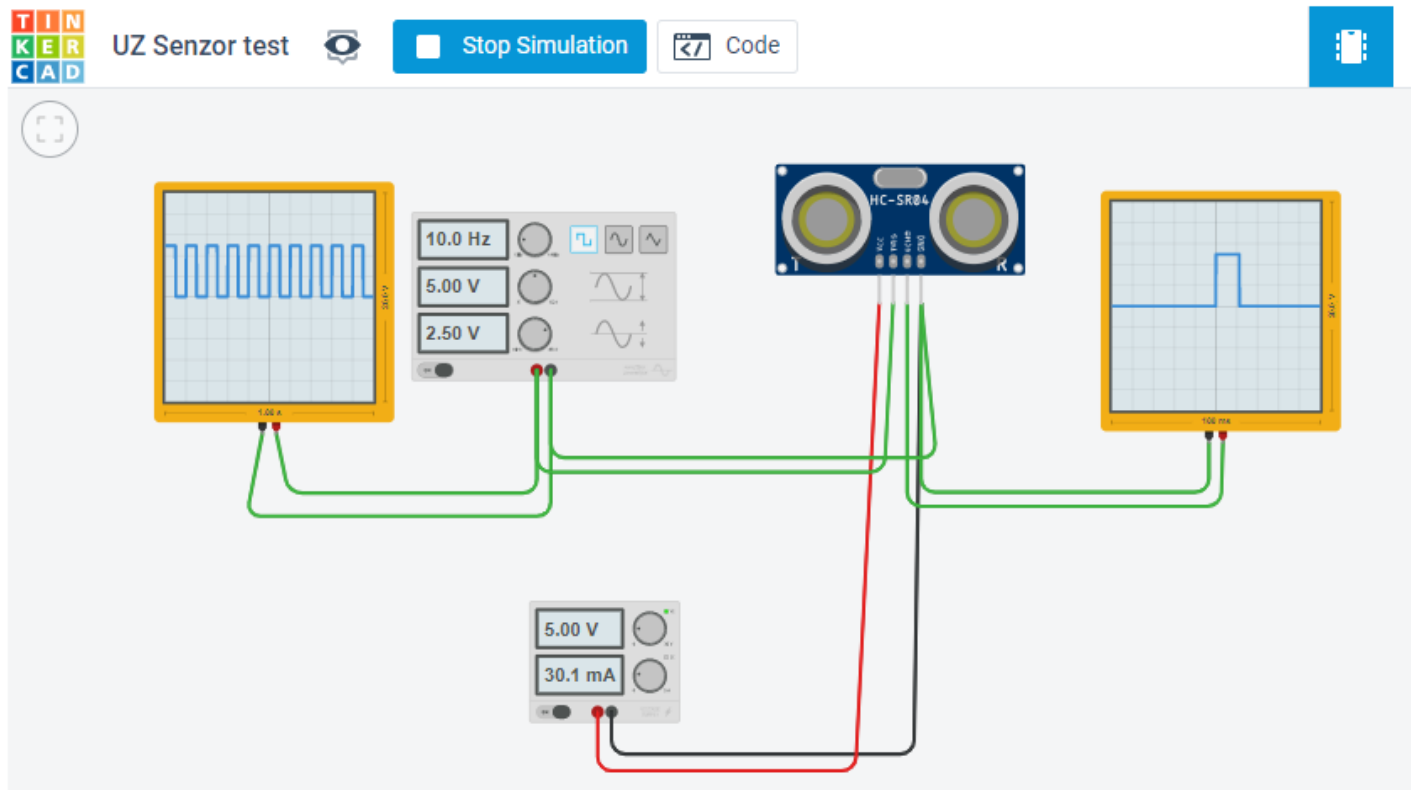
Simulacija



VIN projekt : TinkerCad

UZ tipalo

UZ Senzor test



Z naslova <<https://www.tinkercad.com/things/k6it1PauvwW-uz-senzor-test>>

TinkerCad – viri :

■ Learn how to Tinker

- Sharpen your design and making skills
- Circuits
 - [Starters](#)
 - [Lessons](#)
 - [Projects](#)
- From <<https://www.tinkercad.com/learn/circuits/learning>>

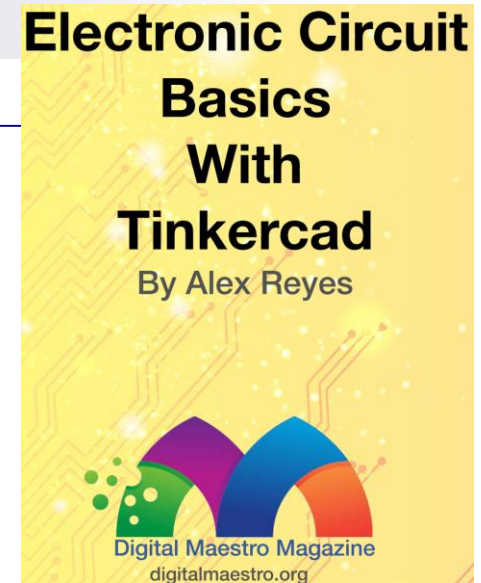
■ Learn how to use Tinkercad to design, build, and test simple circuits.

From <<https://maker.pro/custom/tutorial/how-to-design-and-simulate-circuits-in-tinkercad>>

■ How to design and simulate circuits using Tinkercad | Beginner Level

From <<https://fullyelectronics.com/how-to-design-and-simulate-circuits-using-tinkercad-beginner-level/>>

■ [Electronic Circuit Basics with TinkerCAD 2 \(energiazero.org\)](https://energiazero.org/)



VIN projekt - VP1: Uvod, tipala, TinkerCad osnove

- Uvod v VIN projekt
- Tipala
- Spoznavanje TinkerCad-a
- Domača naloga

TinkerCad – Domača naloga :

- Spada v sklop poročila z LAB vaj
- Naredite sebi zanimivo osnovno vezje(a), še brez uporabe Arduina
- Objavite v OneNote delovnem zvezku
 - Collaboration space, razdelek TinkerCad_Osnova

