Vhodno izhodne naprave

Laboratorijska vaja 2 - VP 2
TinkerCad-Arduino osnove

VIN projekt - VP2: TinkerCad, Breadboard, Arduino

- TinkerCad - ponovitev
- Breadboard – osnovne vezave
- TinkerCad + Arduino
- Domača naloga (DN2-1, DN2-2)

VIN projekt - VP2: TinkerCad, Breadboard, Arduino

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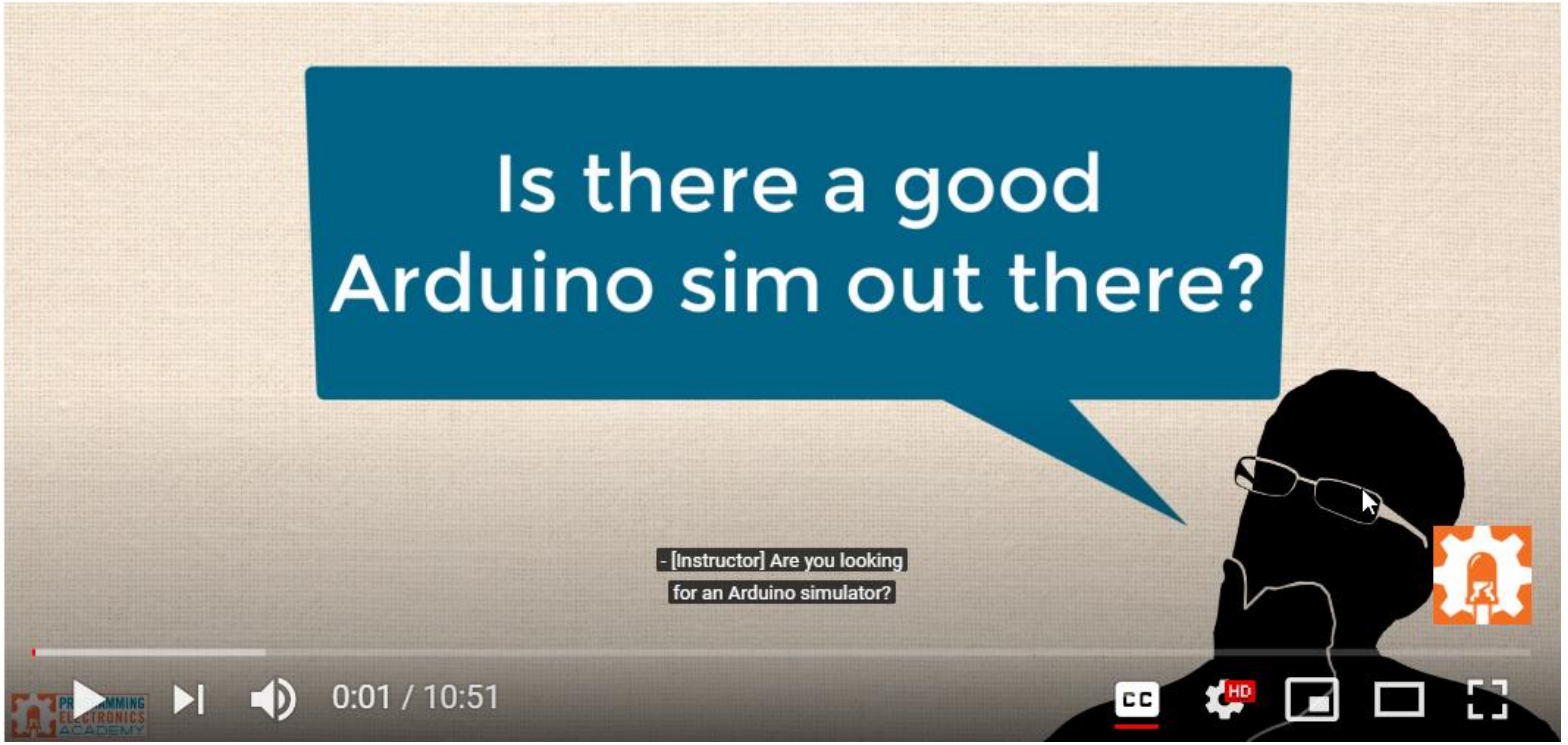
- TinkerCad + Arduino
- Domača naloga

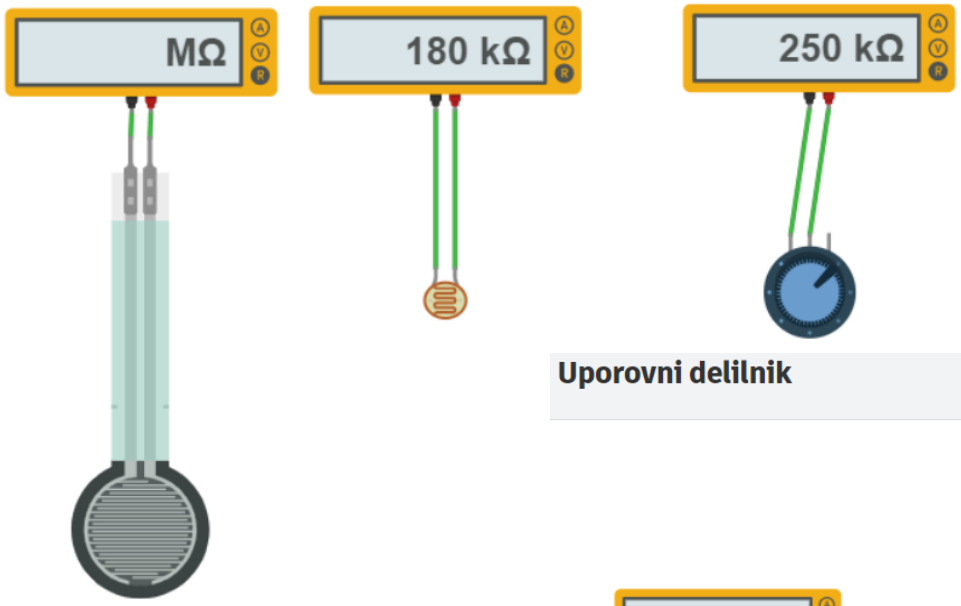
TinkerCad: the Arduino Simulator you've been looking for!



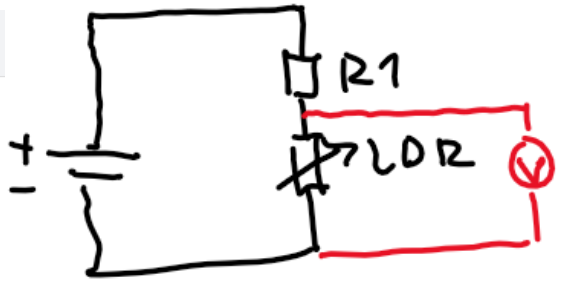
Z naslova <https://www.youtube.com/watch?v=6uz1sCA9joc>

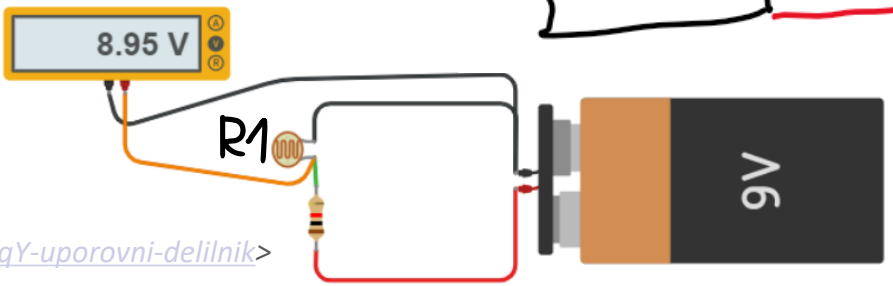
TinkerCad: Uporovna tipala in delilnik napetosti

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



Uporovni delilnik

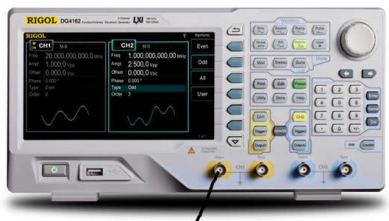


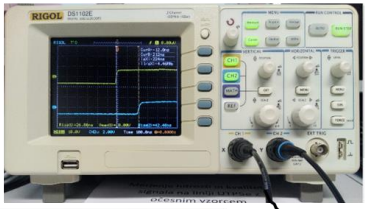


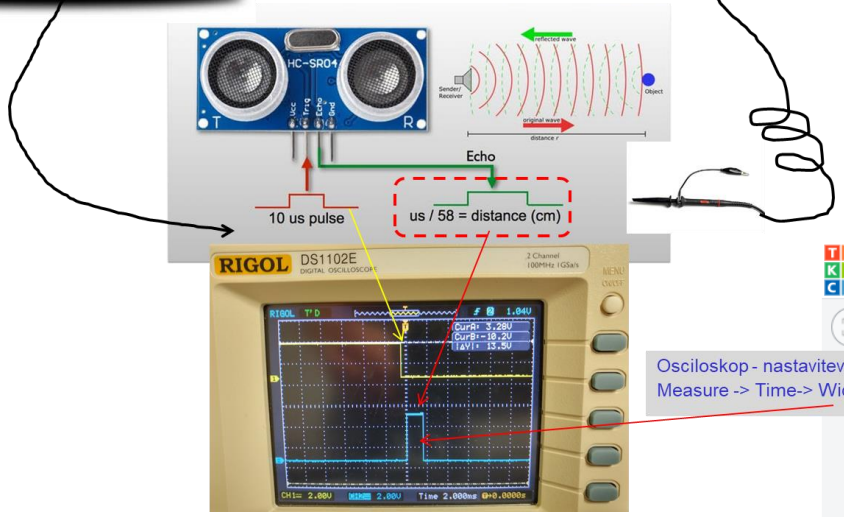
<https://www.tinkercad.com/things/eqKLw5MkQqY-uporovni-delilnik>

UZ senzor in HC-SR04

LAB Preizkus

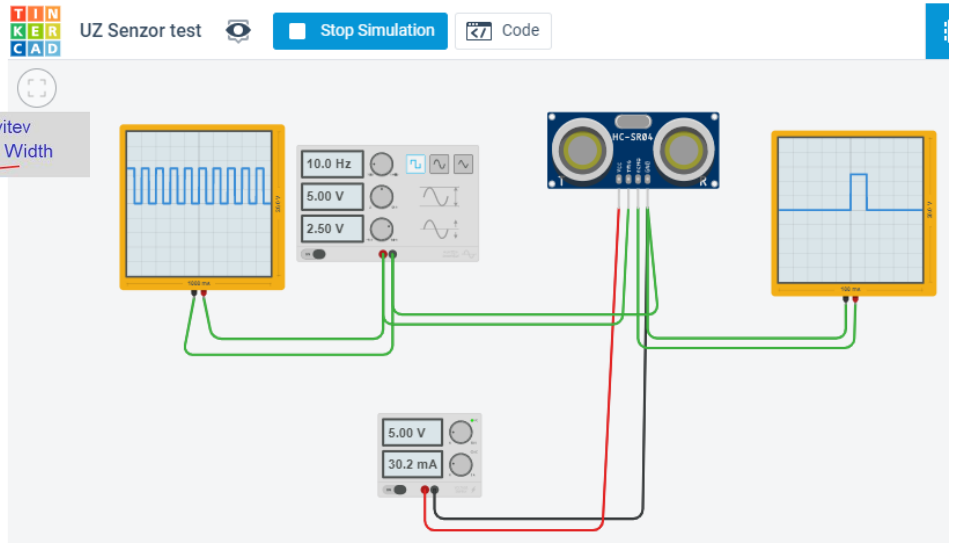






Osciloskop - nastavitev
Measure -> Time-> Width

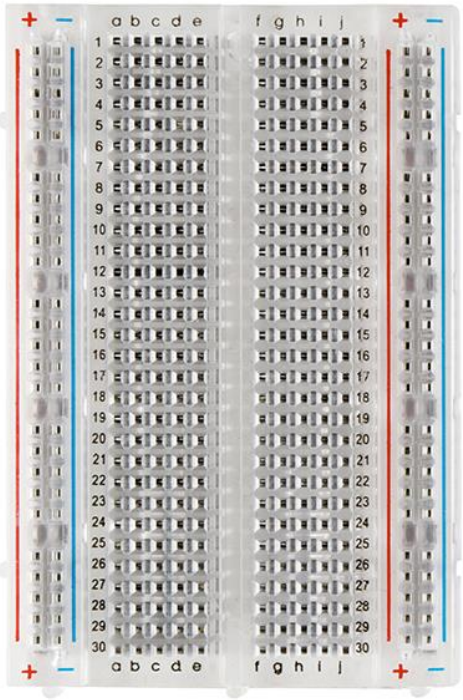
Simulacija - TinkerCad

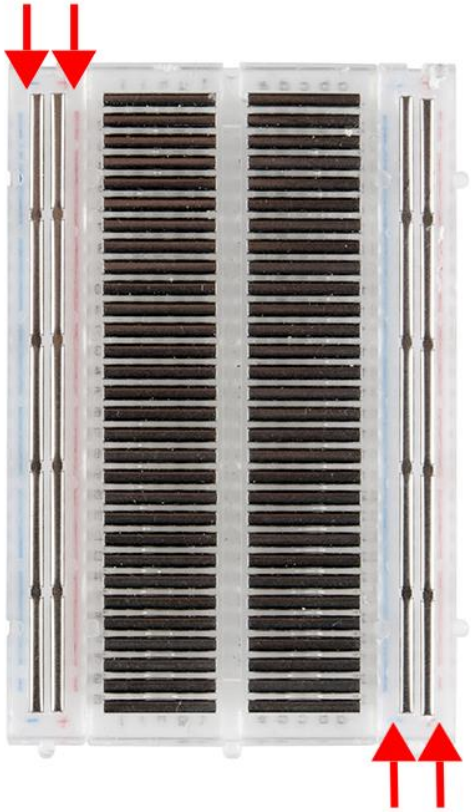


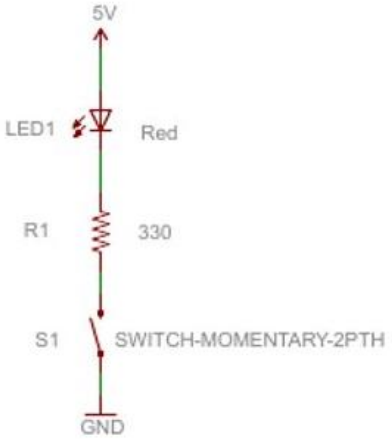
VIN projekt - VP2: TinkerCad, Breadboard, Arduino

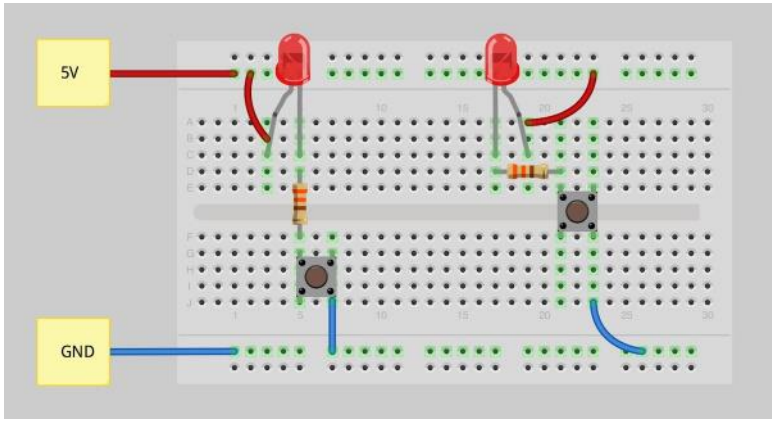
- TinkerCad - ponovitev
- Breadboard – osnovne vezave
- TinkerCad + Arduino
- Domača naloga

VIN projekt : TinkerCad
Breadboard vezave







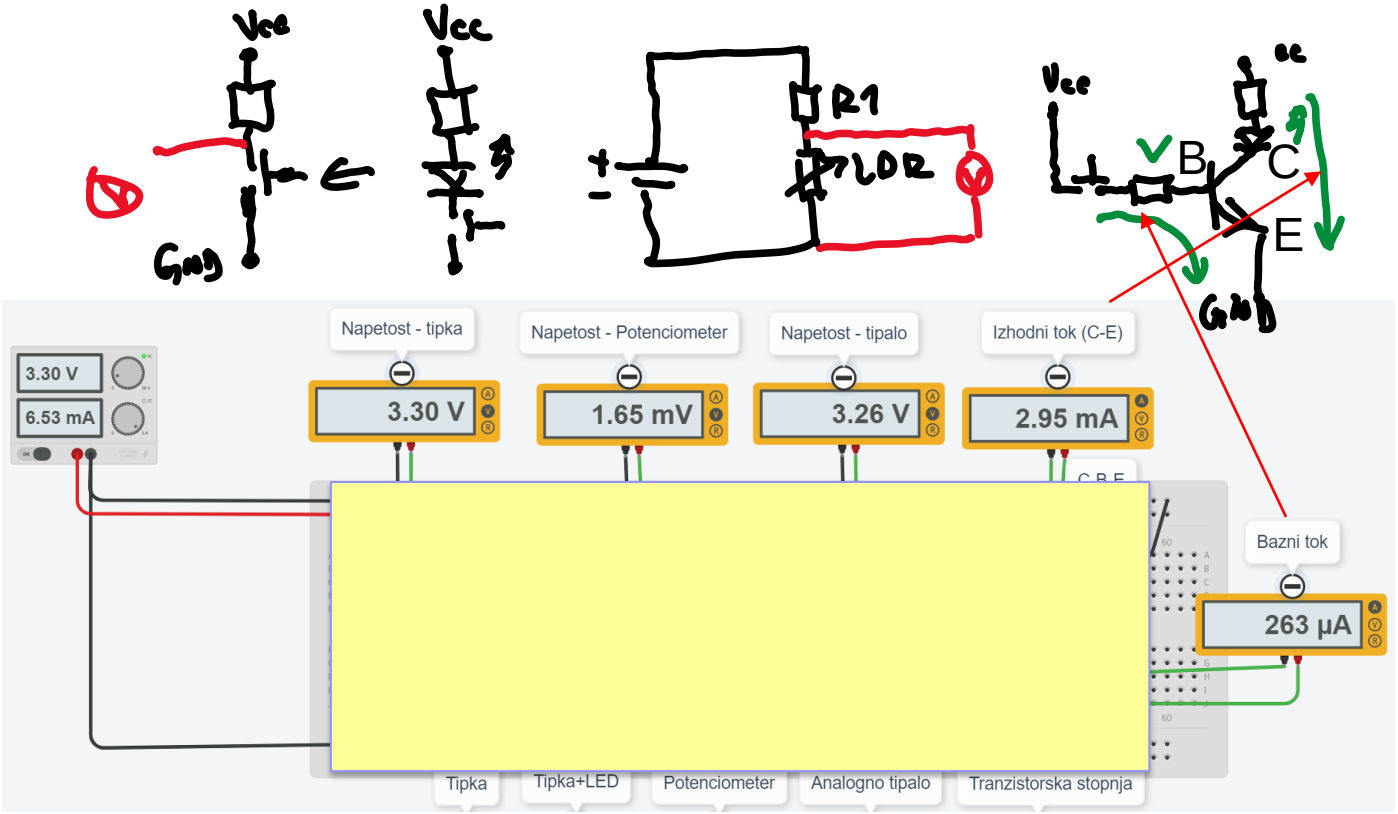


Viri

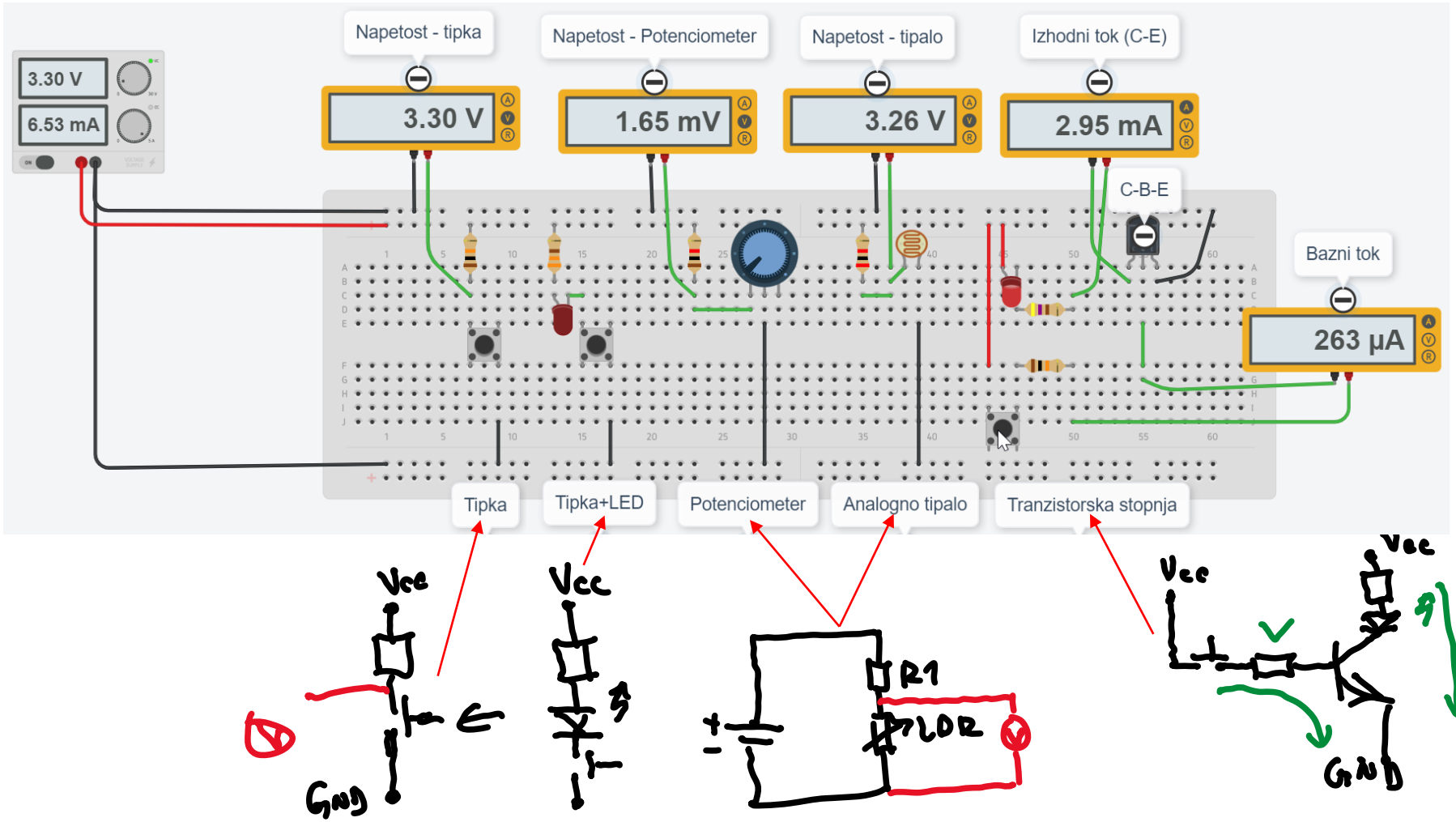
- https://learn.sparkfun.com/tutorials/how-to-use-a-breadboard/
- https://www.sciencebuddies.org/science-fair-projects/references/how-to-use-a-breadboard

VIN projekt : TinkerCad

Breadboard – osnovne vezave

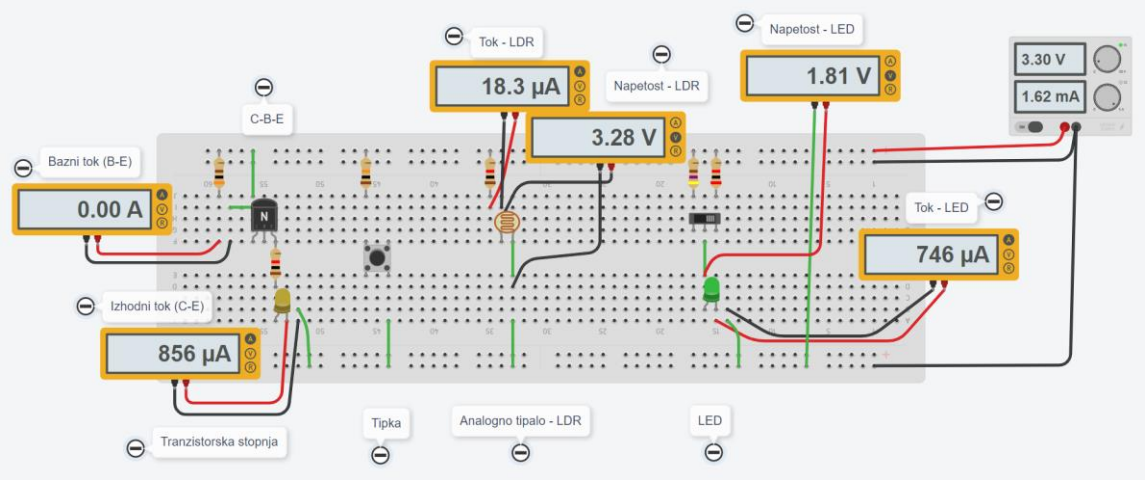


VIN projekt : TinkerCad
Breadboard vezave – Primer rešitve

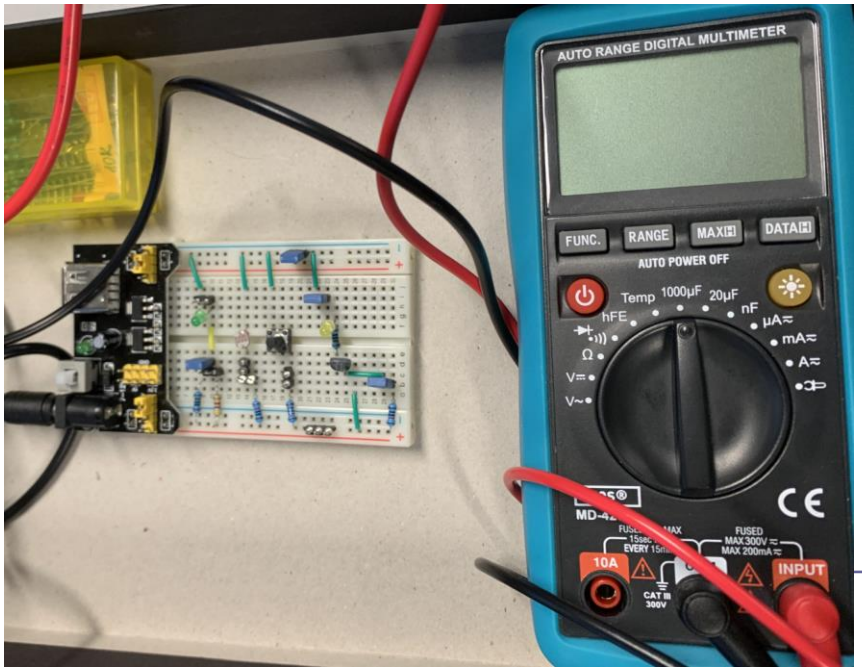


VIN projekt : Breadboard vezave + Unimer

V različnih točkah vezja lahko merimo el. napetost, tok.



https://www.tinkercad.com/things/1UQpxVO5DSY-vin-lab-breadboard-demo

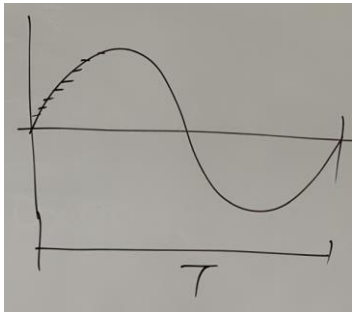


VIN projekt : Breadboard vezave + STM32H7

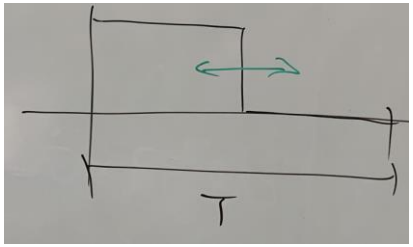
Demo

- Priključitev breadboard-a na STM32H7
- PWM melodije

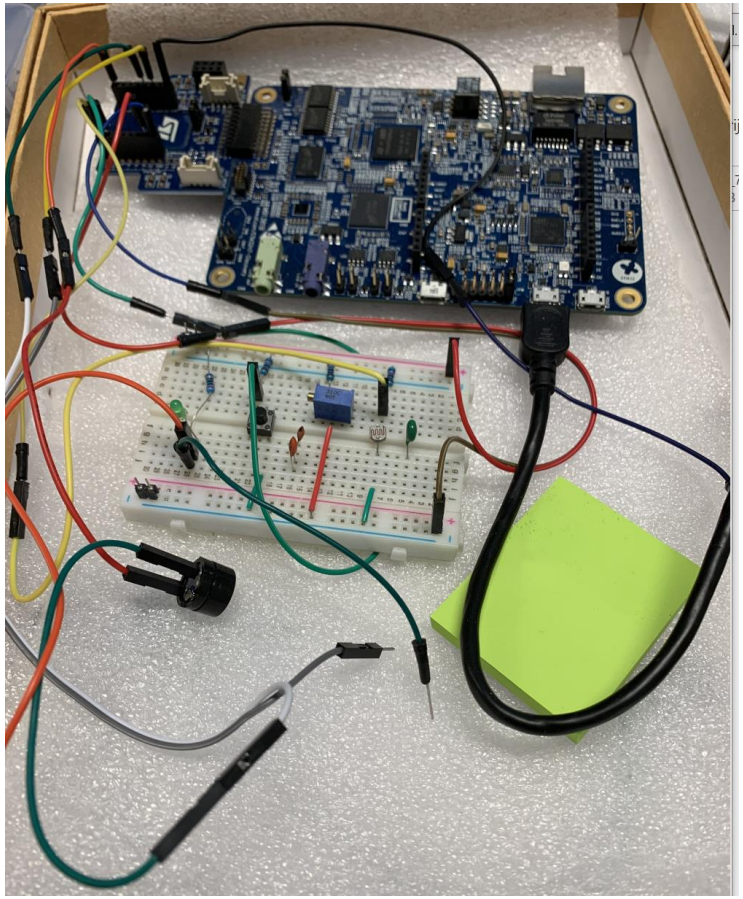
Sinusni signal (ton)



PWM signal (več tonov)



Na brenčaču s pomočjo PWM signala lahko tvorimo melodije



VIN projekt - VP2: TinkerCad, Breadboard, Arduino

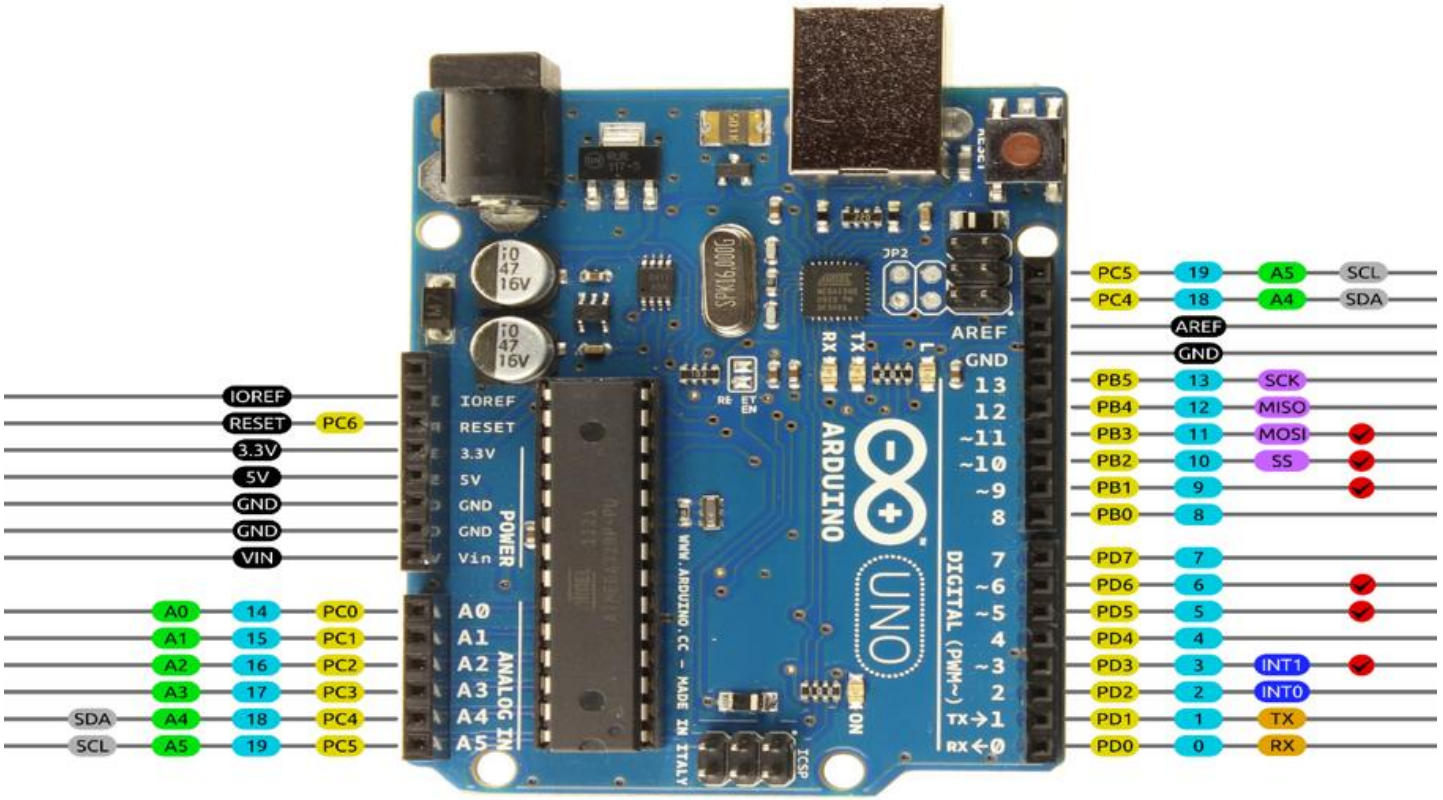
- Spoznavanje TinkerCad-a II.
- Breadboard
- TinkerCad + Arduino
- Domača naloga

ARDUINO HW INTRO

https://academy.programmingelectronics.com/arduino-hardware-basics/

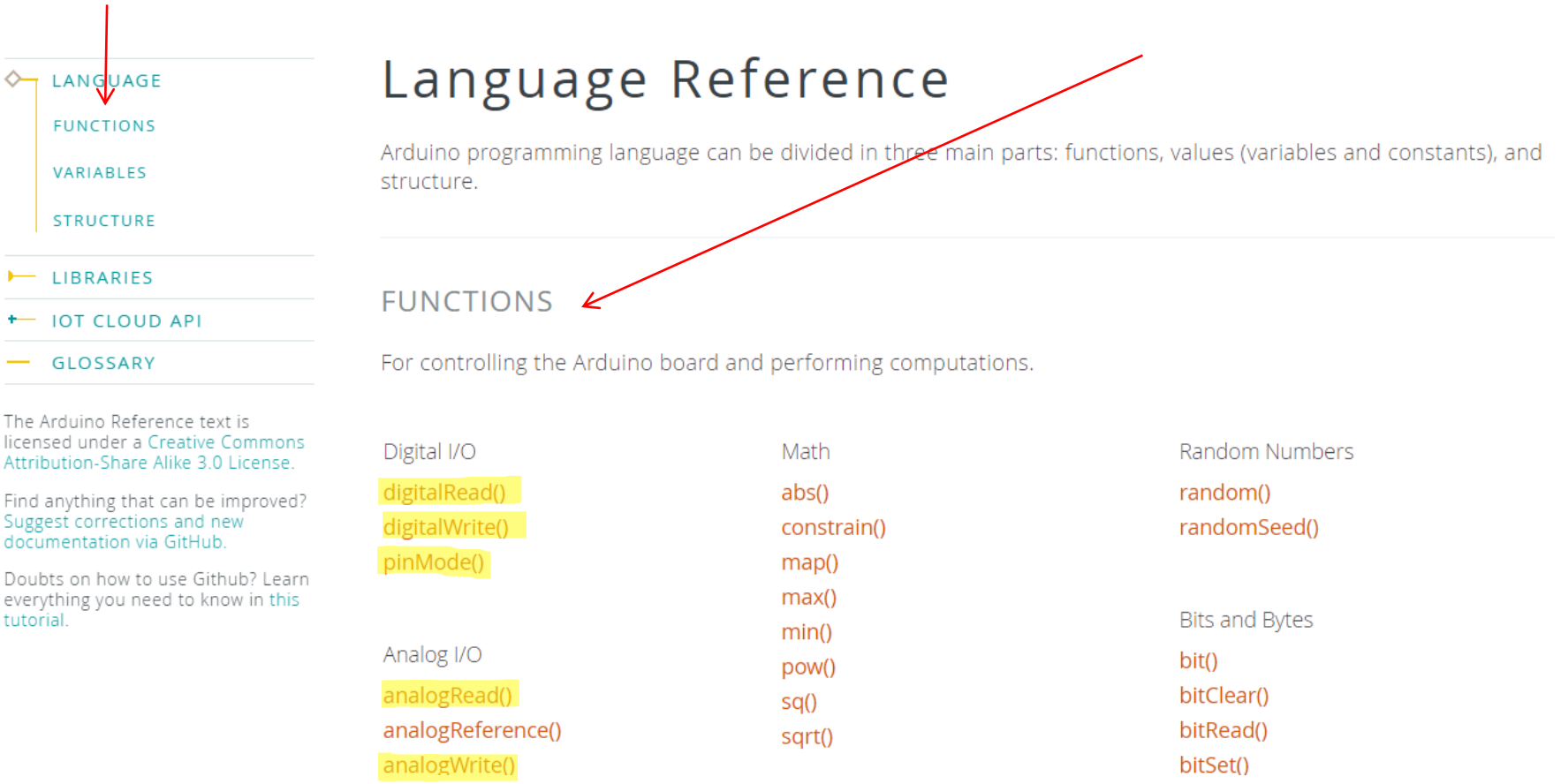
- Arduino :

5V !!!



Arduino – dokumentacija

https://www.arduino.cc/reference/en



TinkerCad – Serijski izpis in vizualizacija

```
void setup()
{
  pinMode(2, INPUT);
  pinMode(A0, INPUT);
  Serial.begin(9600);

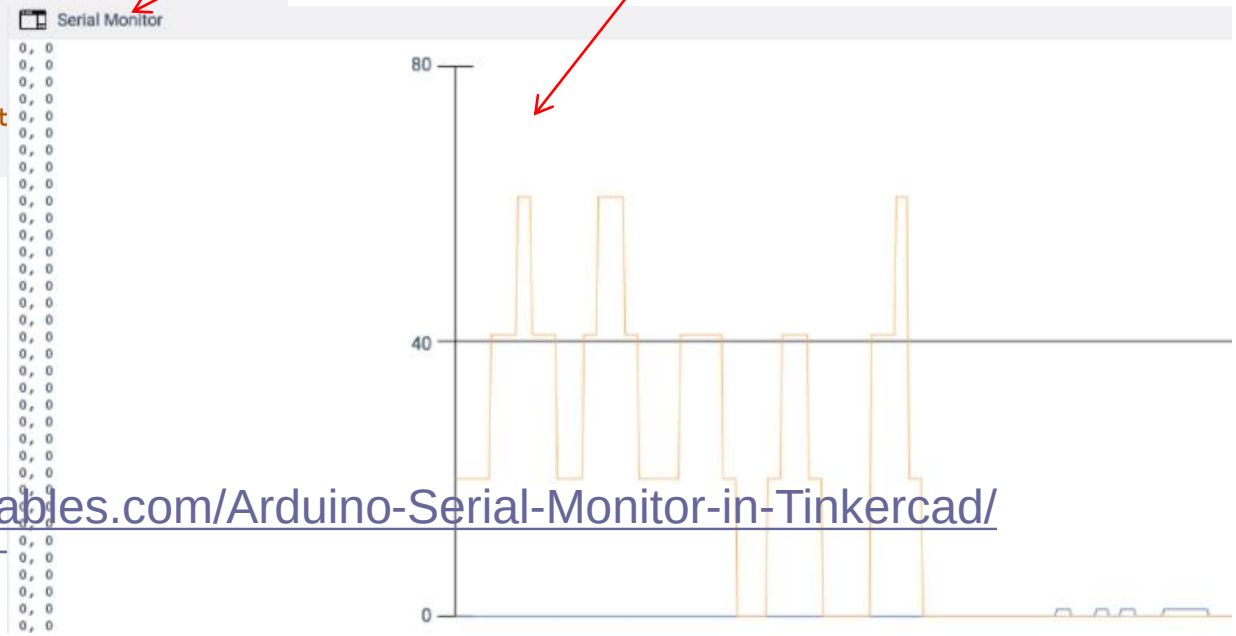
}

void loop()
{
  // read the input pin
  buttonState = digitalRead(2);
  // read the input on analog pin 0:
  sensorValue = analogRead(A0);
  // print values to the serial monitor
  Serial.print(buttonState);
  Serial.print(", ");
  Serial.println(sensorValue);
  delay(10); // Delay a little bit t
}
```

Izpis

Serial Monitor

Vizualizacija

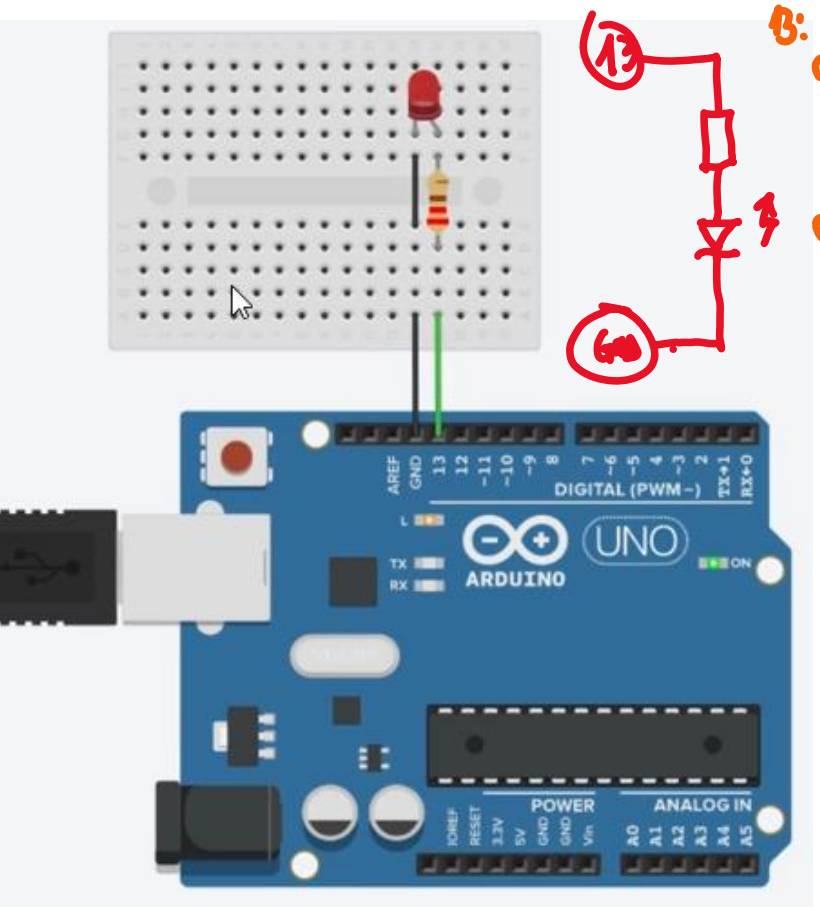


https://www.instructables.com/Arduino-Serial-Monitor-in-Tinkercad/

TinkerCad – razhroščevanje (debugging)

https://www.instructables.com/Arduino-Serial-Monitor-in-Tinkercad/

Preprosto vezje z LED diodo in program



hello_world

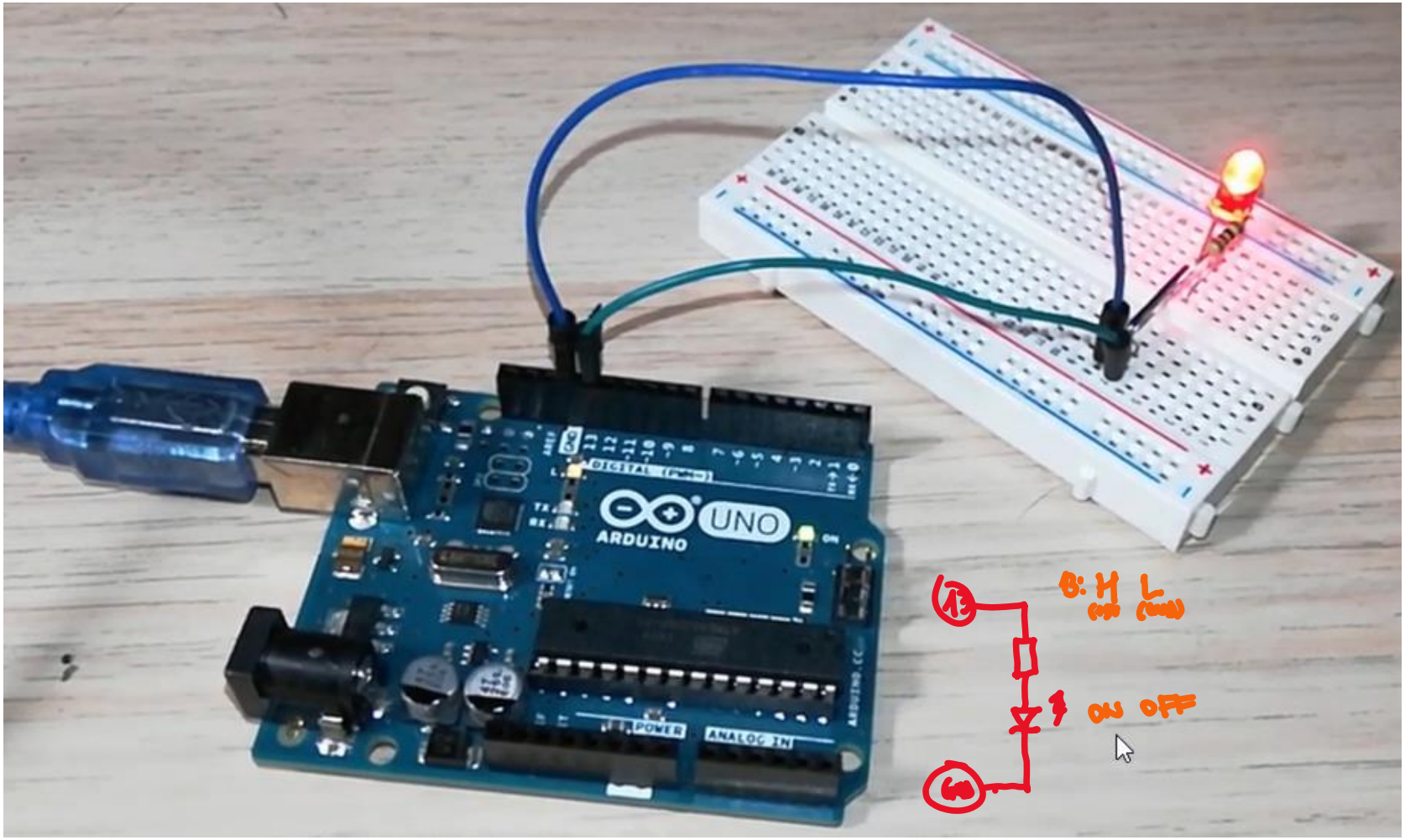
```
/*
  This program blinks pin 13 of the Arduino (the
  built-in LED)
*/

void setup()
{
  pinMode(13, OUTPUT);
}

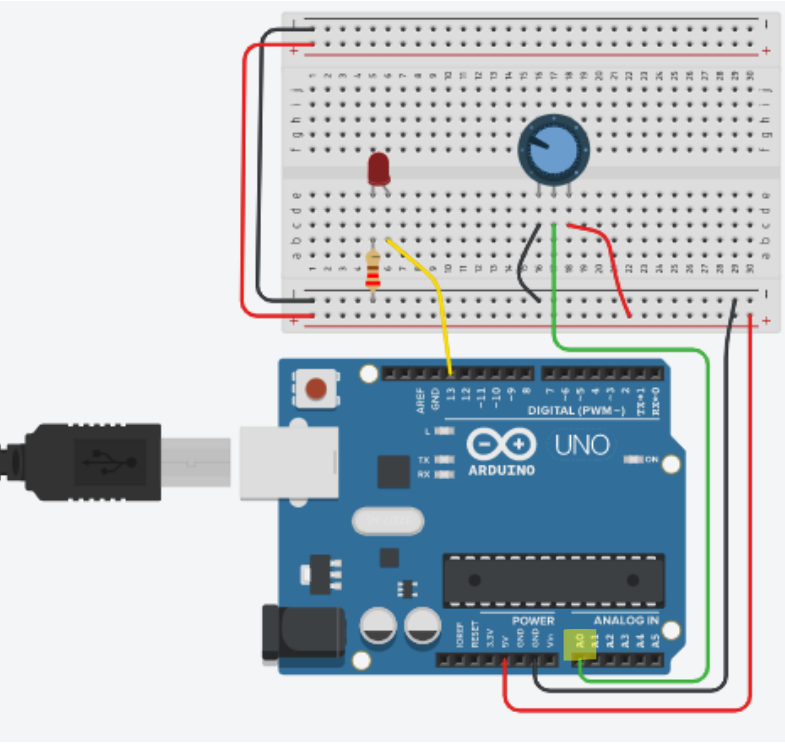
void loop()
{
  // turn the LED on (HIGH is the voltage level)
  digitalWrite(13, HIGH);
  delay(1000); // Wait for 1000 millisecond(s)
  // turn the LED off by making the voltage LOW
  digitalWrite(13, LOW);
  delay(1000); // Wait for 1000 millisecond(s)
}
```

https://www.tinkercad.com/things/IIkRDbp1u2C-vin-arduino-led-dioda

Preprosto vezje z LED diodo



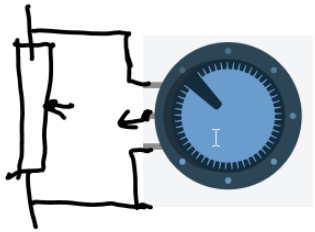
Vezje z uporovnim „tipalom“ (potenciometrom) - ADC



Text

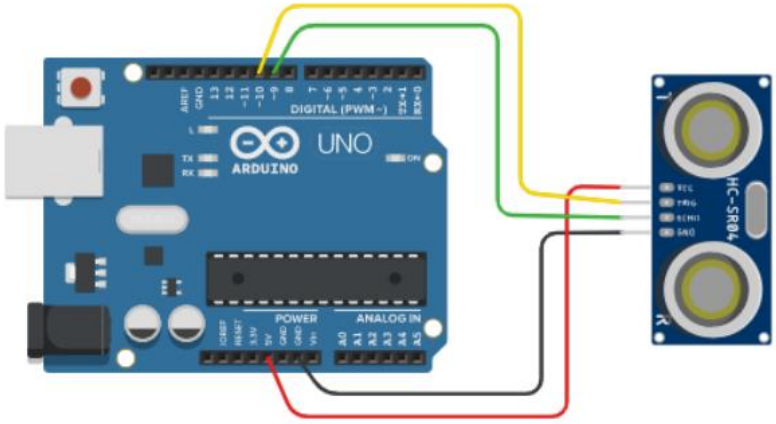
1 (Arduino Uno R3)

```
1  int sensorValue = 0;
2
3  void setup()
4  {
5    pinMode(A0, INPUT);
6    pinMode(13, OUTPUT);
7  }
8
9  void loop()
10 {
11   // read the value from the sensor
12   sensorValue = analogRead(A0);
13   // turn the LED on
14   digitalWrite(13, HIGH);
15   // pause the program for <sensorValue> millseconds
16   delay(sensorValue); // Wait for sensorValue millisecond(s)
17   // turn the LED off
18   digitalWrite(13, LOW);
19   // pause the program for <sensorValue> millseconds
20   delay(sensorValue); // Wait for sensorValue millisecond(s)
21 }
```



VIN Arduino + LED dioda (tinkercad.com)

- Preprosto vezje z UZ tipalom – Časovnik (Timer)



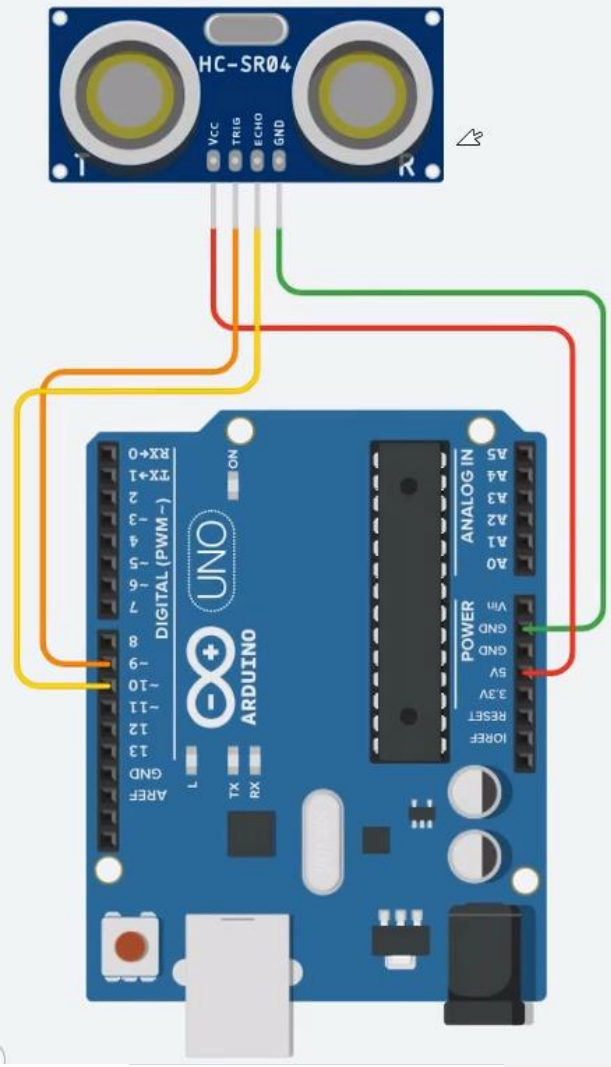
Text

1 (Arduino Uno R3)

```
6  void setup() {
7    Serial.begin(9600);   //Initialize Serial communication
8    pinMode(echo_Pin, INPUT);      //Echo pin as Input
9    pinMode(trigger_Pin, OUTPUT);   //Trigger pin as Output
10 }
11
12 void loop() {
13   digitalWrite(trigger_Pin, LOW); //Make Trigger pin Low at start
14   delay(1);
15   digitalWrite(trigger_Pin, HIGH);
16   delayMicroseconds(10);  //Make Trigger pin High for 10 uS to st
17   digitalWrite(trigger_Pin, LOW);
18   duration = pulseIn(echo_Pin, HIGH);  //Save the time it took ul
19 //  distance = duration * 0.017; //((340*100)/10e6)/2
20   distance = duration / 58; //((340*100)/10e6)/2
21 /* Speed of the sound in Air = 340 m/S
22  * multiply it by 100 to get the data in cm
23  * divide by 1,000,000 as duration is measured in microseconds
24  * divide by 2 as ultrasound signal travels to object and comes b
25  */
26   Serial.print("Distance (cm) : ");
27   Serial.println(distance);
```

https://www.tinkercad.com/things/kAIkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor

Vezje z ultrazvočnim senzorjem SR04




```
const byte trigger_Pin = 9;  //Initialize I/O pins
const byte echo_Pin = 10;
unsigned long duration;  //Since PulseIn return an unsigned Long
unsigned int distance;  //To save the distance

void setup() {
    Serial.begin(9600);   //Initialize Serial communication
    pinMode(echo_Pin, INPUT);      //Echo pin as Input
    pinMode(trigger_Pin, OUTPUT);   //Trigger pin as Output
}

void loop() {
    digitalWrite(trigger_Pin, LOW); //Make Trigger pin Low at start
    delay(1);
    digitalWrite(trigger_Pin, HIGH);
    delayMicroseconds(10);  //Make Trigger pin High for 10 uS to start sending the pulse
    digitalWrite(trigger_Pin, LOW);

   duration = pulseIn(echo_Pin, HIGH);  //Save the time it took ultrasonic wave to come back
   distance = duration * 0.017; //((340*100)/10e6)/2
  /* Speed of the sound in Air = 340 m/s,  multiply it by 100 to get the data in cm
    * divide by 1,000,000 as duration is measured in microseconds
    * divide by 2 as ultrasound signal travels to object and comes back
   */
    Serial.print("Distance (cm) : ");
    Serial.println(distance);
    delay(100);
}
```

Serial Monitor

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


https://www.tinkercad.com/things/kAIkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor

Vezje z ultrazvočnim senzorjem SR04 - program

```
const byte trigger_Pin = 9;  //Initialize I/O pins
const byte echo_Pin = 10;
unsigned long duration;  //Since PulseIn return an unsigned Long
unsigned int distance;  //To save the distance

void setup() {
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   pinMode(echo_Pin, INPUT);      //Echo pin as Input
   pinMode(trigger_Pin, OUTPUT);   //Trigger pin as Output
}

void loop() {
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   delay(1);
   digitalWrite(trigger_Pin, HIGH);
   delayMicroseconds(10);  //Make Trigger pin High for 10 uS to start sending the pulse
   digitalWrite(trigger_Pin, LOW);

   duration = pulseIn(echo_Pin, HIGH);  //Save the time it took ultrasonic wave to come back
   distance = duration * 0.017; //((340*100)/10e6)/2
  /* Speed of the sound in Air = 340 m/s,  multiply it by 100 to get the data in cm
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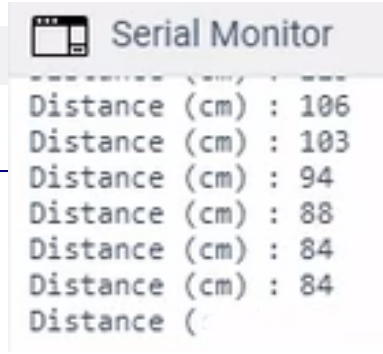
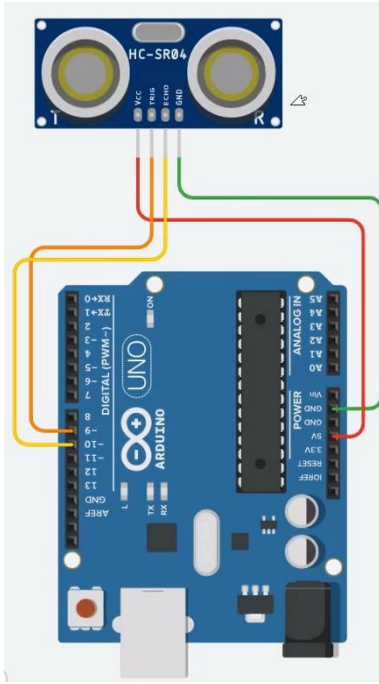
   * divide by 2 as ultrasound signal travels to object and comes back
  */
   Serial.print("Distance (cm) : ");
   Serial.println(distance);
   delay(100);
}
```





https://www.tinkercad.com/things/kAIkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor

Vezje z ultrazvočnim senzorjem SR04 - program

```
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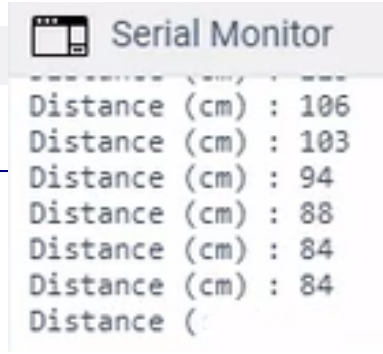
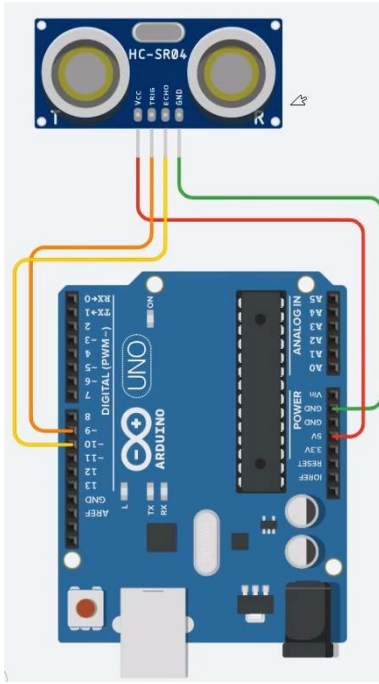
    delay(1);
    digitalWrite(trigger_Pin, HIGH);
    delayMicroseconds(10);  //Make Trigger pin High for 10 uS to start sending the pulse
    digitalWrite(trigger_Pin, LOW);

   duration = pulseIn(echo_Pin, HIGH);  //Save the time it took ultrasonic wave to come back
   distance = duration * 0.017; //((340*100)/10e6)/2
  /* Speed of the sound in Air = 340 m/s,  multiply it by 100 to get the data in cm
   * divide by 1,000,000 as duration is measured in microseconds
   * divide by 2 as ultrasound signal travels to object and comes back
  */
    Serial.print("Distance (cm) : ");
    Serial.println(distance);
    delay(100);
}
```





https://www.tinkercad.com/things/kAIkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor

Vezje z ultrazvočnim senzorjem SR04 - program

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    Serial.begin(9600);   //Initialize Serial communication
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}

void loop() {
    digitalWrite(trigger_Pin, LOW); //Make Trigger pin Low at start
    delay(1);
    digitalWrite(trigger_Pin, HIGH);
    delayMicroseconds(10);  //Make Trigger pin High for 10 uS to start sending the pulse
    digitalWrite(trigger_Pin, LOW);

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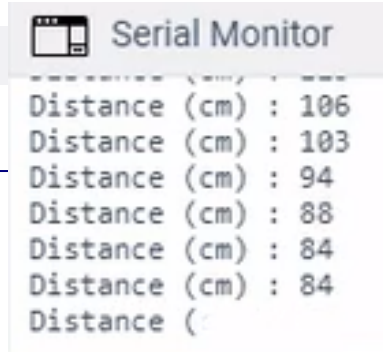
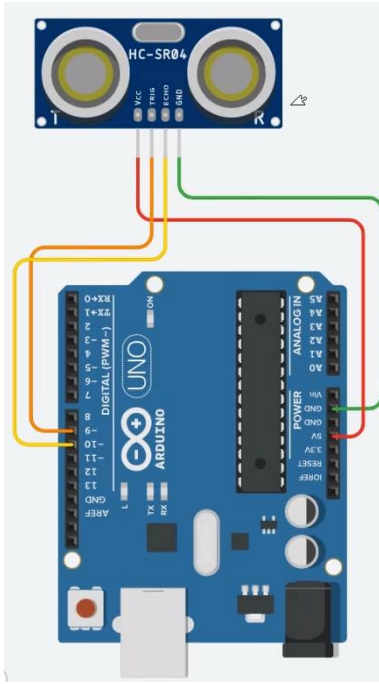
   distance = duration * 0.017; //((340*100)/10e6)/2
  /* Speed of the sound in Air = 340 m/s,  multiply it by 100 to get the data in cm
   * divide by 1,000,000 as duration is measured in microseconds
   * divide by 2 as ultrasound signal travels to object and comes back
  */
    Serial.print("Distance (cm) : ");
    Serial.println(distance);
    delay(100);
}
```





https://www.tinkercad.com/things/kAIkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor

Vezje z ultrazvočnim senzorjem SR04 - program

```
const byte trigger_Pin = 9;  //Initialize I/O pins
const byte echo_Pin = 10;
unsigned long duration;  //Since PulseIn return an unsigned Long
unsigned int distance;  //To save the distance

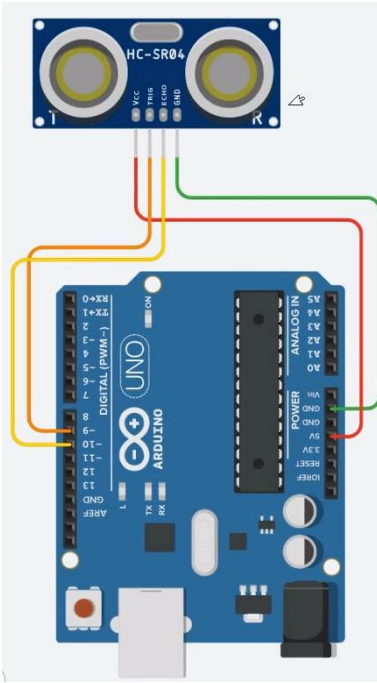
void setup() {
    Serial.begin(9600);   //Initialize Serial communication
    pinMode(echo_Pin, INPUT);      //Echo pin as Input
    pinMode(trigger_Pin, OUTPUT);   //Trigger pin as Output
}

void loop() {
    digitalWrite(trigger_Pin, LOW); //Make Trigger pin Low at start
    delay(1);
    digitalWrite(trigger_Pin, HIGH);
    delayMicroseconds(10);  //Make Trigger pin High for 10 uS to start sending the pulse
    digitalWrite(trigger_Pin, LOW);

    duration = pulseIn(echo_Pin, HIGH);  //Save the time it took ultrasonic wave to come back
    distance = duration * 0.017; //((340*100)/10e6)/2   or    duration/58
   /* Speed of the sound in Air = 340 m/s,  multiply it by 100 to get the data in cm
    * divide by 1,000,000 as duration is measured in microseconds
    * divide by 2 as ultrasound signal travels to object and comes back
    */
    Serial.print("Distance (cm) : ");
    Serial.println(distance);
    delay(100);
}
```

Serial Monitor

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



Distance (cm) = Measured Echo Time (in µsec)/58
Distance (inch) = Measured Echo Time (in µsec)/148

https://www.tinkercad.com/things/kAIkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor

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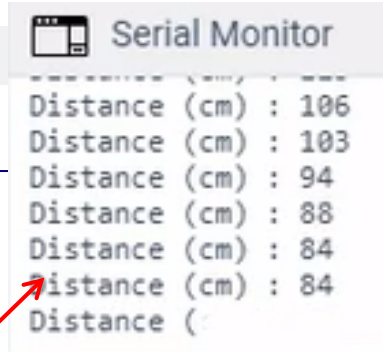
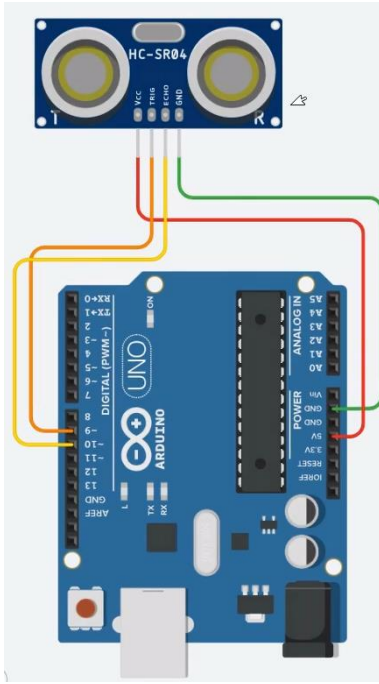
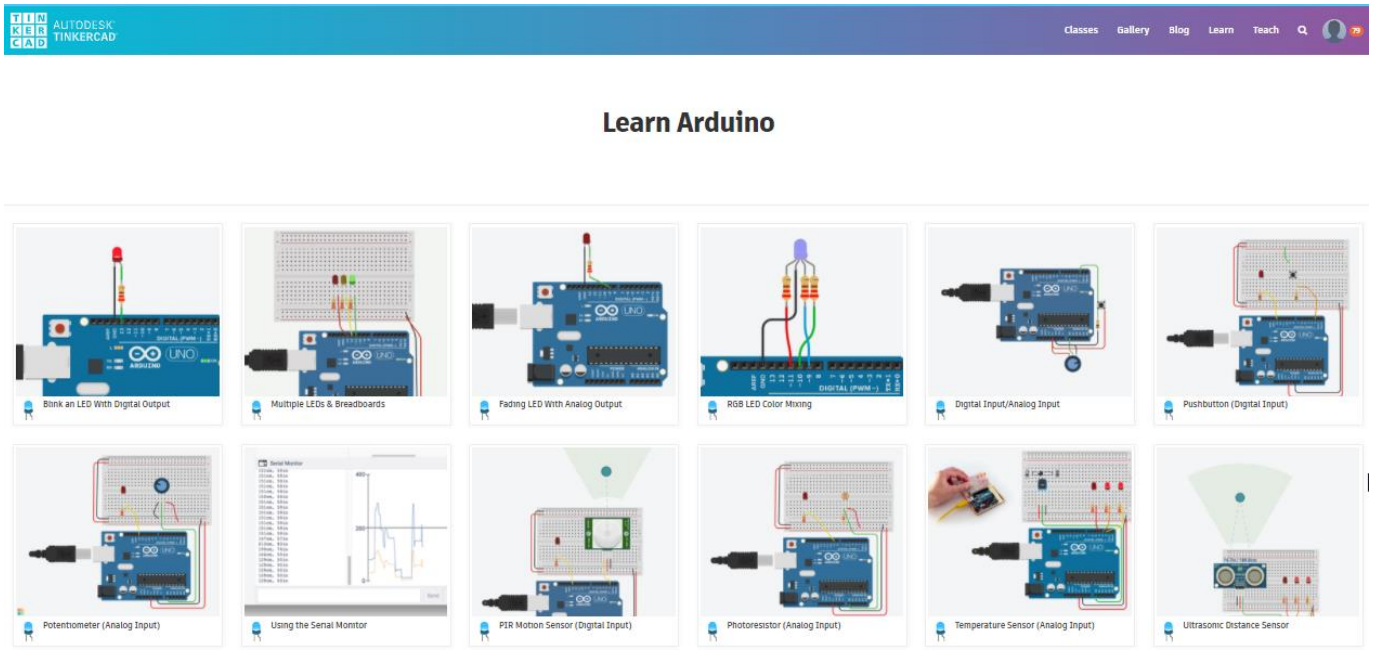




https://www.tinkercad.com/things/kAIkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor

- Viri – TinkerCad + Arduino :
  - GitHub :
    - https://github.com/LAPSyLAB/Arduino_projects
  - TinkerCad – Learn – Arduino
    - https://www.tinkercad.com/learn/circuits/projects



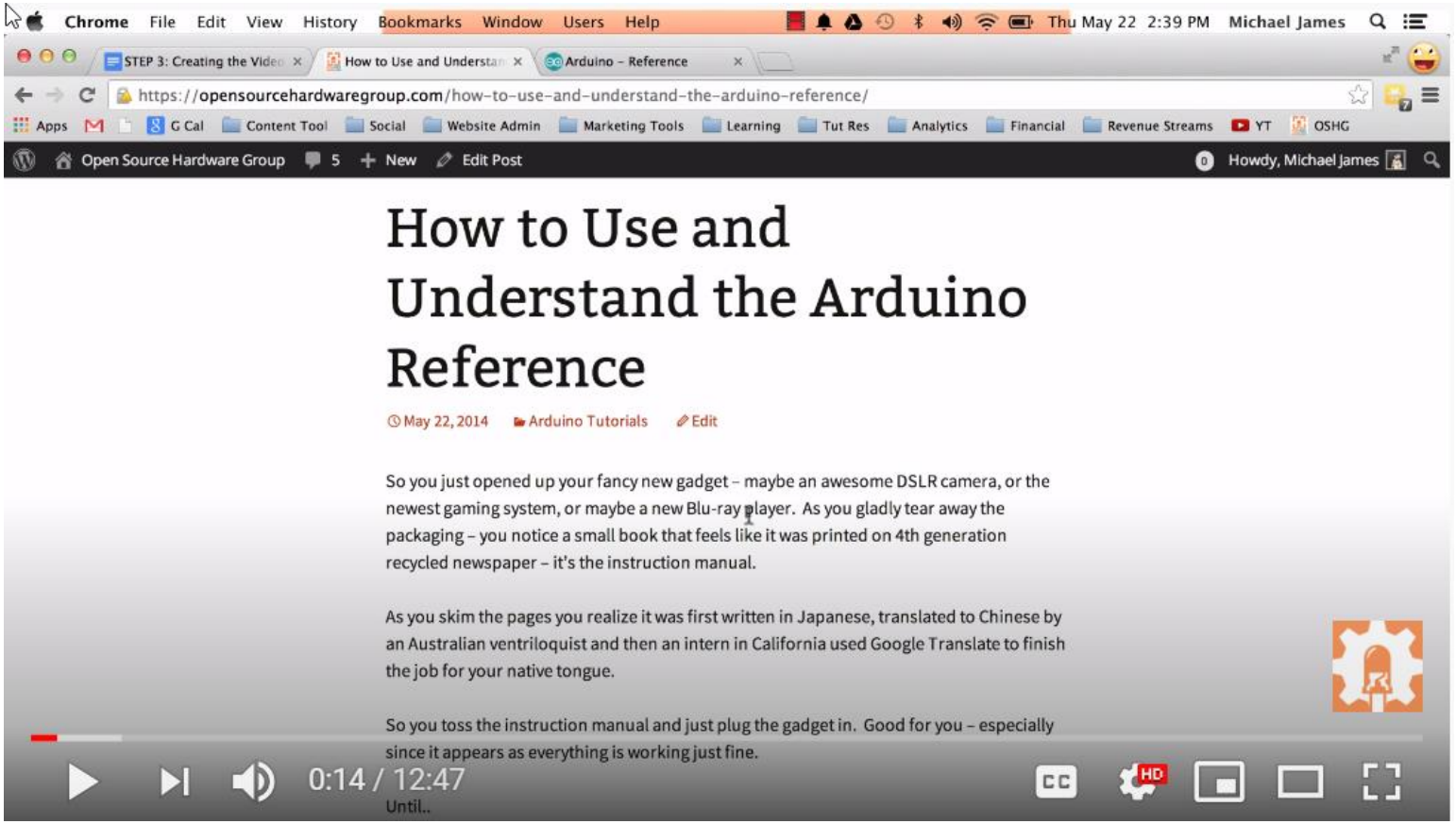
Dodatni viri (po potrebi) :

- GET STARTED PROGRAMMING ARDUINO TODAY!
  - **Learn the 2 most important Arduino programming functions**
  - **Get familiar with Arduino coding**
  - **Understand your Arduino hardware**
  - **Learn the Arduino software setup**
  - **12 engaging video lessons**
  - Z naslova <https://www.programmingelectronics.com/arduino-crash-course/>
- **Coursera: Interfacing with the Arduino**
  - University of California, Irvine
  - Z naslova <https://www.coursera.org/lecture/interface-with-arduino/module-1-introduction-video-VgZmt>

Poglobljena gradiva

- How to Use and Understand the Arduino Reference :: Open Source Hardware Group Arduino Tutorials
  - Z naslova <https://www.youtube.com/watch?time_continue=739&v=f3h4pV_B2Dg&feature=emb_logo>
- LED Blinking code with and without using Arduino library
  - Z naslova <http://electronicswithyou.com/arduino/led-blinking-code-with-and-without-using-arduino-library/>

How to Use and Understand the Arduino Reference (neobvezno)

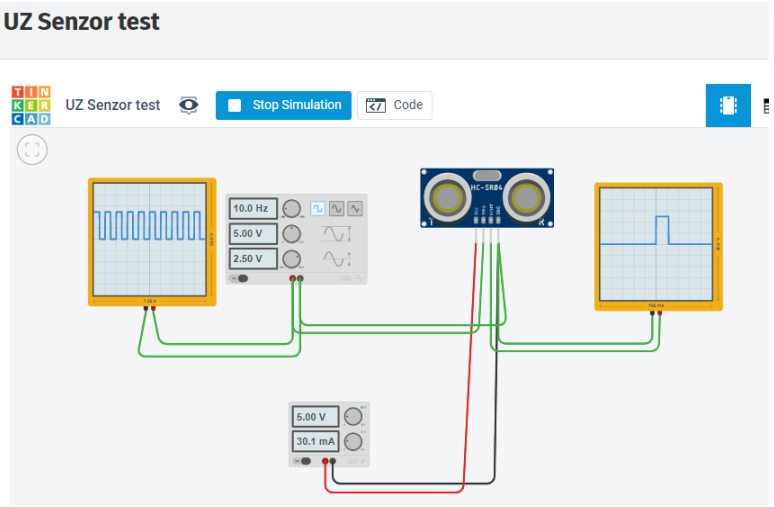


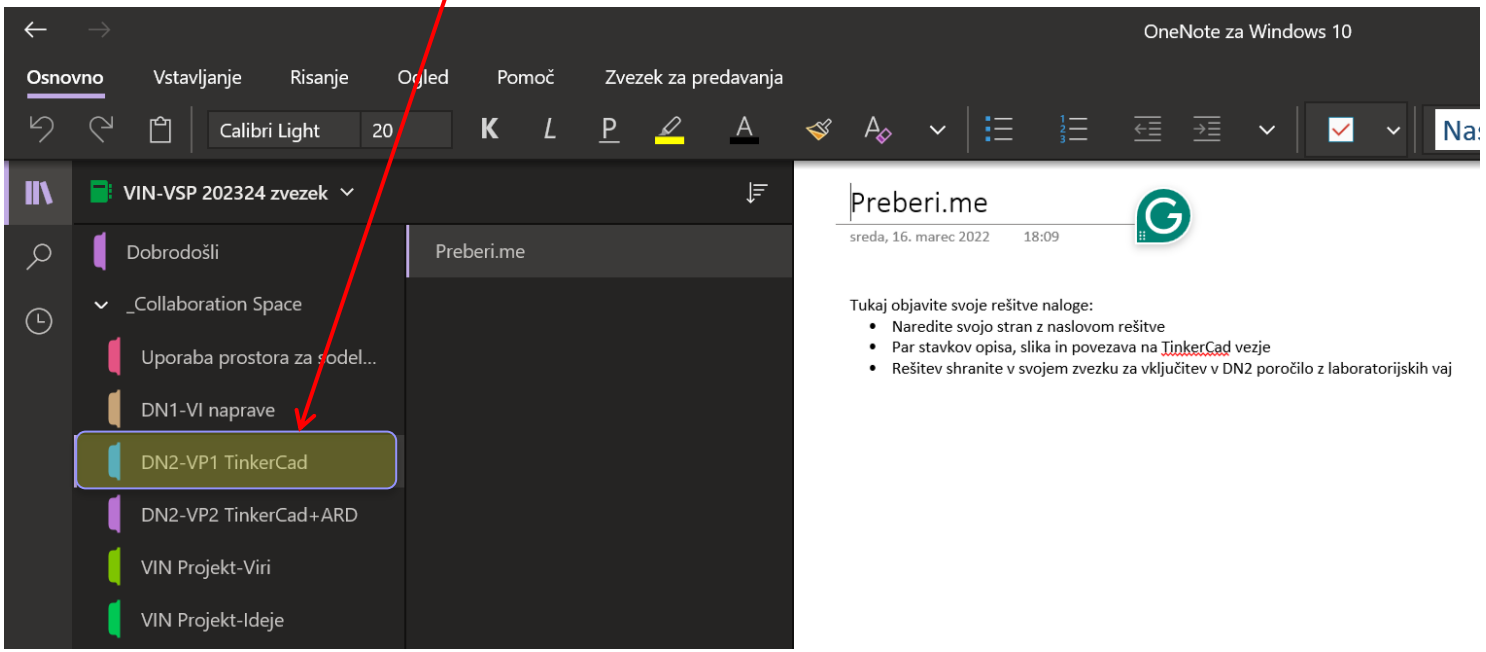
VIN projekt - VP2: TinkerCad, Breadboard, Arduino

- TinkerCad - ponovitev
- Breadboard – osnovne vezave
- TinkerCad + Arduino
- Domača naloga

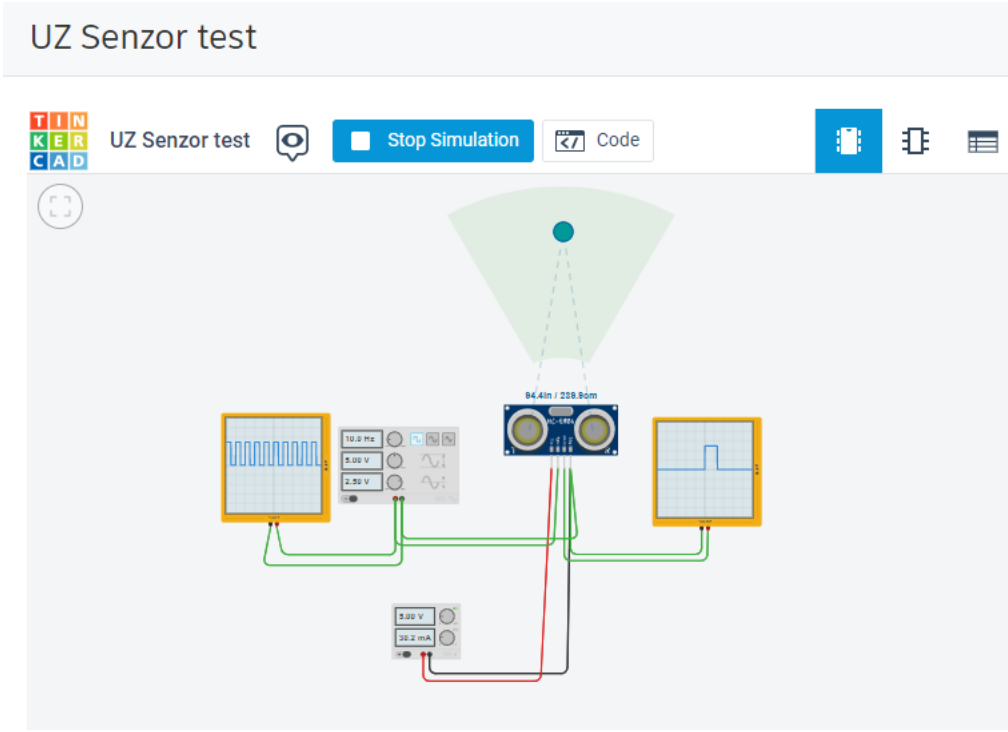
TinkerCad – DN2-VP1 :

- Spada v sklop poročila z LAB vaj (DN2)
- Naredite sebi zanimivo osnovno vezje(a),
  - še brez uporabe mikrokrmilnika (Arduino)
- Objavite v OneNote delovnem zvezku
  - _Prostor za sodelovanje, razdelek DN2-VP1 TinkerCad_Osnova





TinkerCad – DN2-VP1: Primer zapisa (objave)



Preprosto vezje za preizkus delovanja UZ tipala razdalje

Sestavni deli:

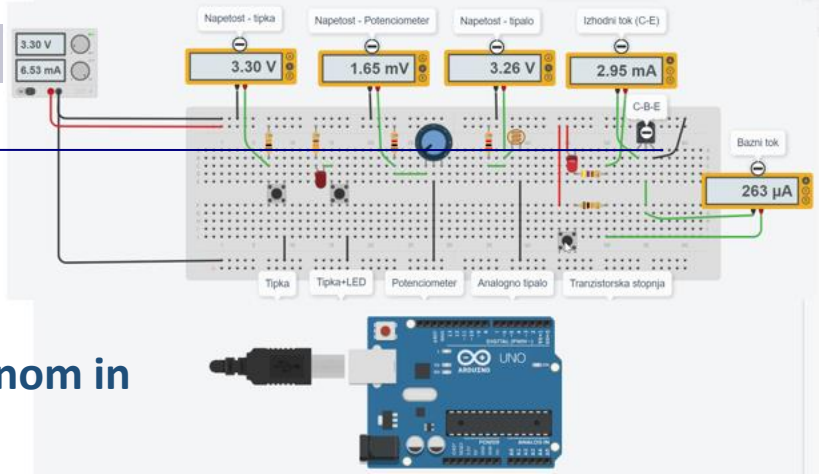
- Napajalnik skrbi za napajanje tipala
- Generator pravokotnega signala proži Trigger vhod tipala, da sproži oddajo UZ signala
- Osciloskop prikaže izhod tipala, ki s širino pulza ponazarja oddaljenost objekta oziroma čas potovanja signala do objekta in nazaj

Opis delovanja:

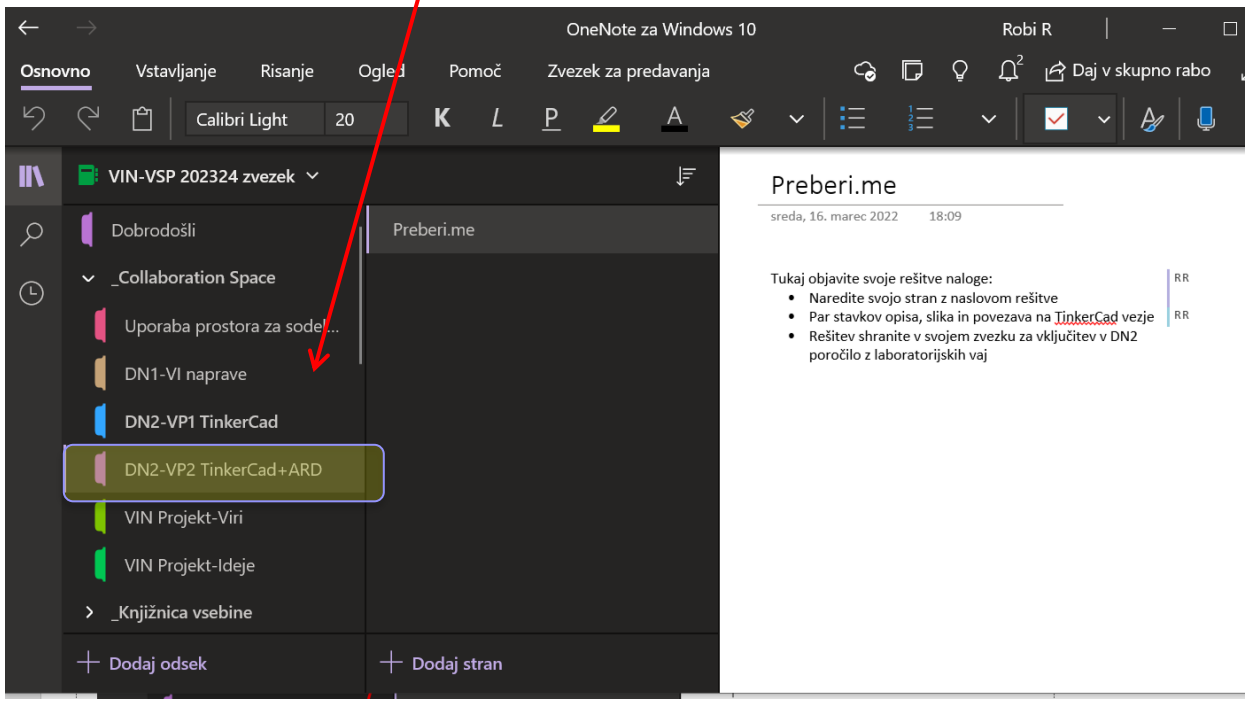
Interaktivno se lahko z miško spreminja pozicija oziroma oddaljenost objekta, kar se odrazi na širini impulza na izhodu UZ tipala (osciloskop).

https://www.tinkercad.com/things/k6it1PauvwW

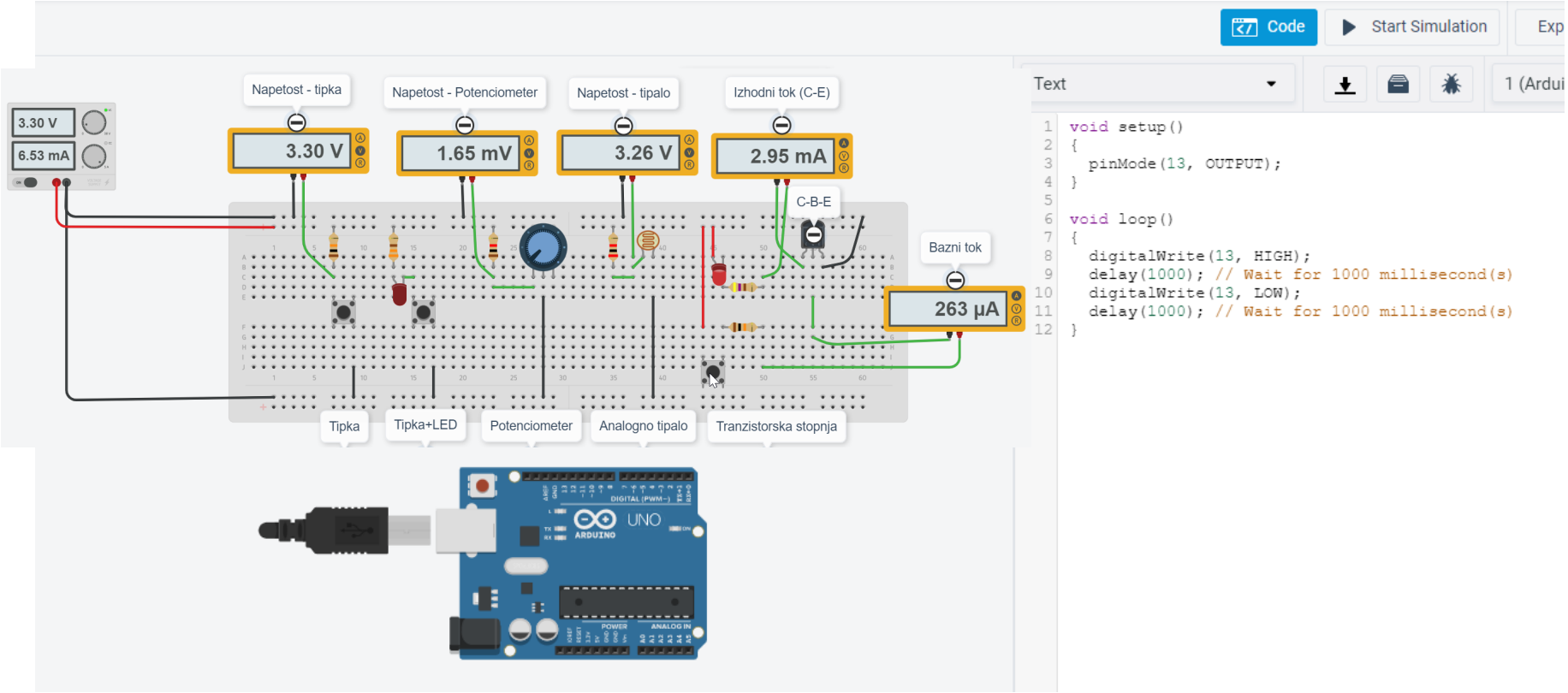
TinkerCad – DN2-VP2:



- **Spada v sklop poročila z LAB vaj**
- **Naredite sebi zanimivo osnovno vezje(a) z Arduinom in ustrezno kodo**
- **Objavite v OneNote delovnem zvezku**
  - **_Prostor za sodelovanje, razdelek DN2-2 TinkerCad+Arduino**



TinkerCad – Domača naloga DN2-VP2:



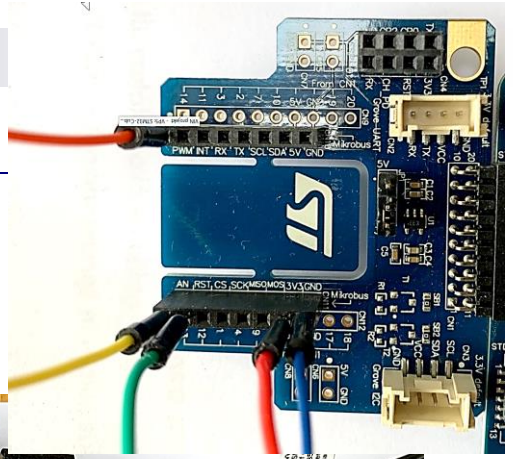
Napoved LAB vaje VP5: Breadboard + STM32H7

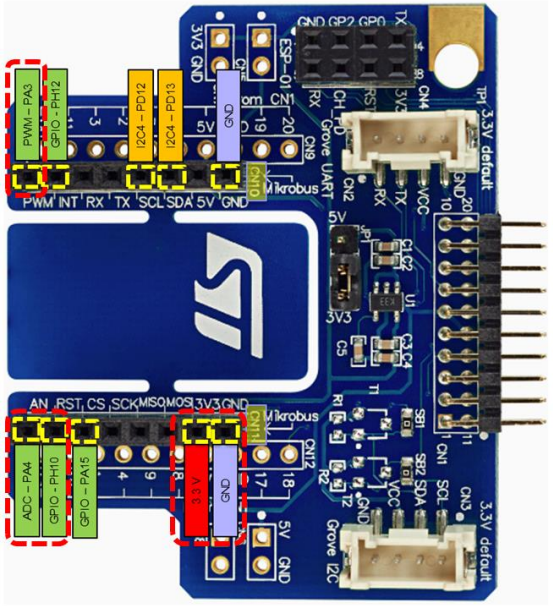
Priključitev na STM32 : 1x analogni, 1x digitalni vhod, 1x digitalni izhod

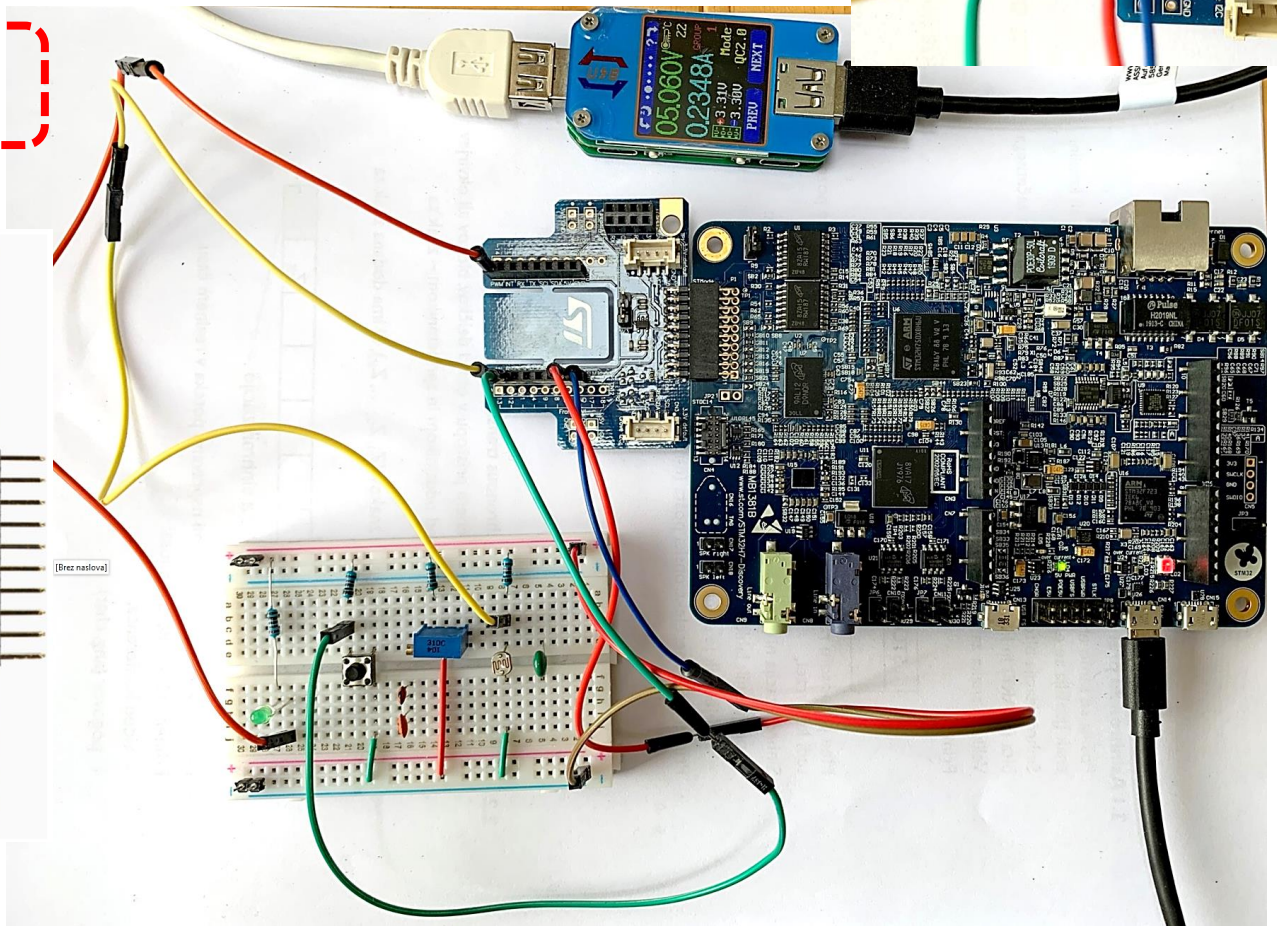
STM32H7

- Testno vezje (primer) - STM32H7 :

GPIO	Vrsta	Povezava
PC13	User tipka	Modra tipka
PA4	Analogni vhod	Rumena žička
PH10	Dig. Vhod	Zelena žička
PA3	Dig. Izhod - LED	Oranžna žička
PJ2,Pi13	Dig. Izhodi	vgr. LED diode

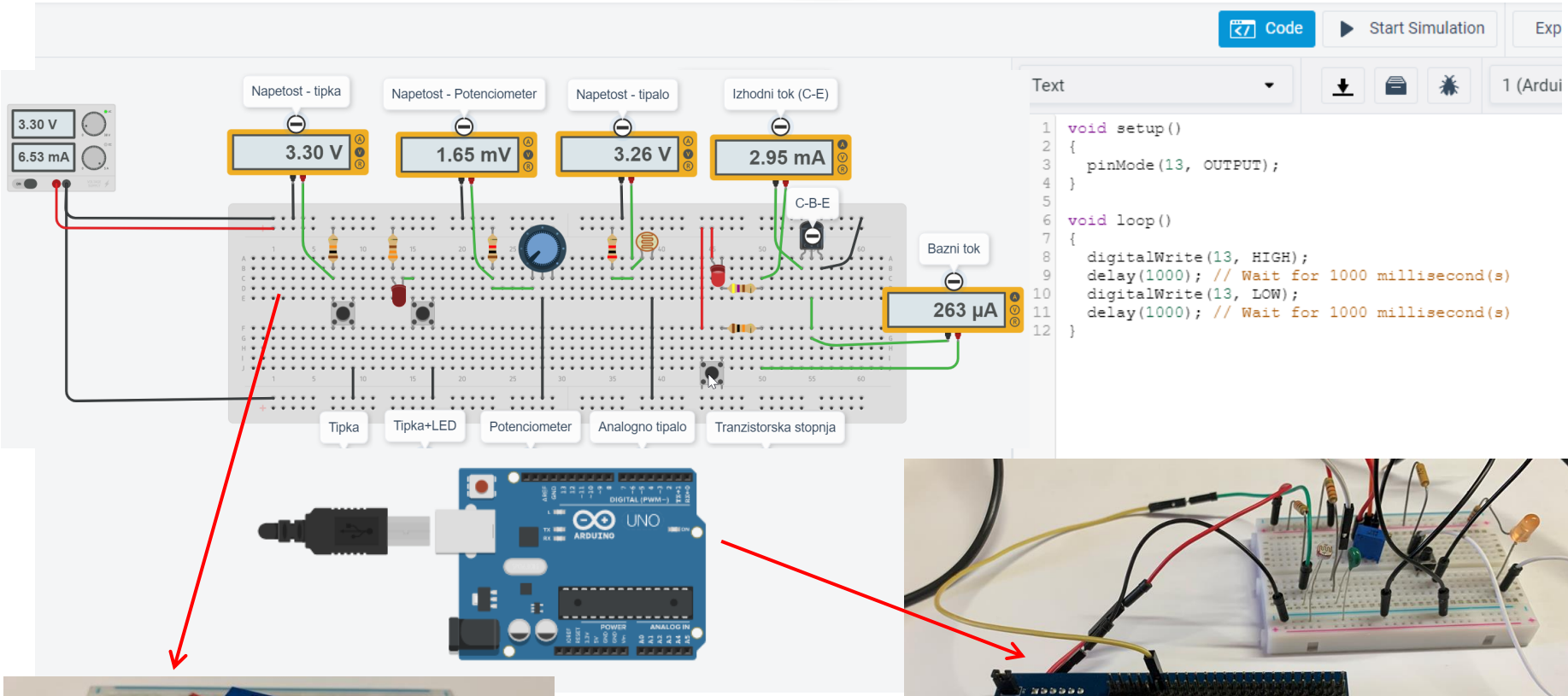


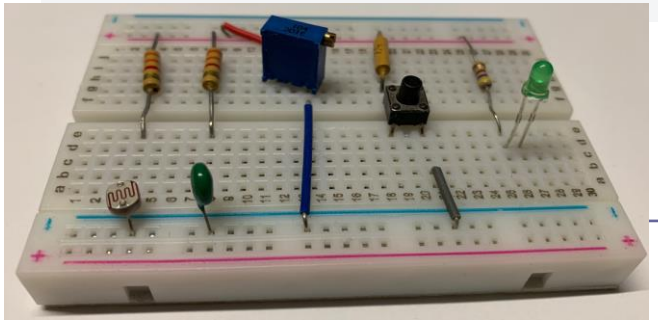


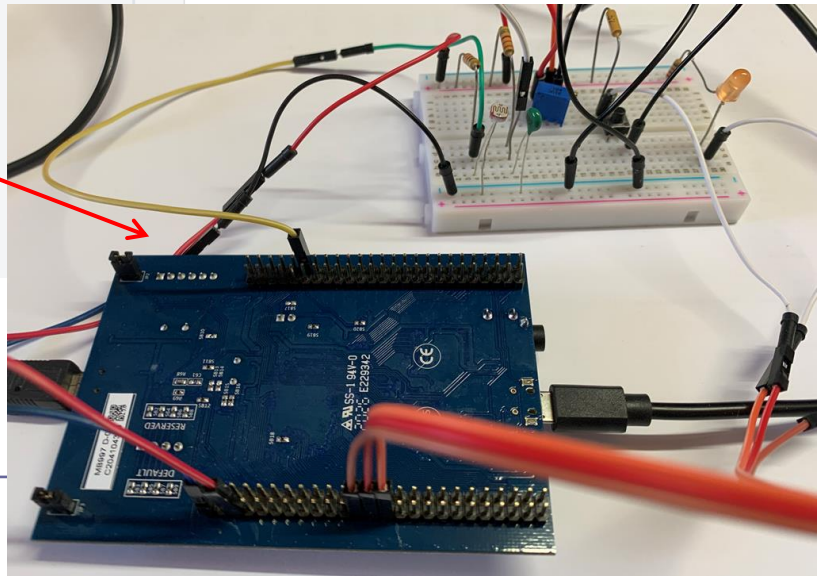


Napoved LAB vaje VP5: Breadboard + STM32F4

STM32F4







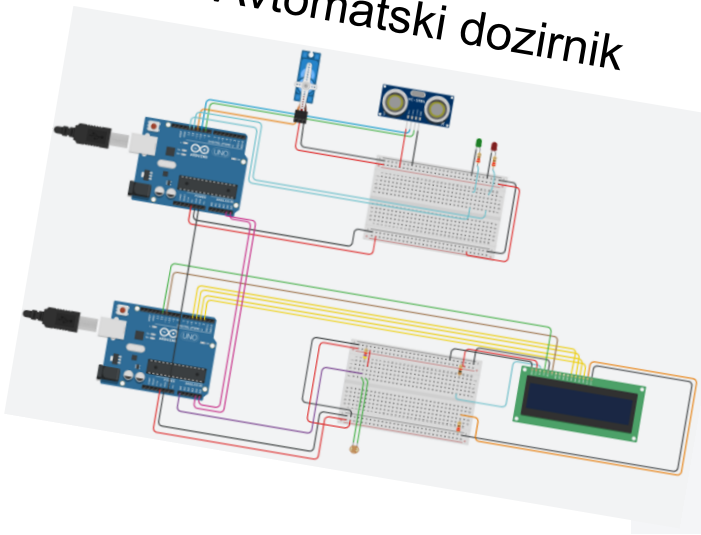
VIN Projekt Arduino – Primeri iz l. 19/20

TinkerCad

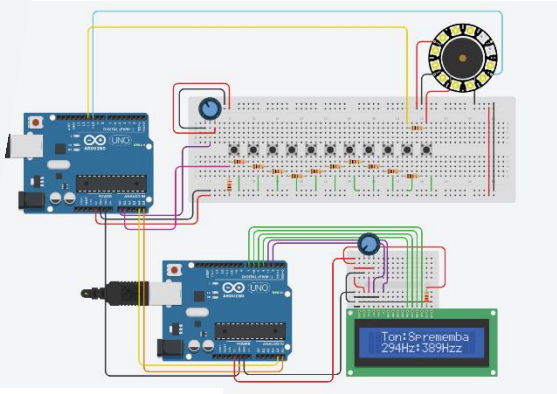
Arduino projekt,
Kontrola centralne kurjave

Vhodno izhodne naprave

Avtomatski dozirnik



Mini Piano



Sledenje

HW izvedba

SENZOR ZA ZAPORNICO

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