

Vhodno izhodne naprave

Laboratorijska vaja 3 - VP 3
Dodatek A:
TinkerCad in Arduino vezave

VIN projekt - VP3: Uvod, tipala, TinkerCad, Breadboard, vezave

- Uvod v VIN projekt
- Tipala
- Spoznavanje TinkerCad-a
- Breadboard – osnovne vezave
- DN2.1 – VP3

■ Dodatek: Vezja v TinkerCad z Arduinom

ARDUINO HW INTRO



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

Arduino – dokumentacija

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

Language Reference

Arduino programming language can be divided in three main parts: functions, values (variables and constants), and structure.

FUNCTIONS

For controlling the Arduino board and performing computations.

Digital I/O

`digitalRead()`

`digitalWrite()`

`pinMode()`

Analog I/O

`analogRead()`

`analogReference()`

`analogWrite()`

Math

`abs()`

`constrain()`

`map()`

`max()`

`min()`

`pow()`

`sq()`

`sqrt()`

Random Numbers

`random()`

`randomSeed()`

Bits and Bytes

`bit()`

`bitClear()`

`bitRead()`

`bitSet()`

LANGUAGE

FUNCTIONS

VARIABLES

STRUCTURE

LIBRARIES

IOT CLOUD API

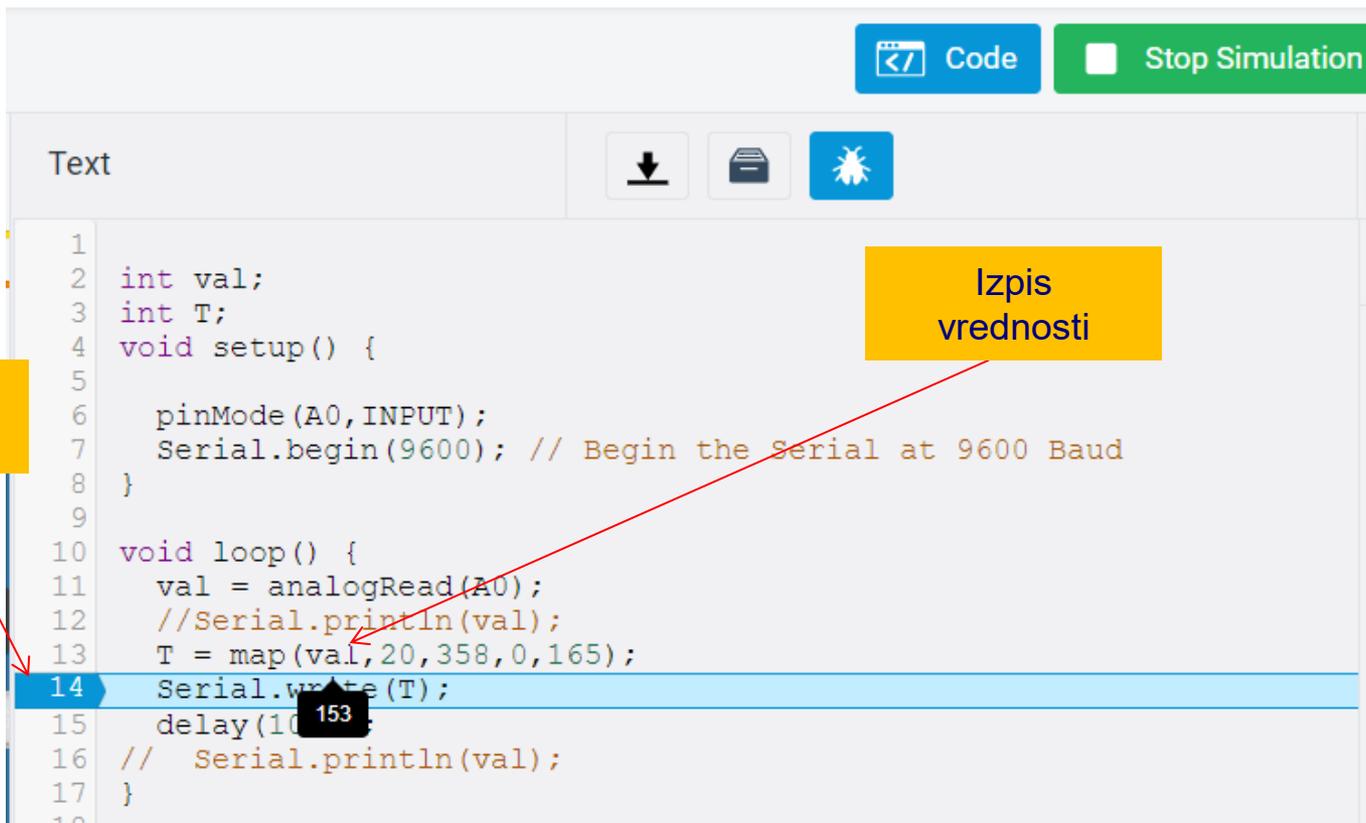
GLOSSARY

The Arduino Reference text is licensed under a [Creative Commons Attribution-Share Alike 3.0 License](#).

Find anything that can be improved? [Suggest corrections and new documentation via GitHub](#).

Doubts on how to use Github? Learn everything you need to know in [this tutorial](#).

TinkerCad – razhroščevanje (debugging)



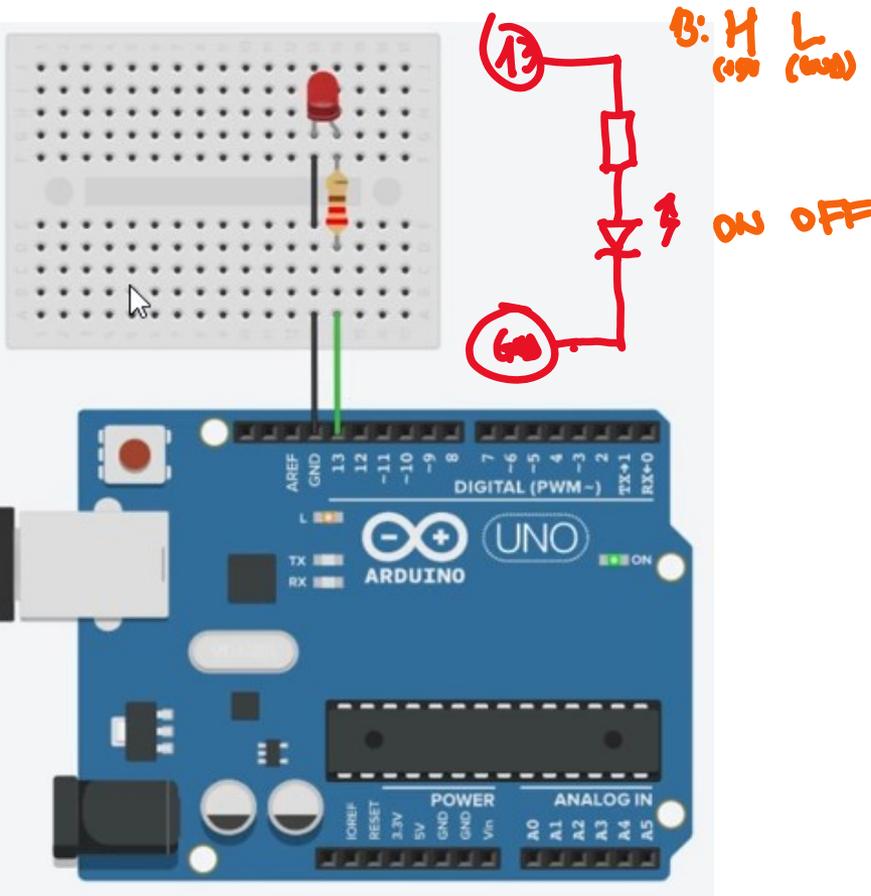
The screenshot shows the TinkerCad code editor interface. At the top right, there are two buttons: 'Code' (with a code icon) and 'Stop Simulation' (with a square icon). Below these, there are three icons: a download arrow, a folder icon, and a star icon. The main area is a text editor with a light gray background. The code is as follows:

```
1
2 int val;
3 int T;
4 void setup() {
5
6     pinMode(A0, INPUT);
7     Serial.begin(9600); // Begin the Serial at 9600 Baud
8 }
9
10 void loop() {
11     val = analogRead(A0);
12     //Serial.println(val);
13     T = map(val, 20, 358, 0, 165);
14     Serial.write(T);
15     delay(1000);
16     // Serial.println(val);
17 }
18
```

Line 14 is highlighted in blue, indicating a breakpoint. A red arrow points from a yellow box labeled 'Prekinitev (Breakpoint)' to this line. A black tooltip with the number '153' is visible over the '1000' in line 15. A yellow box labeled 'Izpis vrednosti' (Output value) has a red arrow pointing to the '153' in the tooltip.

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

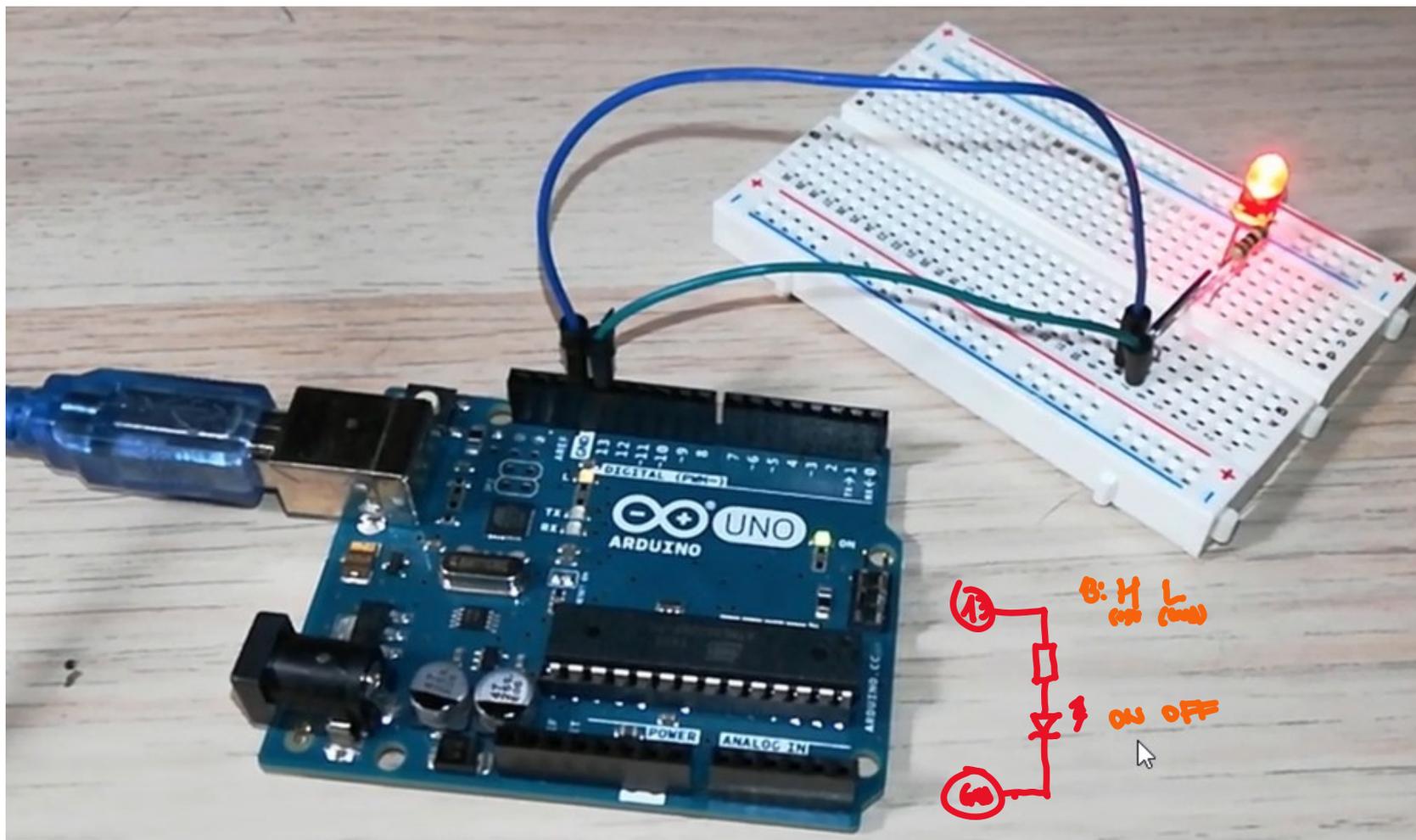
Preprosto vezje z LED diodo in program



```
hello_world
1 /*
2  This program blinks pin 13 of the Arduino (the
3  built-in LED)
4  */
5
6 void setup()
7 {
8   pinMode(13, OUTPUT);
9 }
10
11 void loop()
12 {
13   // turn the LED on (HIGH is the voltage level)
14   digitalWrite(13, HIGH);
15   delay(1000); // Wait for 1000 millisecond(s)
16   // turn the LED off by making the voltage LOW
17   digitalWrite(13, LOW);
18   delay(1000); // Wait for 1000 millisecond(s)
19 }
```

<https://www.tinkercad.com/things/llkRDbp1u2C-vin-arduino-led-dioda>

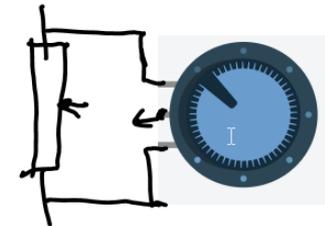
Preprosto vezje z LED diodo



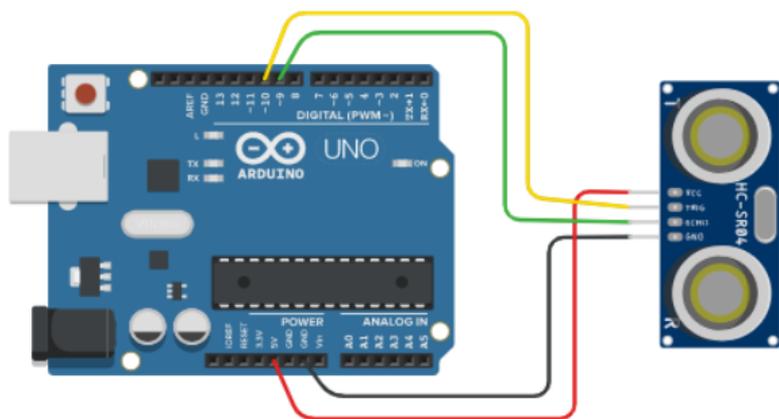
■ Vezje z uporovnim „tipalom“ (potenciometrom) - ADC

```
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> milliseconds
16   delay(sensorValue); // Wait for sensorValue millisecond(s)
17   // turn the LED off
18   digitalWrite(13, LOW);
19   // pause the program for <sensorValue> milliseconds
20   delay(sensorValue); // Wait for sensorValue millisecond(s)
21 }
```

[VIN Arduino + LED dioda \(tinkercad.com\)](https://www.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);
28 }
```

<https://www.tinkercad.com/things/kAlkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor>

Vežje 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
```

```
}
```

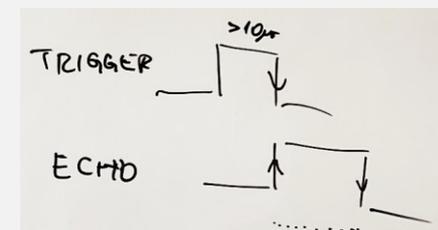
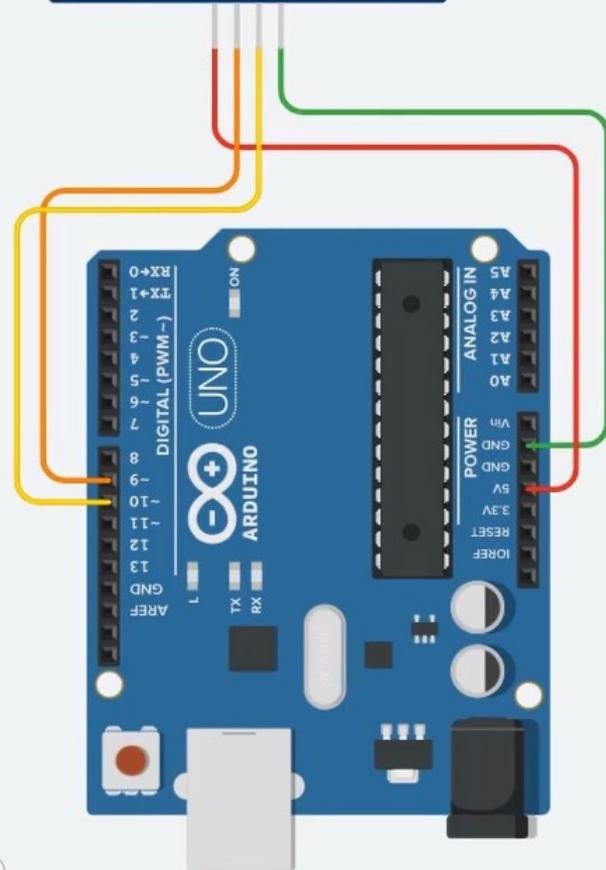
```
void loop() {
```

```
  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);
```

```
}
```

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



Vežje 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
```

/* 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) : ");
```

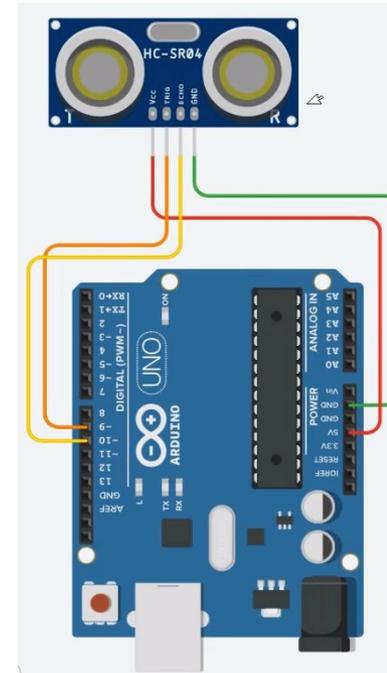
```
Serial.println(distance);
```

```
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/kAlkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor>

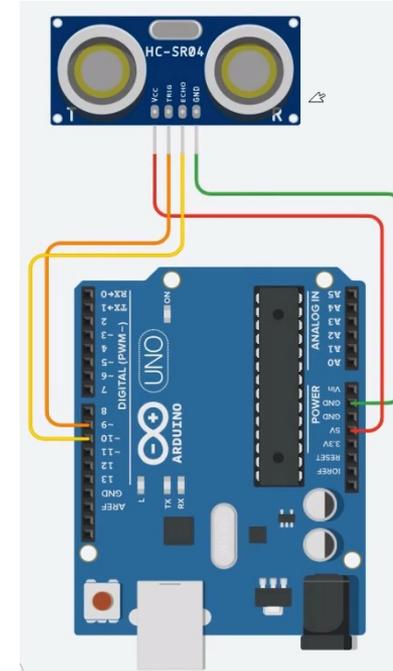
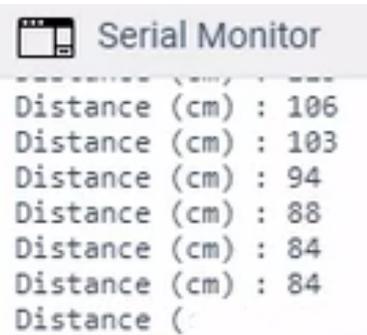
Vezje z ultrazvočnim senzorjem SR04 - program

```
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
```

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void setup() {
  Serial.begin(9600); //Initialize Serial communication
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  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);
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  digitalWrite(trigger_Pin, LOW);

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  /* 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);
}
```



Vezje z ultrazvočnim senzorjem SR04 - program

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const byte trigger_Pin = 9; //Initialize I/O pins
const byte echo_Pin = 10;
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unsigned int distance; //To save the distance
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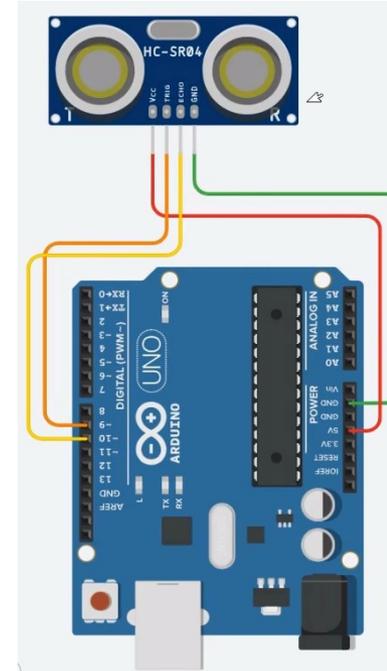
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  pinMode(echo_Pin, INPUT); //Echo pin as Input
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void loop() {
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  delayMicroseconds(10); //Make Trigger pin High for 10 uS to start sending the pulse
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```

```
  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/kAlkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor>

```
Distance (cm) : 106
Distance (cm) : 103
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Distance (
```



Vežje z ultrazvočnim senzorjem SR04 - program

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```

void setup() {

```
Serial.begin(9600); //Initialize Serial communication
pinMode(echo_Pin, INPUT); //Echo pin as Input
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```

```
}
```

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 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
```

```
*/
```

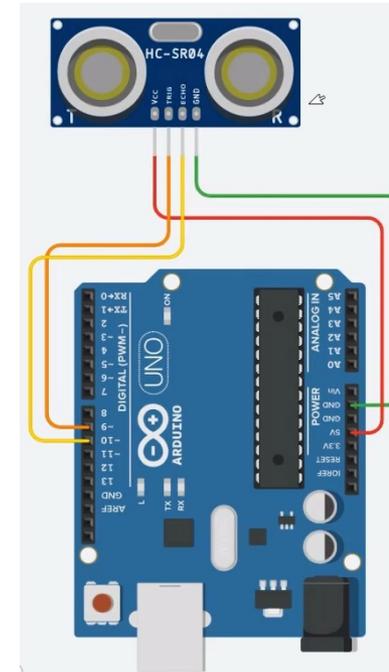
```
Serial.print("Distance (cm) : ");
```

```
Serial.println(distance);
```

```
delay(100);
```

```
}
```

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



*Distance (cm) = Measured Echo Time (in μ sec)/58
Distance (inch) = Measured Echo Time (in μ sec)/148*

<https://www.tinkercad.com/things/kAlkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor>

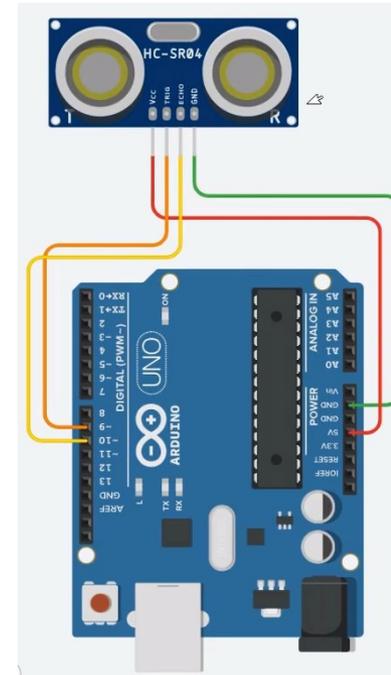
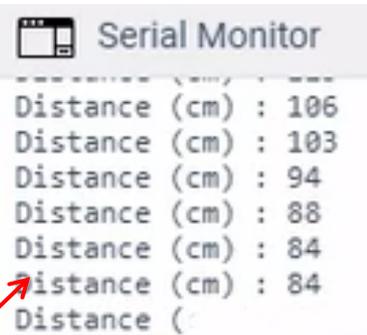
Vezje z ultrazvočnim senzorjem SR04 - program

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  */
  Serial.print("Distance (cm) : ");
  Serial.println(distance);
  delay(100);
}
```



<https://www.tinkercad.com/things/kAlkT1BfjB0-vin-arduino-sr04-uz-ultrazvocni-senzor>

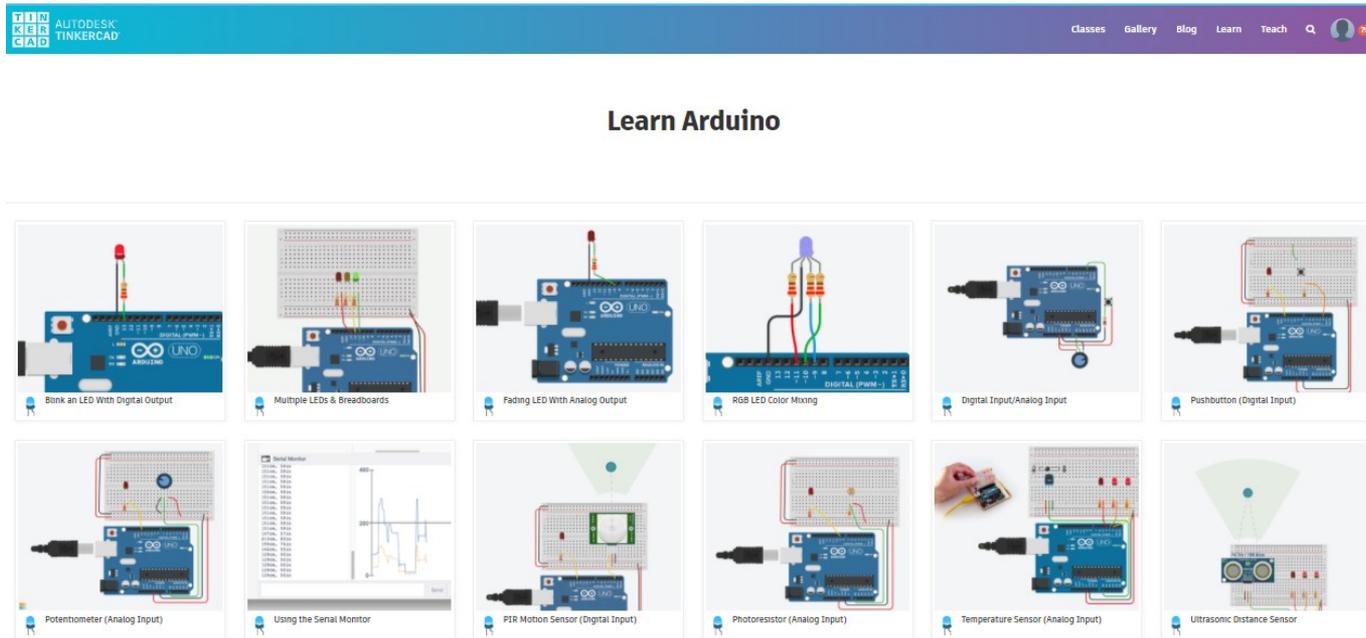
■ Viri – TinkerCad + Arduino :

□ 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

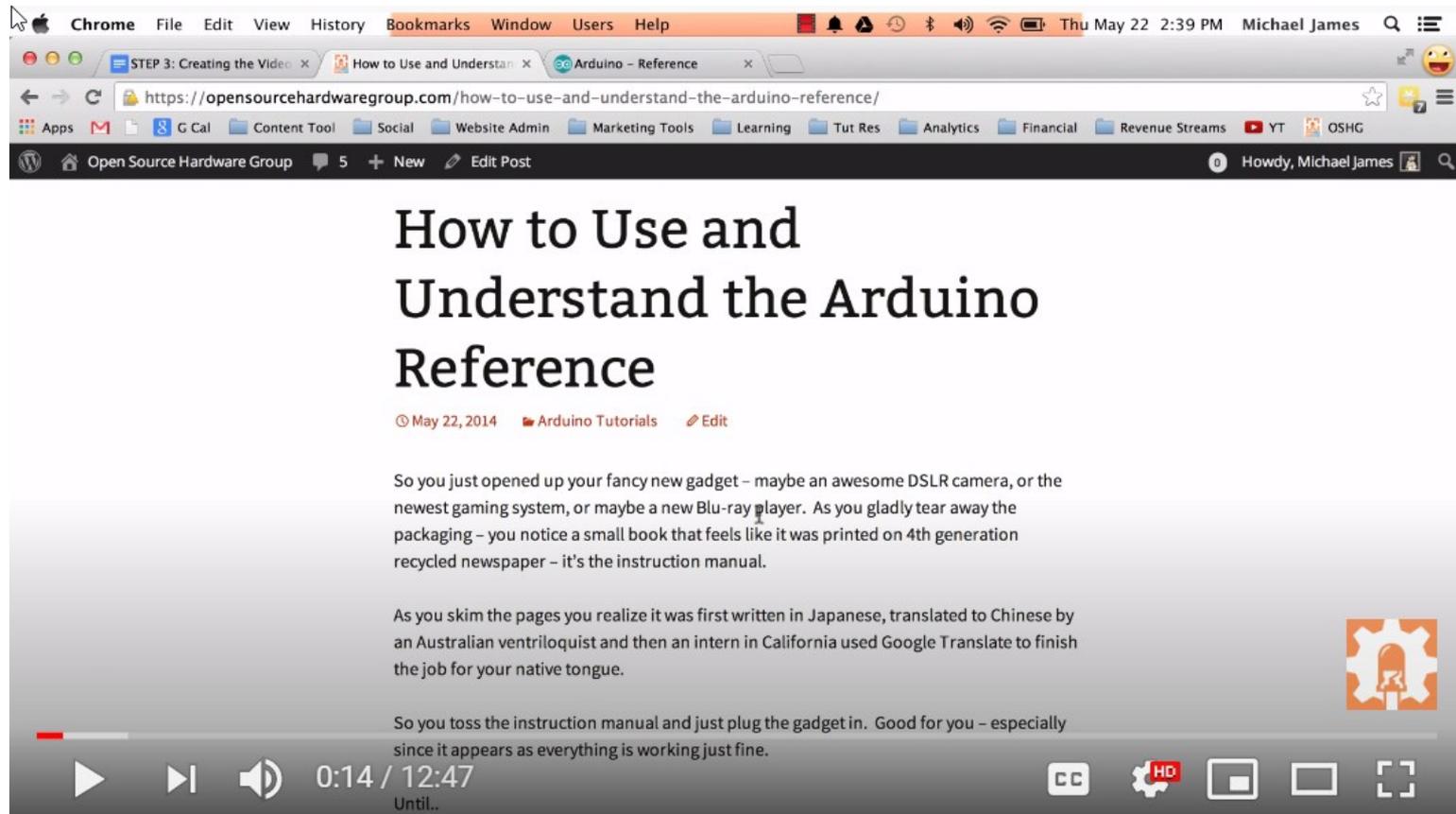
■ How to Use and Understand the Arduino Reference :: Open Source Hardware Group Arduino Tutorials

- 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)



The screenshot shows a video player interface. At the top, there's a Chrome browser window with several tabs open: 'STEP 3: Creating the Video', 'How to Use and Understand the Arduino Reference', and 'Arduino - Reference'. The address bar shows the URL: <https://opensourcehardwaregroup.com/how-to-use-and-understand-the-arduino-reference/>. Below the browser window, the video player displays the title 'How to Use and Understand the Arduino Reference' in a large, bold font. Underneath the title, it shows the date 'May 22, 2014', the category 'Arduino Tutorials', and an 'Edit' link. The main content of the video is a text-based introduction. It starts with: 'So you just opened up your fancy new gadget - maybe an awesome DSLR camera, or the newest gaming system, or maybe a new Blu-ray player. As you gladly tear away the packaging - you notice a small book that feels like it was printed on 4th generation recycled newspaper - it's the instruction manual.' The second paragraph reads: 'As you skim the pages you realize it was first written in Japanese, translated to Chinese by an Australian ventriloquist and then an intern in California used Google Translate to finish the job for your native tongue.' The third paragraph says: 'So you toss the instruction manual and just plug the gadget in. Good for you - especially since it appears as everything is working just fine.' At the bottom of the video player, there's a progress bar showing '0:14 / 12:47' and a volume icon. To the right of the progress bar, there are icons for 'CC' (Creative Commons), 'HD' (High Definition), and other video controls. A small orange icon of a gear with a lightbulb inside is visible on the right side of the video frame.