

Robotics and AI workshops

Robo CO. - Robots and AI as future colleagues

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Robotics and AI workshops – Introduction to Robotics and AI

- Two workshops:
 - Introduction to Arduino
 - **Introduction to Machine Vision**
- The workshops are part of Robo CO.-Robots and AI as future colleagues –project (+18)
 - Please sign in EURA2021 –system as project participant
 - www.eura2021.fi/osallistuja
 - Project code: S30394

Under the provisions in effect, information on all persons participating in such projects must be reported to the EU and this data is entered in the EURA 2021 information system of the Ministry of Economic Affairs and Employment. The information will help to determine the results achieved with the projects in Finland.



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Introduction to Machine Vision

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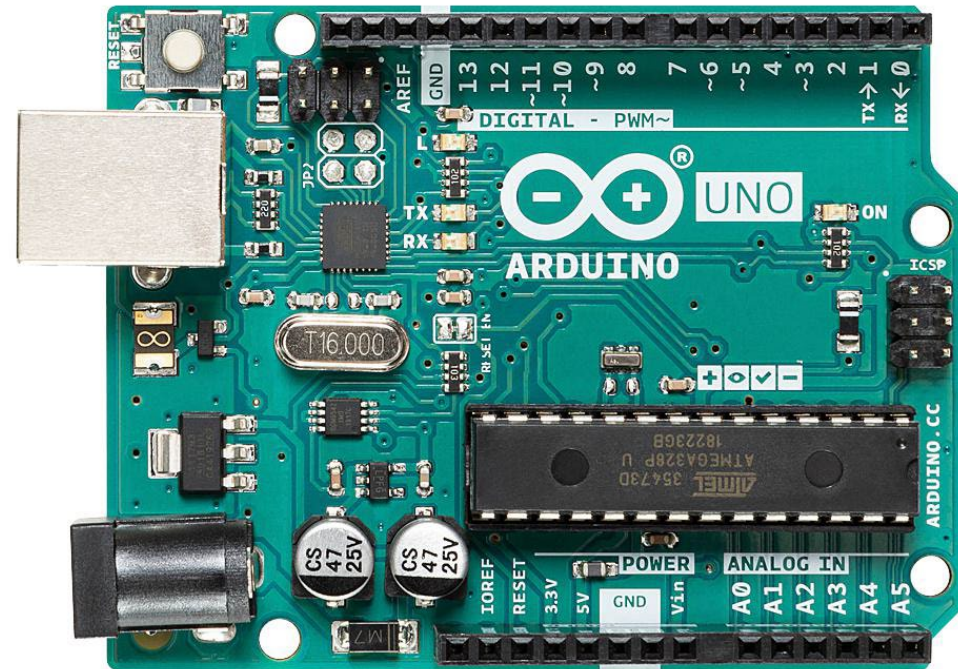


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Arduino

- Open-Source platform
 - Open-source electronics platform
 - Hardware
 - Software
- Easy to use for projects
 - To study electronics, programming, embedded systems ...
 - Prototyping



Pixy2 Camera

- Open-Source platform
 - Open-source electronics platform
 - Hardware
 - Software
- Easy to use for projects
 - To study Machine vision and object detection
 - 60 fps colour video feed
 - Line following integrated



Pixy2 camera

- **Inexpensive** – The Pixy2 is an affordable smart vision sensor, making it accessible for hobbyists, students, and developers.
- **Fast, real-time object tracking** – Pixy2 can track multiple objects at up to 60 frames per second, making it suitable for dynamic robotics and automation tasks.
- **Line-following and barcode reading** – Built-in algorithms allow Pixy2 to follow lines and detect barcodes, enabling autonomous navigation in robotic projects.
- **Multiple interface support** – Pixy2 supports SPI, I2C, UART, USB, and analog/digital I/O, allowing easy integration with platforms like Arduino, Raspberry Pi, and other microcontrollers.
- **Customizable and programmable** – With PixyMon software, users can configure vision parameters, train new objects, and debug behavior. Developers can also extend its capabilities using firmware and software libraries.



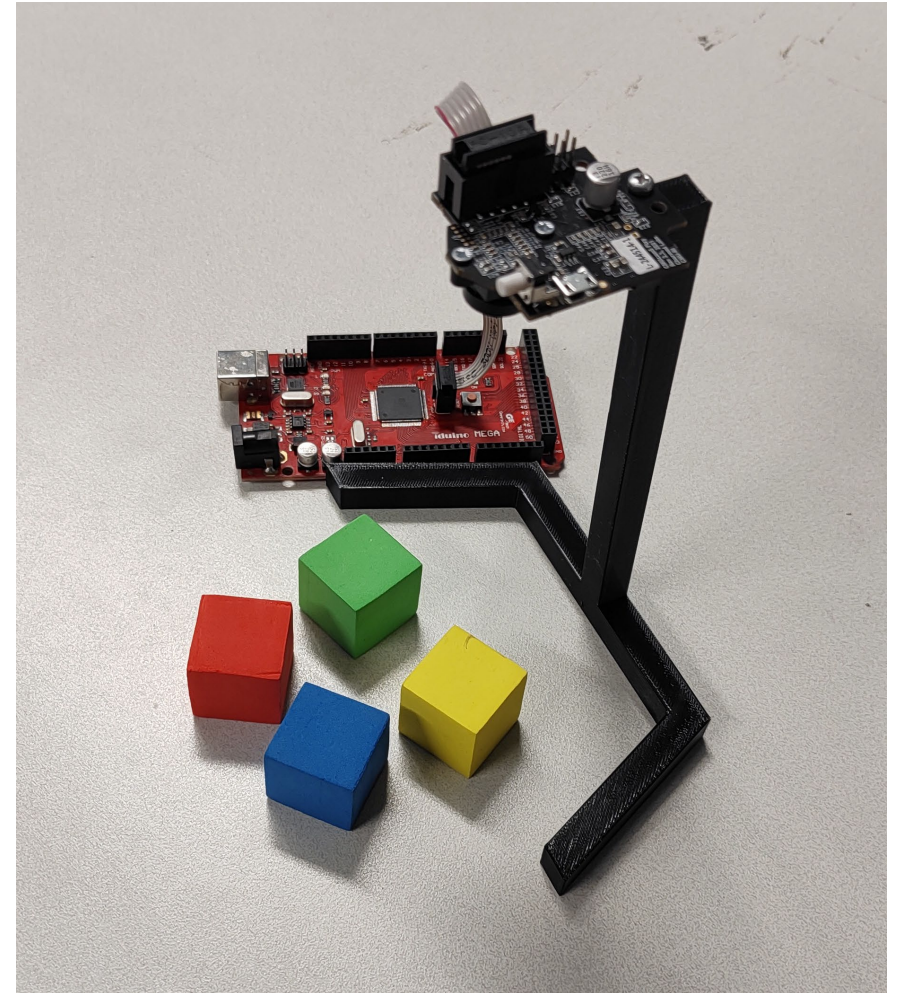
Downloadable

- Arduino Software (IDE)
- PixyMon (Pixy2 Software)
- Pixy2 Arduino Library



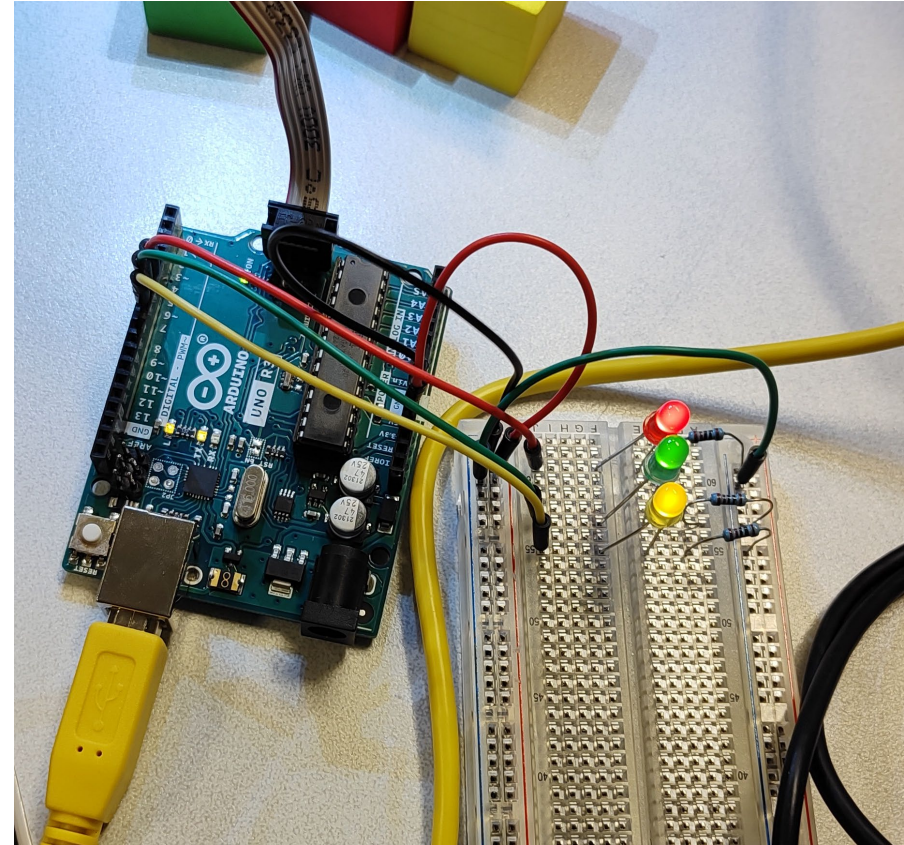
Pre-Programming

- Fix camera on stand
- Connect camera to arduino with the cable to i2c ports
- Connect pixy usb cable to PC
- Recreate and modify the traffic light system in the breadboard
- Connect arduino usb cable
- Select the right port of the ide to arduino 1



Project – Cube color detection with leds

- This Project is:
 - Detect colours of blocks with the camera.
 - Light up the led associated with the colour identified.



```

#include <Pixy2.h> // For SPI, use this header

Pixy2 pixy;

const int RED_LED_PIN = 5;
const int GREEN_LED_PIN = 6;
const int YELLOW_LED_PIN = 7;

void setup() {
  Serial.begin(9600);

  pixy.init(); // Automatically uses SPI on Arduino Uno

  pixy.changeProg("color_connected_components");

  pinMode(RED_LED_PIN, OUTPUT);
  pinMode(GREEN_LED_PIN, OUTPUT);
  pinMode(YELLOW_LED_PIN, OUTPUT);

  // Start with all LEDs off
  digitalWrite(RED_LED_PIN, LOW);
  digitalWrite(GREEN_LED_PIN, LOW);
  digitalWrite(YELLOW_LED_PIN, LOW);
}

void loop() {
  pixy.setLamp(1, 1); // Turn on Pixy2's white LED (top light)

```

```

// Reset LEDs
digitalWrite(RED_LED_PIN, LOW);
digitalWrite(GREEN_LED_PIN, LOW);
digitalWrite(YELLOW_LED_PIN, LOW);

if (numBlocks > 0) {
  Serial.print("Blocks detected: ");
  Serial.println(numBlocks);

  for (int i = 0; i < numBlocks; i++) {
    int sig = pixy.ccc.blocks[i].m_signature;

    if (sig == 1) {
      digitalWrite(RED_LED_PIN, HIGH);
    } else if (sig == 2) {
      digitalWrite(GREEN_LED_PIN, HIGH);
    } else if (sig == 3) {
      digitalWrite(YELLOW_LED_PIN, HIGH);
    }
  }
} else {
  // Optional: turn lamp off if nothing detected
  pixy.setLamp(1, 1);
}

delay(100);
}

```

```
int numBlocks = pixy.ccc.getBlocks();
```



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Thank you!

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