

# Designing Control system for Sorting boxes in a Production line



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# 01

## Designing Control system for Sorting boxes in a Production line

### ABSTRACT

For higher efficiency, businesses around the world automate their sorting process. In any industrial automation process, sorting plays a key role, particularly in the packaging industry.

### INTRODUCTION

It is obvious over 21st century years that automation has been incorporated in all labor-intensive industries. The packaging industries are very well utilized by recent developments in automation. As the innovations in the packaging industry continues to expand, In order to arrange the boxes (i.e., products ) according to their dimensions, there is a necessity for automation systems to be used.

This can be done by the use of the control system, which saves cost of labor and time, thereby enhancing accuracy and overall performance of the production processes.





## 02

# THE AIM

What is the purpose of this project ?

Designing a control system that operates and works to sort Different boxes according to their dimensions using microcontroller , servo motors and sensors .



# 03

## The technique

The components that have been used :

Software component



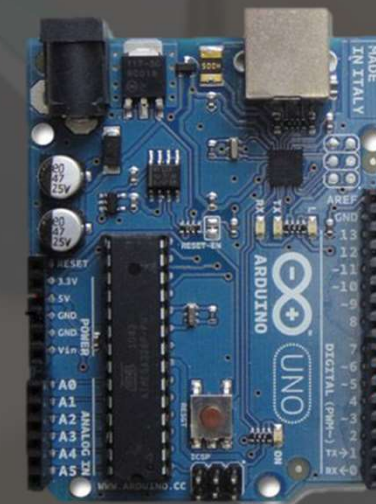
Hardware components



Ultrasonic sensor



Servo motor



Arduino

## 03

# The technique

The components specifications :



Microcontroller	ATmega328
Clock Speed	16MHz
Operating Voltage	5V
Maximum supply Voltage (not recommended)	20V
Supply Voltage (recommended)	7-12V
Analog Input Pins	6
Digital Input/Output Pins	14
DC Current per Input/Output Pin	40mA
DC Current in 3.3V Pin	50mA
SRAM	2KB
EEPROM	1KB
Flash Memory	32KB of which 0.5KB used by boot loader

Type	Robotis RX-64
Size [mm × mm × mm]	61.1 × 40.2 × 41
Torque [Kgcm]	64 (18V)
Speed [sec / 60deg]	0.162
Weight [g]	116
Voltage [V]	18
Operation current [A]	1.2 (Max)
Operation angle range [deg]	300/ Endless turn
Communication speed [bps]	1Mbps
Manufacturer	Robotis

Part Number	MA40S4R/S
Construction	Open structure type
Using method	Receiver and Transmitter (dual use) type
Nominal frequency (kHz)	40
Sound Pressure (dB)	120±3 (20Pa)
Directivity (deg)	80
Detectable range (m)	0.2 – 4
Dimension (mm)	9.9φ x 7.1 height
Input voltage (Vp-p)	20 (40kHz) continuous signal



## 03

# The technique

### The mechanism of the control system :

#### Setting Up

all components should be connected to the microcontroller (Arduino ) and programmed to build a control system to achieve the purpose of this project .

#### Ultrasonic Sensors

Ultrasonic sensor should be used to determine the height of the moving box.

#### Sending Signals

Ultrasonic Sensors will send out a signal to the microcontroller after identifying the Hight. The microcontroller compares the set vale with the measured value

#### Doing action

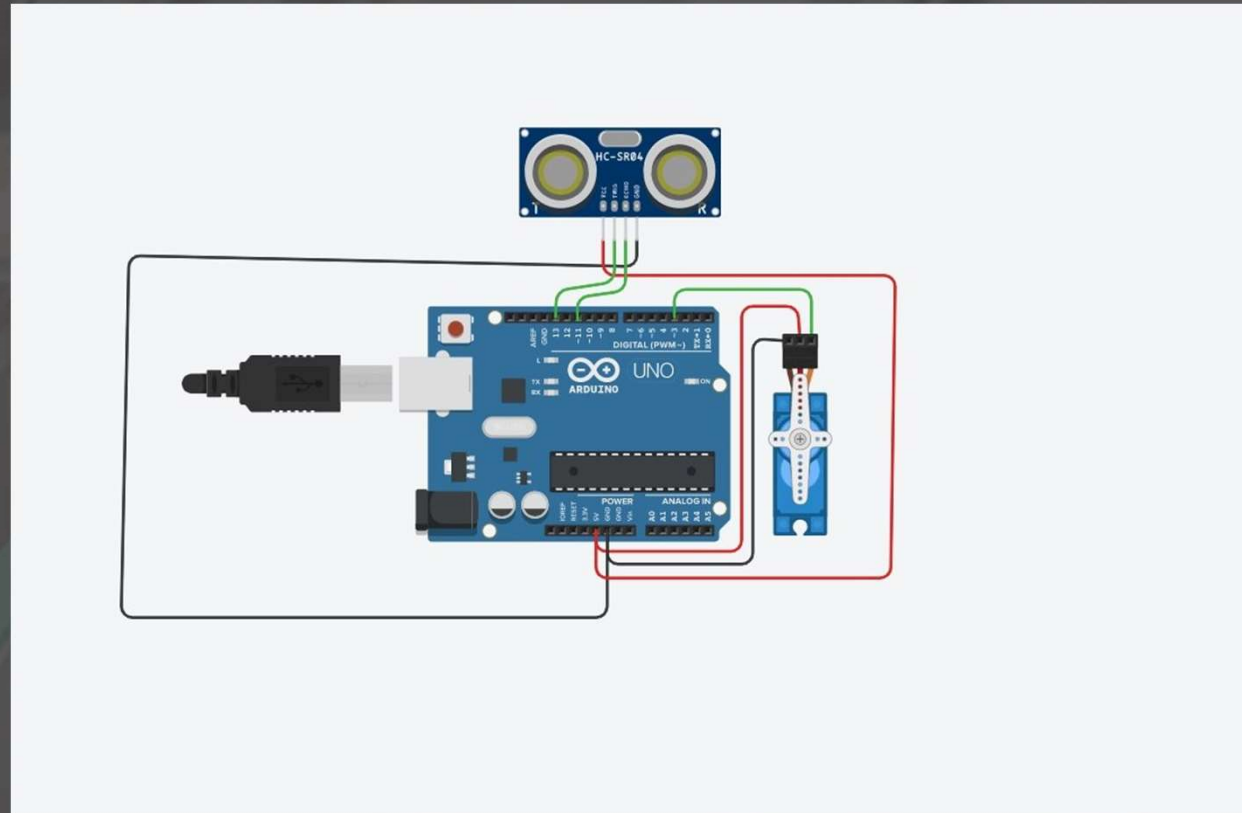
The microcontroller sends an output signal (decision) to the servo motors. Finally , the servo motors are activated to rotate the rotatory part to direct the boxes to the desired storage >

#### Making decision

According to the comparison between the set and measured values, the microcontroller makes a decision

# 04 Control system implementation

The circuit design :



**NOTE :**

I have designed and programmed the circuit on an online software called Tinkercad .It can be simulated online on Tinkercad website : <https://www.tinkercad.com/things/218yg7jBCBn-task-5designing-a-control-system-to-a-production-line-/editel>



# The code :

```
#include <Servo.h>
// done by mogahid farah
Servo motor;

const int trigger=13,echo=12;
void setup() {

  motor.attach(5);
  pinMode(trigger,OUTPUT);
  pinMode(echo,INPUT);
  Serial.begin(9600);
  motor.write(90);

}

void loop() {
  long duration=0;
  float distance=0;
  digitalWrite(trigger,LOW);
  delayMicroseconds(10);
```

```
  digitalWrite(trigger,HIGH);
  delayMicroseconds(5);
  digitalWrite(trigger,LOW);

  duration=pulseIn(echo,HIGH);

  distance =duration / 58.8;
  Serial.print(distance);
  Serial.println("cm");
  if (distance<300 && distance>201) {
    motor.write(0);
    delay(1000);
    motor.write(90);
    delay(1000);
  }
  else if (distance<200 && distance>101){
    motor.write(90);
    delay(1000);
    motor.write(90);
    delay(1000);
  }
  else if (distance<100 && distance>0){
    motor.write(180);
    delay(1000);
    motor.write(90);
    delay(1000);

  }}
}}
```

# REFERENCES

**Automation and Employment in the 21st Century Monday, March 27, 2017 Irving Wladawsky-Berger**

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# THANK YOU



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