Index

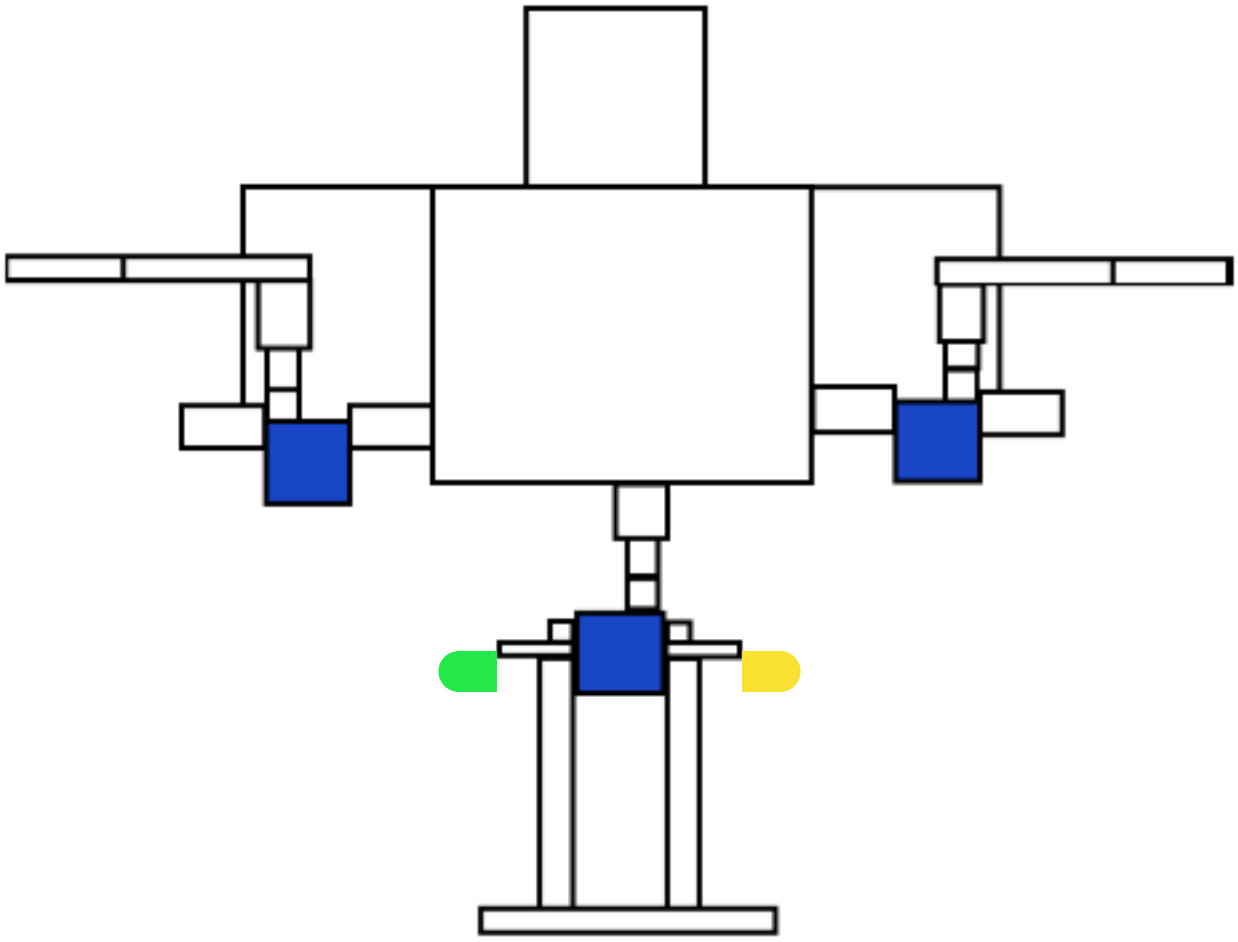
Abstract

In order to bring efficiency mainly in the industrial environment, we can reduce dependency on skilled manpower in hazardous working conditions. In that direction automation of activities can be brought about using robots which can efficiently accomplish complex tasks in a much more coordinated manner.This saves a lot of time and helps increase outputs. Thus reliability on automation is a major factor in improving the industrial performance parameters.

Introduction

Basically, the C-bot is a robot that carries objects. Its body has simple mechanisms to lift the object and move it. It is controlled by a microcontroller programmed manually. This is built as a prototype, aiming for higher level advancements in the field of mechatronics and computer science. We get to know more about in the features explained further.

Construction



The C-bot's body is made by an assembly of LEGO pieces. It has 2 servos or actuators to control the arms and one more to control the body (shown in the figure). All the servos are connected to an Arduino MEGA ADK Board with the help of a breadboard. The servos are in parallel to 5V and ground pins taken from the board. Each servo is connected to a separate pin numbers on the board. There is also a pushbutton which helps in controlling the main circuit by acting as a pull down circuit. There are 2 LEDs to indicate the status of the ongoing process.

Components used

1. LEGO pieces

They become the skeleton or the main framework of the bot. They hold all the components in place and give the bot its stability.

2. Arduino MEGA ADK microcontroller board

It is the main part of the bot and acts as the control centre for all its activities.

3. Solderless breadboard

All the connections are made on this board and do not require soldering. It helps in connecting circuits parallelly.

4. Microservos

They help the bot to move its arms and body and provide degrees of freedom for movement and move the parts smoothly.

5.Green and Yellow LEDs

It forms a part of feedback where the green LED is lit when the robot is in action and the yellow one is lit when it is static.

6. Jumper Wires

They are used to connect the microcontroller and the other components to the breadboard. 5V connections take red wires, Ground takes white and pin connections take orange wires.

7. USB – Arduino adapter cable

This is used to power the Arduino board via a wall outlet.

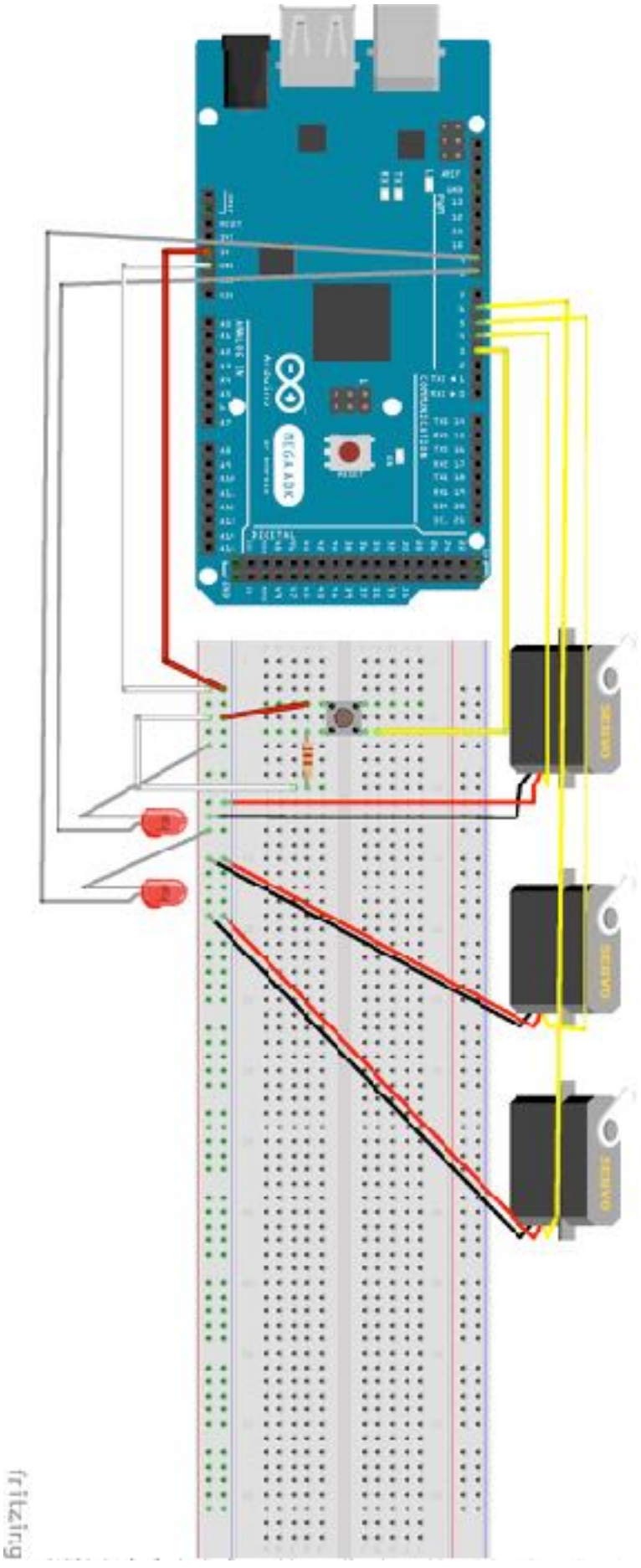
8. Pusbutton

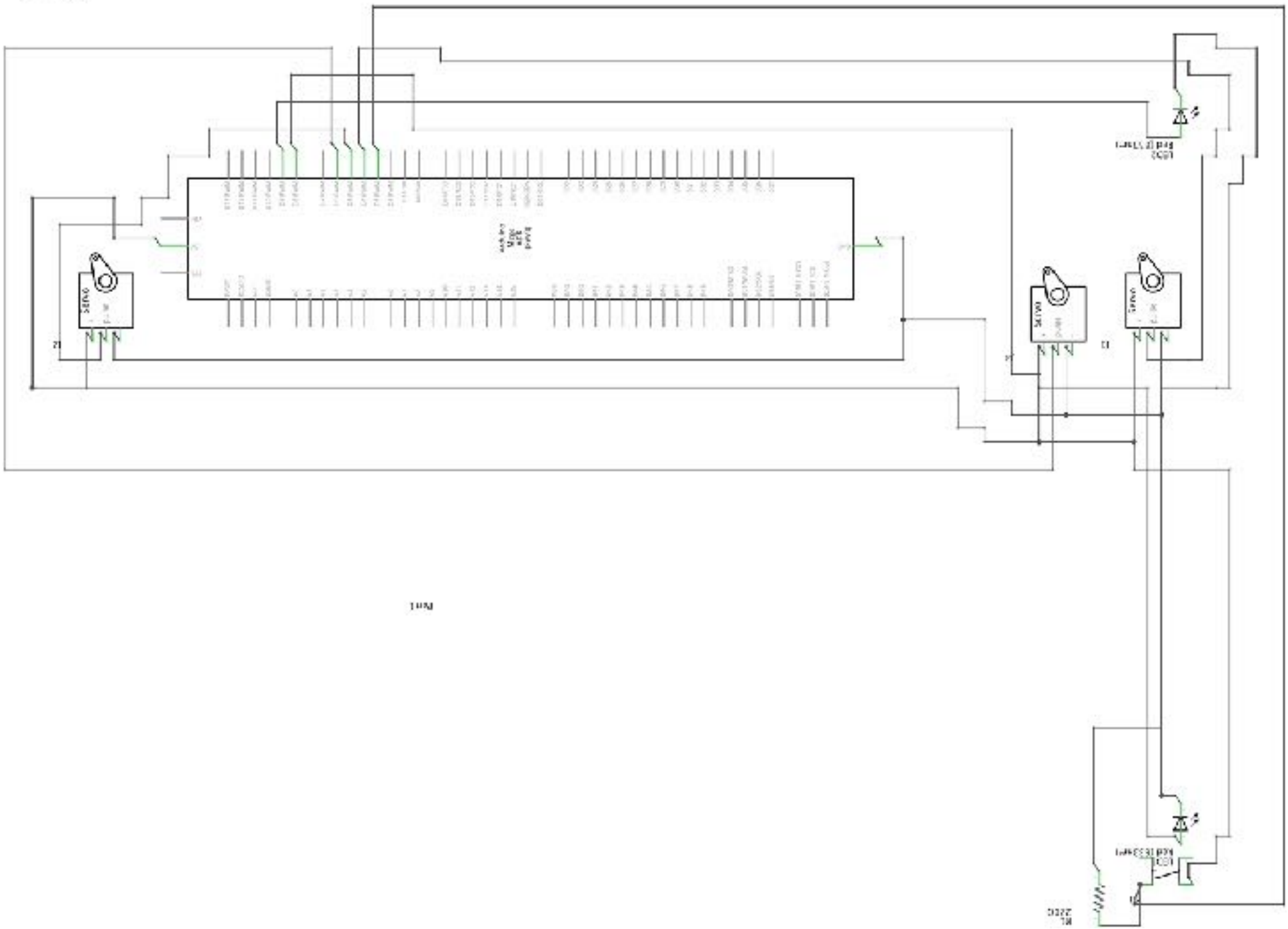
This button tells the bot to do its job when it is HIGH and to remain in its initial position when LOW.

9. 220 ohm resistor

It forms a pull down circuit in which it is connected to the ground of the Arduino and the pushbutton is connected to this resistor.

Circuit

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Code

```
#include <Servo.h>

Servo servob;
Servo servol;
Servo servor;

int pos = 0;
const int buttonPin = 3;
const int ledPin =  13;
int buttonState = 0;
const int ledg = 8;
const int ledy = 9;


void setup() {
  // put your setup code here, to run once:
servob.attach(4);
servol.attach(5);
servor.attach(6);
 pinMode(buttonPin, INPUT);
 pinMode(ledPin, OUTPUT);
 pinMode(ledg, OUTPUT);
 pinMode(ledy, OUTPUT);
}

void loop() {
  // put your main code here, to run repeatedly:
buttonState = digitalRead(buttonPin);
if(buttonState == LOW)
{
servob.write(0);
servol.write(180);
servor.write(0);
digitalWrite(ledy, HIGH);
```

```
digitalWrite(ledg, LOW);

}
else
if(buttonState == HIGH)
{
digitalWrite(ledg, HIGH);
digitalWrite(ledy, LOW);

servor.write(90);
servol.write(90);

delay(5000);

for(pos =0; pos<=100;pos++)
{
servob.write(pos);
delay(5);
}

for(pos = 90; pos>=0;pos--)
{
servor.write(pos);
servol.write(180 - pos);
delay(5);
}
delay(3000);

for(pos = 100; pos>=0;pos--)
{
servob.write(pos);
delay(10);
}
}
}
```

Working / Outputs

The pushbutton is a part of the pull down circuit which contains its one leg connected to the ground (GND) via a resistor. Its another leg is connected to 5V and the pushbutton is connected to pin 3 on the board.

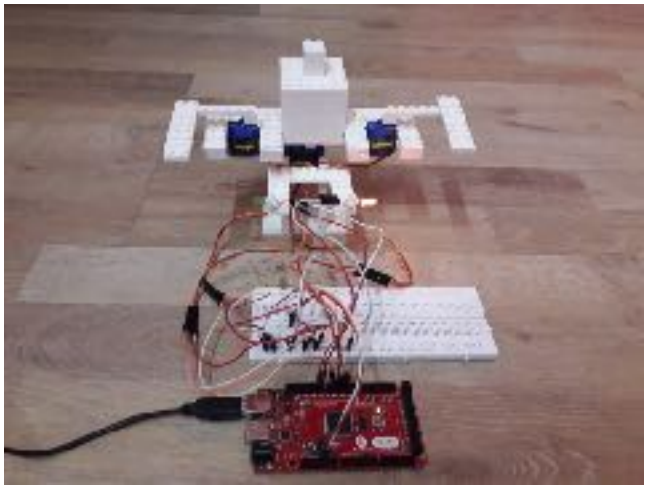
When the pushbutton is in off state (LOW), all the servos remain in their initial positions. When the button is pressed (HIGH), first, the arm servos rotate 90 degrees and the object is placed on them.

Then, the body servo rotates 90 degrees and the arms rotate to 0 degrees, which results in the object being passed or carried from one point to another.

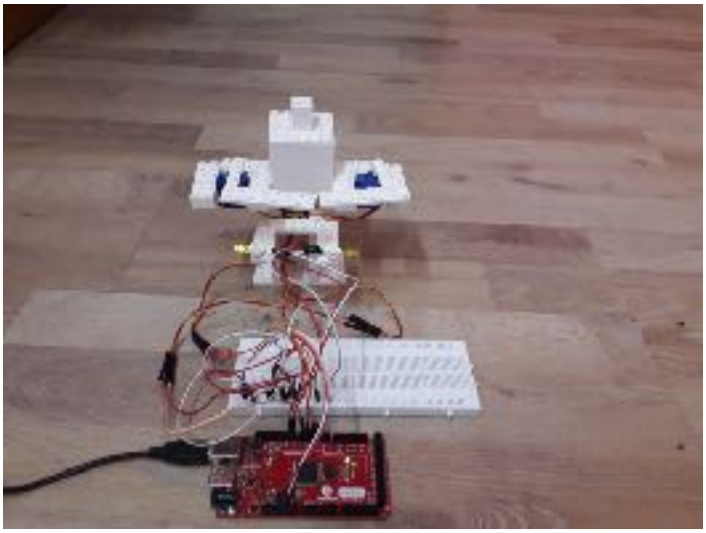
Then, the body servo comes back to its initial position. This process is repeated when the button is pressed again.

The green LED glows when this process is taking place. Once completed, the yellow LED glows,

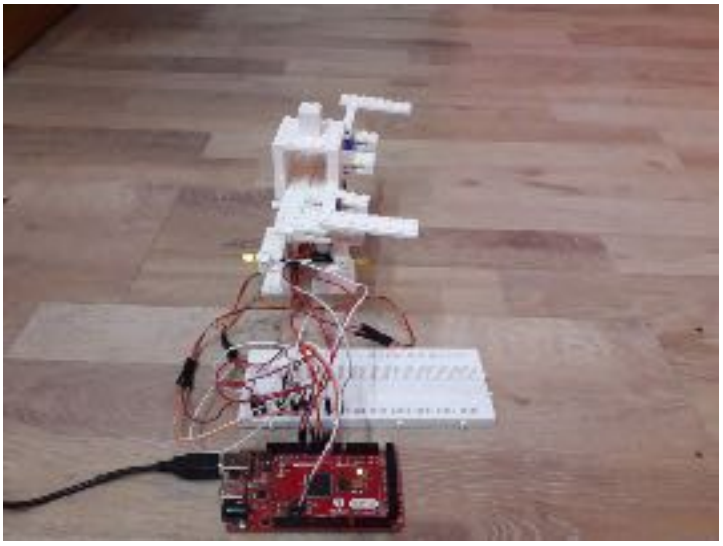
indicating that the circuit is waiting for the next button press.



Initial state – Pushbutton LOW



Pushbutton HIGH – Arms rotated



Pushbutton HIGH Body rotated

Applications

* The model can be integrated on a large scale and be used to carry heavy objects in industries. This can connect two parts of an industry and help to transport objects.

* With the correct use of fixtures, all kinds of components can be lifted and sent.

* This can take industrial automation to the next level and help reduce manual labour.

* Coupled with artificial intelligence and machine learning, these kind of robots could be taught to recognize objects and carry them to the right place or reject the defective pieces.

* A small network can be built using Internet of Things(IoT) and make each robot communicate with the others and accomplish the given tasks efficiently.

* By using ultrasonic sensors and converting it into a line following bot, this can be made to move around the plant and carry objects which are generally laborious for humans to carry.

Advantages

* Simple to construct and design.
* Helps reduce manual labour.
* Efficiency is fairly high.
* Easily programmable.
* Can help in technological advancement of industries.
* Applies concepts of Industry 4.0.
* Can be integrated and used in large scale industries to improve cost effectiveness.

Conclusion

In conclusion, the C-bot is a small prototype of an object carrying robot which can be made more technically advanced, packed with features. The microcontroller used here can be programmed easily and its features can be modified to fit our requirements. With the help of correct materials, this model can be made mechanically strong enough to carry much heavier loads. The servos and actuator joints can be increased to give more degrees of freedom to the bot. The angles can be controlled and be given as feedback to another circuit. Electronic displays can be used to program the bot to move the object to a required place.

Thus, by incorporating the above features, it can reduce manpower and decrease processing time, hence increasing the overall performance efficiency in many adverse work environments . Therefore, robots can be made to co-exist conveniently with humans and help them whenever required, easing our lifestyles.

References

* https://www.arduino.cc – all the information on the circuit elements, code and Arduino software.

* Hughes Electrical electronics technology – tenth edition, revised by John Hiley, Keith Brown and Ian McKenzie Smith