



# **D.Y.PATIL COLLEGE OF ENGINEERING & TECHNOLOGY, KOLHAPUR.**

**DEPT. OF  
ELECTRONICS AND TELECOMMUNICATION**

**COURSE NAME : MINI-PROJECT-II  
COURSE CODE : 201ETP317**

**-: PROJECT NAME :-  
ARDUINO BASED 3D PRINTED ROBOTIC ARM WITH  
SMARTPHONE CONTROL**

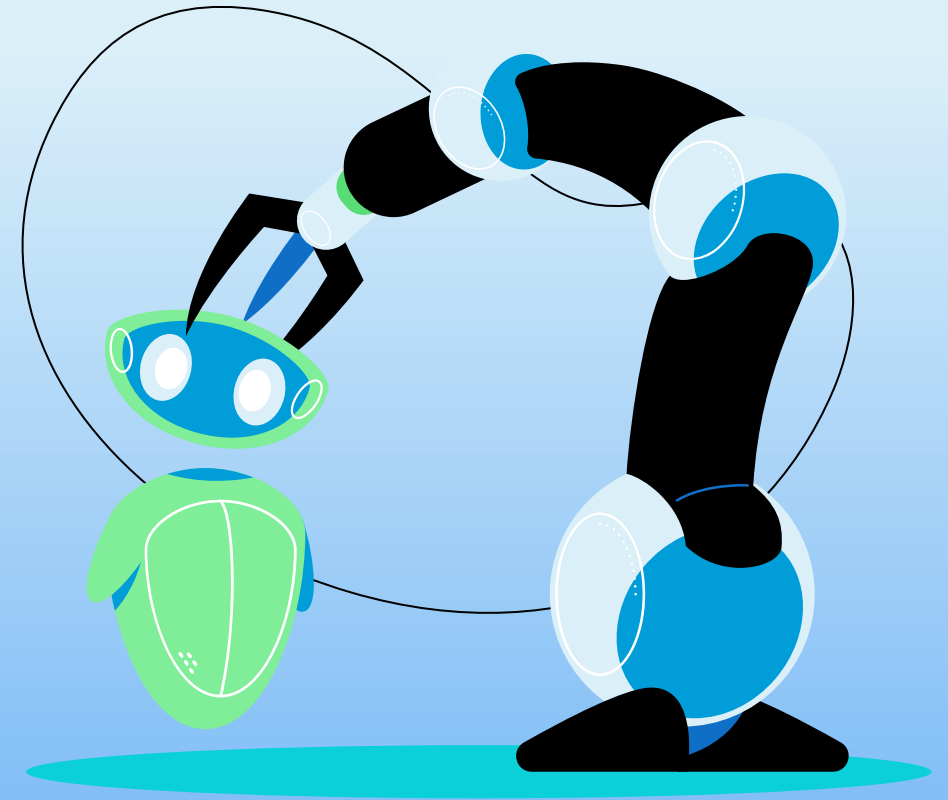
# ARDUINO BASED ROBOT ARM WITH SMARTPHONE CONTROL

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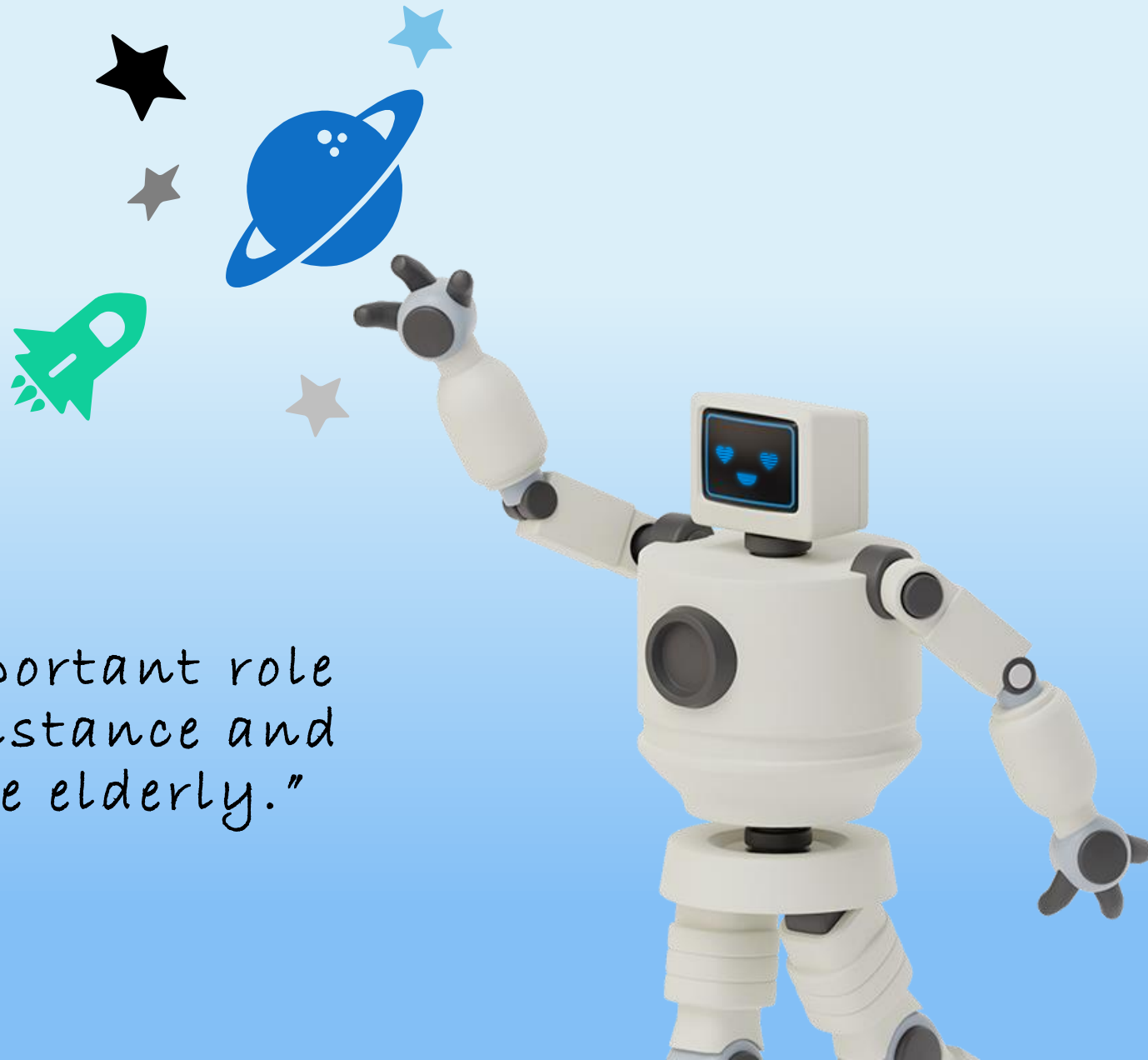
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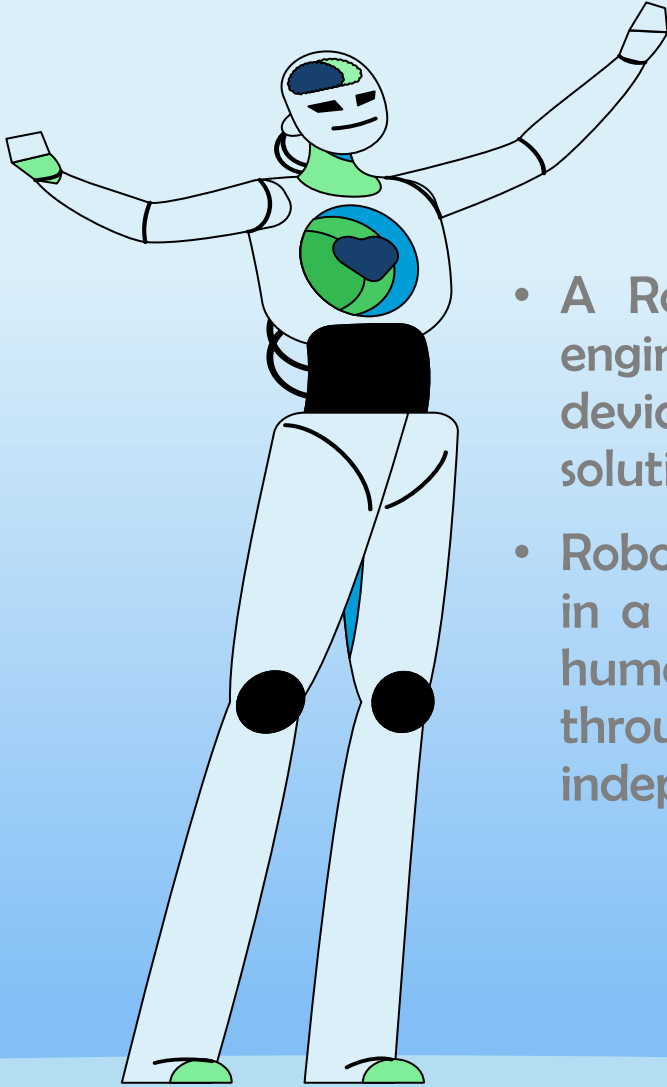
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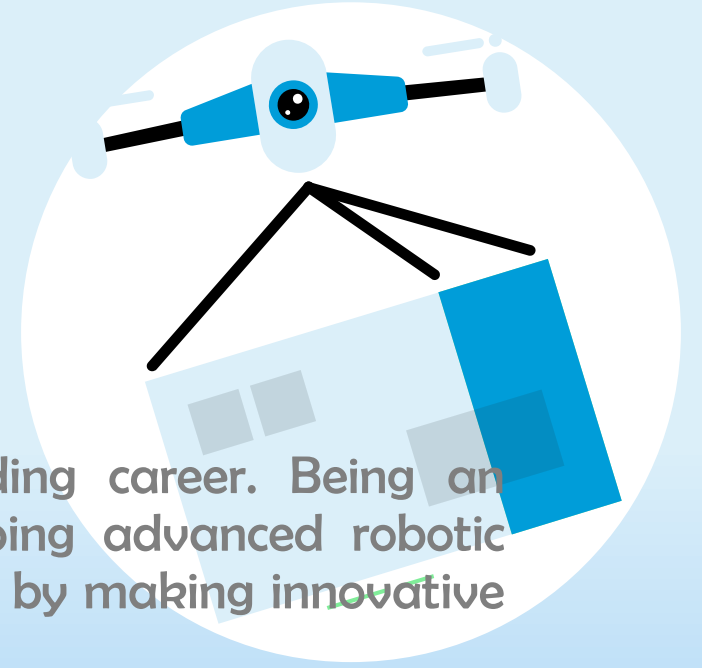
"Robotics will play an important role in providing physical assistance and even companionship for the elderly."

-Bill Gates





- A Robotics is the most lucrative and rewarding career. Being an engineering student you are not only developing advanced robotic devices but also making the lives of people easy by making innovative solutions that enhance and help humans.
- Robotic hands that appear and act like human hands are constructed in a way that makes them very similar to the real thing. This simple human-like hand uses multiple motors with one long tendon roped through the fingers to close and relax the hand, and move the fingers independently.





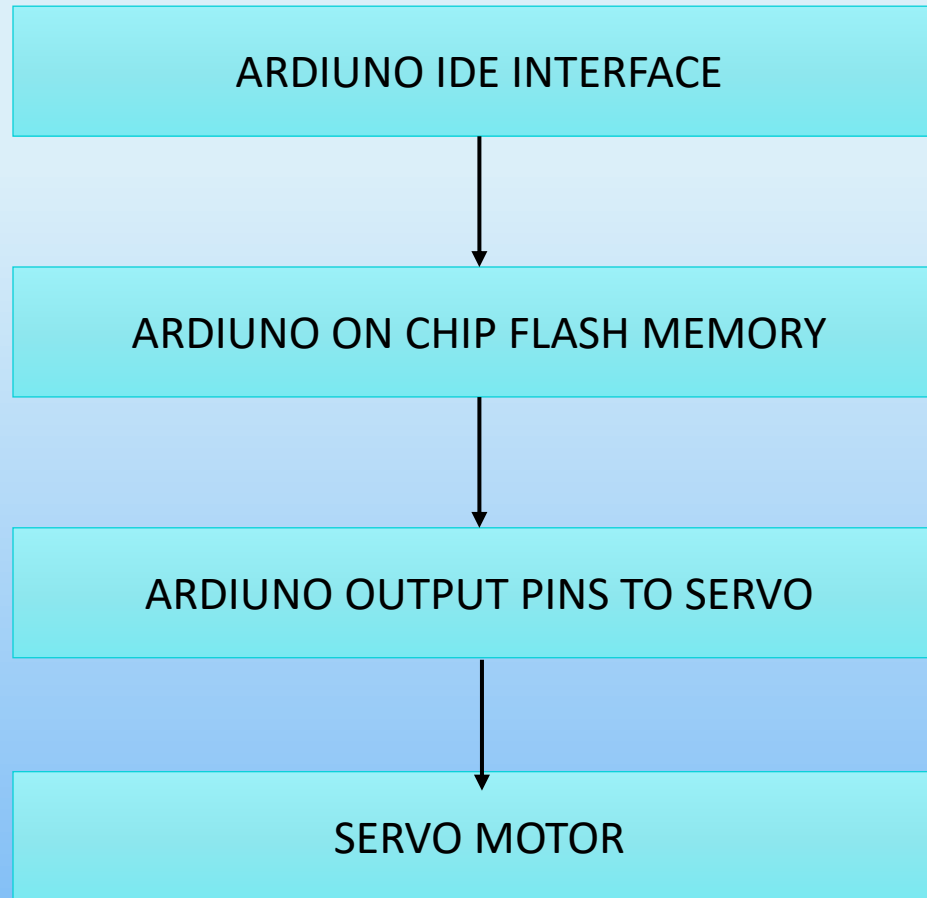
# Aims and Objectives:

- Robotic arms are fast, accurate and reliable, and can collectively be programmed to perform an almost infinite range of different operations.
- Robotics arms can be used for all manner of industrial production, processing and manufacturing roles- any task in which extremely precise, fast and repeatable movements are required



- At times humans may tend to error or get tired or may not be competent to work at certain levels and hence the use of Robotic Arm becomes Mandatory.
- Robot arms are ideal for operations which are repetitive, consistent and require a very high degree of accuracy, as well as for applications in which a human worker might struggle to perform safely.

# Block Diagram:



# Hardware & Software Requirements:



MG996R  
Servo Motor-3pc.



Aurduino UNO



Power Adapter



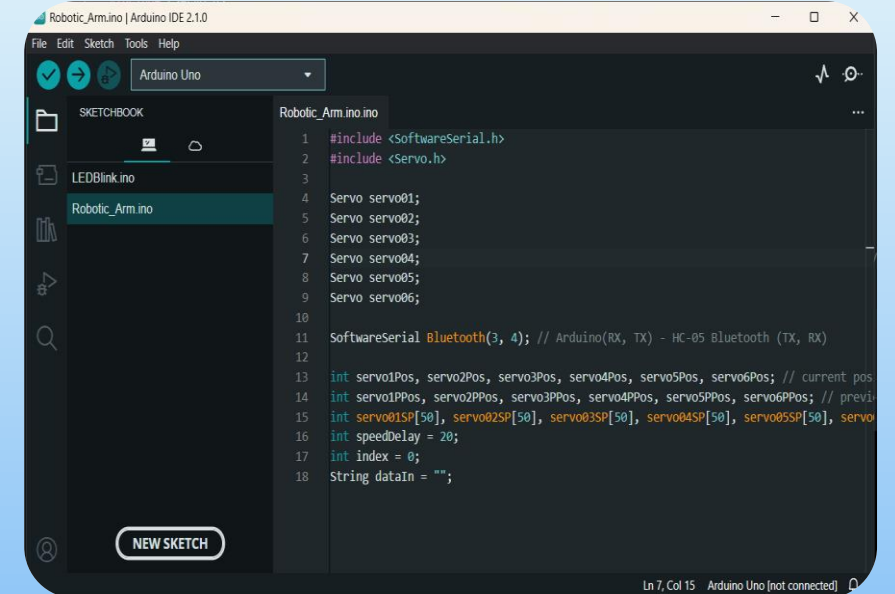
SG90 Servo  
Motor-3pc.



Screwdriver

 Small Bearing 1pcs	 M4 Screw Nut 20pcs	 M3 Screw Nut 10pcs	 M2 Screw Nut 10pcs
 M4*20 Screw 5pcs	 M4*8 Screw 12pcs	 M3*10 Screw 1pcs	 M3*8 Screw 10pcs
	 M3*6 Screw 20pcs	 M2*6 Screw 10pcs	 M2*5 Screw 35pcs

## Ardiuno IDE



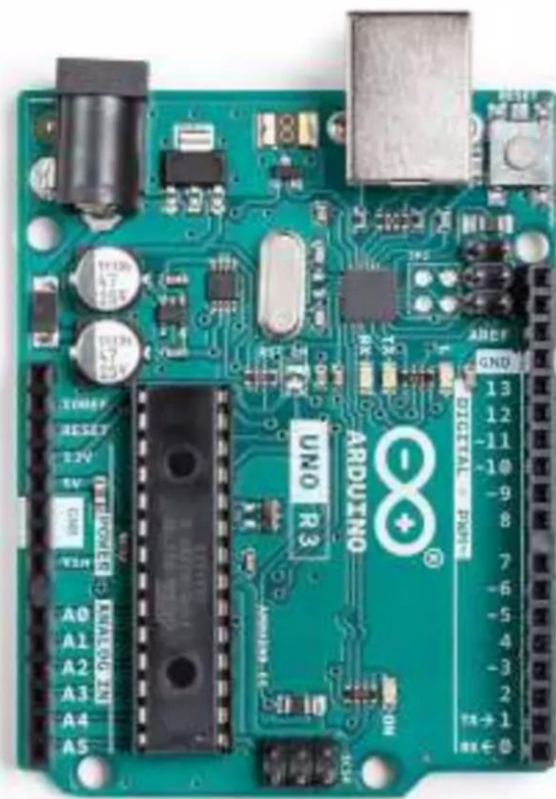
```
1 #include <SoftwareSerial.h>
2 #include <Servo.h>
3
4 Servo servo01;
5 Servo servo02;
6 Servo servo03;
7 Servo servo04;
8 Servo servo05;
9 Servo servo06;
10
11 SoftwareSerial Bluetooth(3, 4); // Arduino(RX, TX) - HC-05 Bluetooth (TX, RX)
12
13 int servo1Pos, servo2Pos, servo3Pos, servo4Pos, servo5Pos, servo6Pos; // current pos
14 int servo1PPos, servo2PPos, servo3PPos, servo4PPos, servo5PPos, servo6PPos; // previ
15 int servo01SP[50], servo02SP[50], servo03SP[50], servo04SP[50], servo05SP[50], servo
16 int speedDelay = 20;
17 int index = 0;
18 String dataIn = "";
```



# Components Specifications

Microcontroller	ATmega328P – 8 bit AVR family microcontroller
Operating Voltage	5V
Recommended Input Voltage	7-12V
Input Voltage Limits	6-20V
Analog Input Pins	6 (A0 – A5)
Digital I/O Pins	14 (Out of which 6 provide PWM output)
DC Current on I/O Pins	40 mA
DC Current on 3.3V Pin	50 mA
Flash Memory	32 KB (0.5 KB is used for Bootloader)
SRAM	2 KB
EEPROM	1 KB
Frequency (Clock Speed)	16 MHz

## Arduino UNO



# Components Specifications

## MG996 Servo Motor



Operating Voltage:	+5V typically
Current:	2.5A (6V)
Stall Torque:	9.4 kg/cm (at 4.8V)
Maximum Stall Torque:	11 kg/cm (6V)
Operating speed:	0.17 s/60°
Gear Type:	Metal
Rotation :	0°-180°
Weight of Motor:	55gm



# Components Specifications

## MG90 Servo Motor



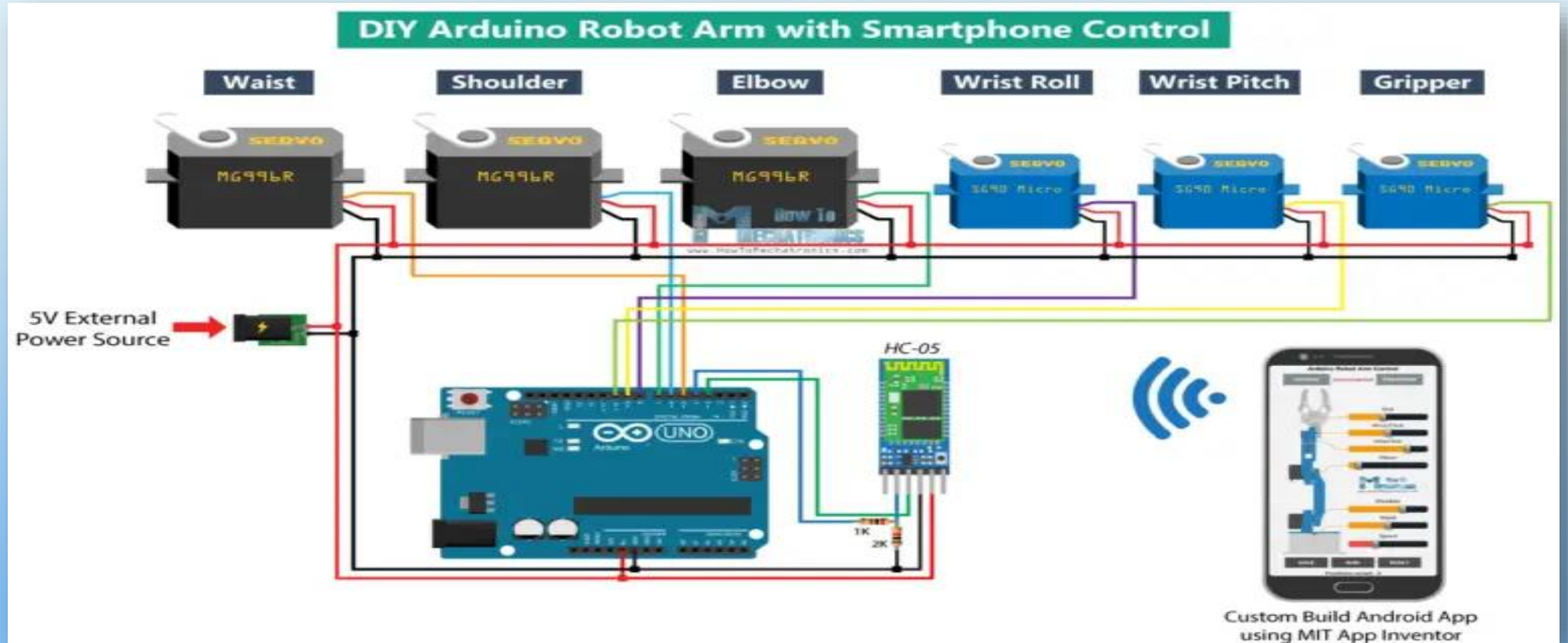
Operating Voltage:	4.8 ~ 6 V DC Volts
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Operating Speed (4.8v):	0.15 Sec/60 Degrees
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Operating Speed (6v)	0.12 Sec/60 Degrees
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Stall Torque (4.8v):	1.3kg/cm
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# Circuit Diagram:



# Ardiuno IDE code :

roboticpick-place.ino.ino

```
1  #include<Servo.h>
2  Servo s1;
3  Servo s2;
4  Servo s3;
5  Servo s4;
6
7  void setup() {
8      // put your setup code here, to run once:
9      s1.attach(5);
10     s2.attach(6);
11     s3.attach(7);
12     s4.attach(8);
13 }
14
15 void loop() {
16     // put your main code here, to run repeatedly:
17     s1.write(0);        //s1 motor (waist) rotate
18     delay(2000);
19
20     s2.write(70);       //shoulder down
21     delay(2000);
22
23     s3.write(160);      //elbow down
24     delay(2000);
25
```

```
25
26     s4.write(0);        //gripper close to pick the element
27     delay(2000);
28
29     s3.write(90);       //elbow up
30     delay(2000);
31
32     s2.write(120);      //shoulder up
33     delay(2000);
34
35     s1.write(90);       //waist rotate
36     delay(2000);
37
38     s2.write(70);       //shoulder down
39     delay(2000);
40
41     s3.write(160);      //elbow down
42     delay(2000);
43
44     s4.write(90);       //open jow realese the element
45     delay(2000);
46
47     s2.write(120);      //shoulder up
48     delay(2000);
49
50     // after all operations done. arm will come to its original position.
51 }
```

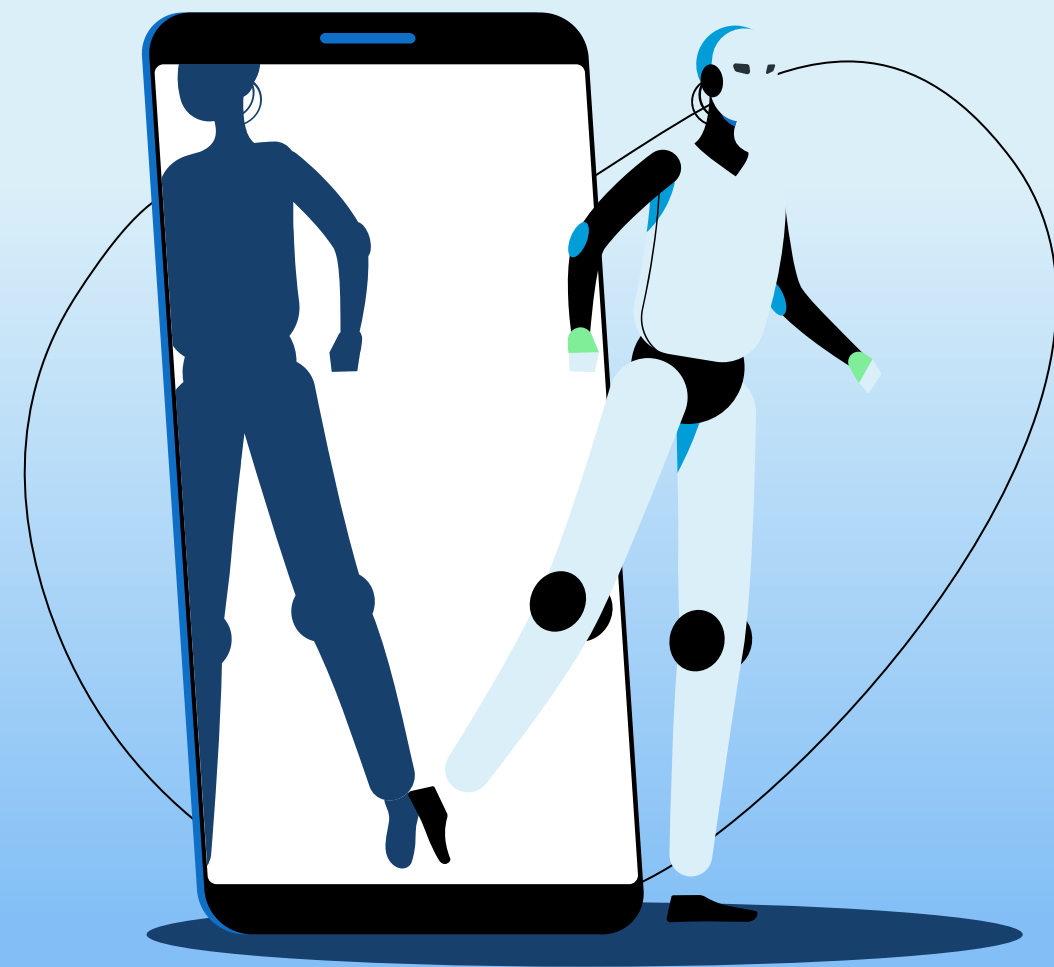
# Advantages:

- **Cost Effectiveness:** There will be no lunchbreaks, holidays, sick leave or shift time allocated for robotic2. **Improved Quality Assurance:** Robotic automation eliminates the risks of vigilance decrement by accurately producing and checking items meet the required standard without fail.
- **Increased Productivity:** Due to continuous and stress less work the production will take place continuously and will boost the production.
- **Work In Hazardous Environments:** If a high level of chemicals are present, robotic automation offers the ideal solution, as it will continue to work without harm, even in areas that have extremely high or low temperatures Robotics will prove themselves the best.



# Limitations:

- Potential Job Losses : One of the biggest concerns surrounding the introduction of robotic automation is the impact of jobs for workers. If a robot can perform at a faster, more consistent rate, then the fear is that humans may not be needed at all.
- Initial Investment Costs: This is typically the biggest obstacle that will decidewhether or not a company will invest in robotic automation, or wait until a later stage. The cash flow must be sustainable in the meantime and the stability of the company is by no means worth the risk if the returns are only marginal.
- Hiring Skilled Staff: Over the past decade manufacturers have found it harder to source skilled staff members to fill the specialised roles in their factories.



**Thank You!**

