**APPEDIX**

**SOURCE CODE FOR ROBOTICS ARM CONTROL SYSTEM**

#include <Servo.h>

Servo motor\_1;

Servo motor\_2;

Servo motor\_3;

Servo motor\_4;

int enA = 7;

int in1 = 5;

int in2 = 4;

int in3 = 3;

int in4 = 2;

int enB = 7;

int servo1 = 90;//grip

int servo2 = 110;//elbow

int servo3 = 50; //shoulder

int servo4 = 90; //waist

char data;

int Speed = 200;

void setup() {

Serial.begin(9600); // initialize serial communication at 9600 bits per second:

motor\_1.attach(8);

motor\_2.attach(9);

motor\_3.attach(10);

motor\_4.attach(11);

motor\_1.write(servo1);

motor\_2.write(servo2);

motor\_3.write(servo3);

motor\_4.write(servo4);

pinMode(enA, OUTPUT); // declare as output for L298 Pin enA

pinMode(in1, OUTPUT); // declare as output for L298 Pin in1

pinMode(in2, OUTPUT); // declare as output for L298 Pin in2

pinMode(in3, OUTPUT); // declare as output for L298 Pin in3

pinMode(in4, OUTPUT); // declare as output for L298 Pin in4

pinMode(enB, OUTPUT); // declare as output for L298 Pin enB

delay(1000);

}

void loop() {

//if some date is sent, reads it and saves in state

if (Serial.available() > 0)

{

data = Serial.read();

Serial.println(data);

if (data > 20) {

Speed = data;

}

}

analogWrite(enA, Speed); // Write The Duty Cycle 0 to 255 Enable Pin A for Motor1 Speed

analogWrite(enB, Speed); // Write The Duty Cycle 0 to 255 Enable Pin B for Motor2 Speed

if (data == 1) {

forward();

}

else if (data == 2) {

backward();

}

else if (data == 3) {

left();

}

else if (data == 4) {

right();

}

else if (data == 5) {

Stop();

}

else if (data == 8) {

servo1o();

}

else if (data == 9) {

servo1c();

}

else if (data == 10) {

servo2u();

}

else if (data == 11) {

servo2d();

}

else if (data == 12) {

servo3f();

}

else if (data == 13) {

servo3b();

}

else if (data == 14) {

servo4l();

}

else if (data == 15) {

servo4r();

}

}

void forward() { //forward

digitalWrite(in1, HIGH); //Right Motor forword Pin

digitalWrite(in2, LOW); //Right Motor backword Pin

digitalWrite(in3, HIGH); //Left Motor backword Pin

digitalWrite(in4, LOW); //Left Motor forword Pin

}

void backward() { //backward

digitalWrite(in1, LOW); //Right Motor forword Pin

digitalWrite(in2, HIGH); //Right Motor backword Pin

digitalWrite(in3, LOW); //Left Motor backword Pin

digitalWrite(in4, HIGH); //Left Motor forword Pin

}

void right() { //turnRight

digitalWrite(in1, HIGH); //Right Motor forword Pin

digitalWrite(in2, LOW); //Right Motor backword Pin

digitalWrite(in3, LOW); //Left Motor backword Pin

digitalWrite(in4, HIGH); //Left Motor forword Pin

}

void left() { //turnLeft

digitalWrite(in1, LOW); //Right Motor forword Pin

digitalWrite(in2, HIGH); //Right Motor backword Pin

digitalWrite(in3, HIGH); //Left Motor backword Pin

digitalWrite(in4, LOW); //Left Motor forword Pin

}

void Stop() { //stop

digitalWrite(in1, LOW); //Right Motor forword Pin

digitalWrite(in2, LOW); //Right Motor backword Pin

digitalWrite(in3, LOW); //Left Motor backword Pin

digitalWrite(in4, LOW); //Left Motor forword Pin

}

void servo1o() {

if (servo1 <= 180 && servo1 >= 1) {

servo1 = servo1 - 2;

delay(30);

motor\_1.write(servo1);

}

}

void servo1c() {

if (servo1 >= 0 && servo1 < 180) {

servo1 = servo1 + 2;

delay(30);

motor\_1.write(servo1);

}

}

void servo2u() {

if (servo2 <= 180 && servo2 >= 1) {

servo2 = servo2 - 2;

delay(30);

motor\_2.write(servo2);

}

}

void servo2d() {

if (servo2 >= 0 && servo2 < 180) {

servo2 = servo2 + 2;

delay(30);

motor\_2.write(servo2);

}

}

void servo3f() {

if (servo3 <= 180 && servo3 >= 1) {

servo3 = servo3 - 2;

delay(30);

motor\_3.write(servo3);

}

}

void servo3b() {

if (servo3 >= 0 && servo3 < 180) {

servo3 = servo3 + 2;

delay(30);

motor\_3.write(servo3);

}

}

void servo4l() {

if (servo4 <= 180 && servo4 >= 1) {

servo4 = servo4 - 2;

delay(30);

motor\_4.write(servo4);

}

}

void servo4r() {

if (servo4 >= 0 && servo4 < 180) {

servo4 = servo4 + 2;

delay(30);

motor\_4.write(servo4);

}

}