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LIST OF SYMBOLS

A=Ampere

V=Voltage

mV=Mili Voltage

mA=Mili Ampere

DC=Direct Current

AC=Alternative Current

HMI=Human Machine Interface

PWM=Pulse Widht Modulation

GND=Ground

IOT=Internet Of Thing

LCD=Liquid Crystal Display

LED=Light Emitting Diode

W=Watt

L=Lenght

w=Width

ABSTRACT

In this thesis i will talk about Robot Arm history after that, i will explain Robot Arm ,Robot Arm using areas , Structive of Industrial Robots , Aduino and Servo motor.We have a polishing and painting room.It has got two fan ,one of them has a Resistance heater Design.

ISTANBUL 06/2017 **HALIL IBRAHIM TURGUT**

INTRODUCTION

As a result of my observations on robot arms, I started to build a 6-axis robot and program it to use it on the industrial side. Nowadays robotic arms have become an integral part of the industry. It makes a significant contribution to today's technology by reducing the human power the most, reducing the rate of error and bringing the production quantity to the upper levels. When we consider the work areas, benefits and future success of robot arms, there is a field that needs to be taken care of with certainty.

It is known that modern automobile factories are a very necessary production environment. Companies facing world wide competition have to find solutions, today's challenging business requirements. The way to meet these requirements is to increase productivity.

First, I learned how to control how a robot arm Works. I chose robot arm type which is most suitable to use industrial field by looking at robot arm types. Among the 5 most important types, we chose robot arm structure articulated robot arm.

Then I tried the 7805 regulator system, but the engines we used for the axes were too powerful and the 7805 regulator was not enough.Afterwards, we discovered the strong sources of power DC-DC converter.I used 4 dc-dc converter ,theree of them for servo power supply ,the ohter dc converter is a arduıno and general power supply.Every dc-dc converter has 3 A current value .that is enough for servo motors.I connected 2 servo with one dc-dc converter.

1. ROBOTIC ARM

The robotic arm can be described as a programmable, whole mechanical part or as part of a complex robot. Nowadays robotic arms have become an integral part of the industry. It makes a significant contribution to today's technology by reducing the human power the most, reducing the rate of error and bringing the production quantity to the upper levels.

1.1 HISTORY

Today, the robot, the American robot industry association with different programmed movements, materials, parts, tools or special vehicles, with a reprogrammable feature, a multipurpose Manipulator. If it is necessary to give a simpler definition of production, Programmable, automatic repeatable and work in the industrial environment machine is an industrial robot.

Robot arm starts in 1801 with Programmable weaving loom and in 1974 The first commercial industrial robot to use a mini computer.

1.2 TYPES

1.2.1 SCARA ROBOT ARM

It is widely used in fields such as filling applications and assembly applications. It is especially attracted by its high speed and work capacity. The electric motors at the joints allow the arm to rotate around its axis. In the mouth there is a pneumatic motor. This allows the engine to gain flexibility.

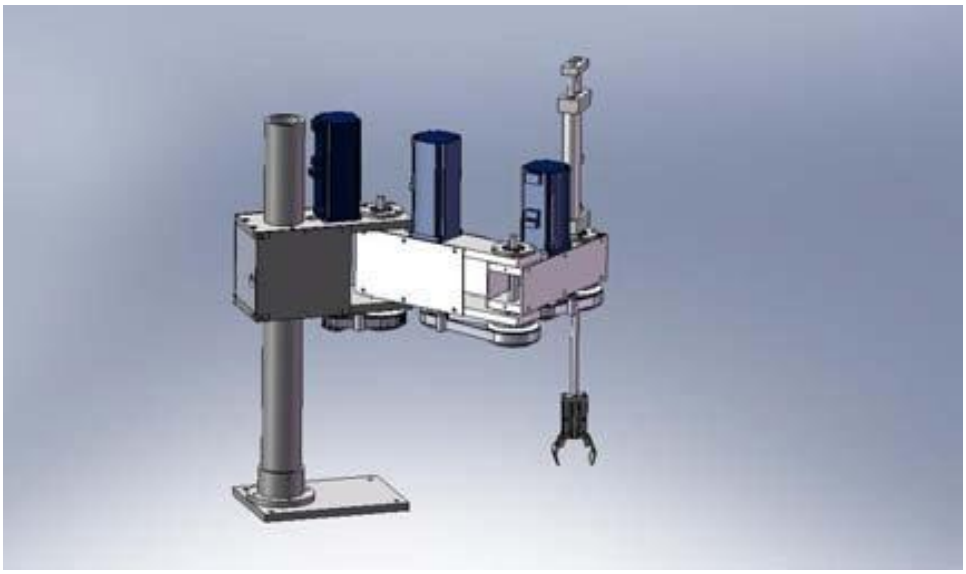

Figure: 1.0 Scara Robot Arm View

1.2.2 CARTESIAN ROBOT ARM

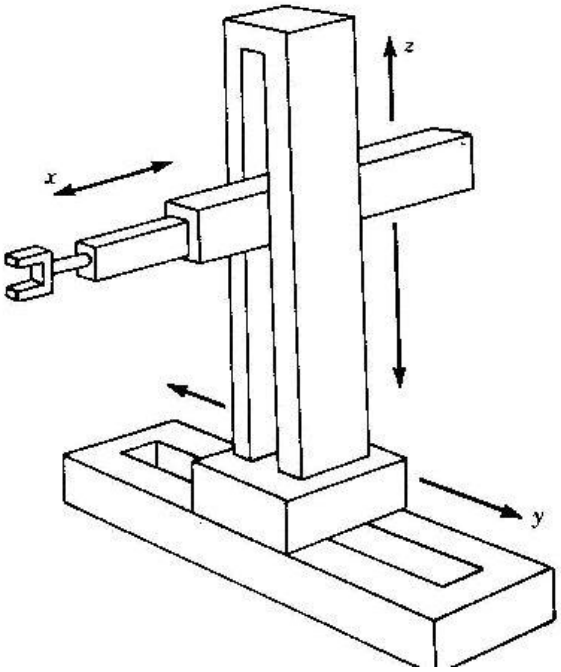

Figure:2.1 Cartesian Robot Arm View

It moves linearly in X, Y, Z axes. Has the ability to hold and carry. The bounded area is very simple to reach a certain point, but it moves in such a limited way. Because it is strong in the mechanical direction, it is among the ideal robot arms to carry heavy-duty and large-sized objects.

1.2.3 CYLINDRICAL ROBOT ARM

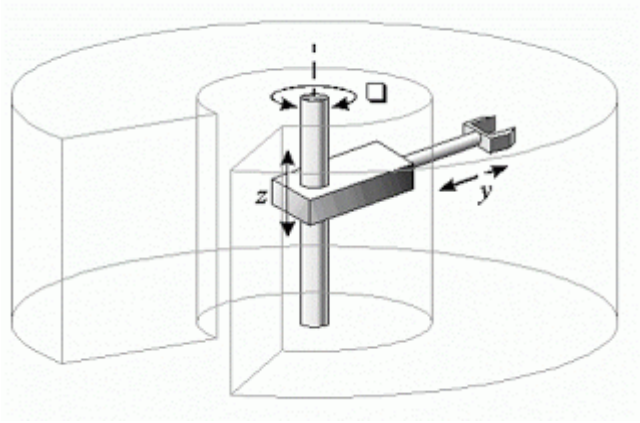

Figure:2.2 Cylindrical Robot Arm View

Cylindrical robot arms have higher moving capability than Cartesian robot arm due to their high turnability. It performs the task of grab and stone in the cylindrical meeting area. Coordinate systems are not cylindrical, so they do not have a flexible use. Hydraulic, pneumatic and electric motor types are available.

1.2.4 SPHERICAL ROBOT ARM

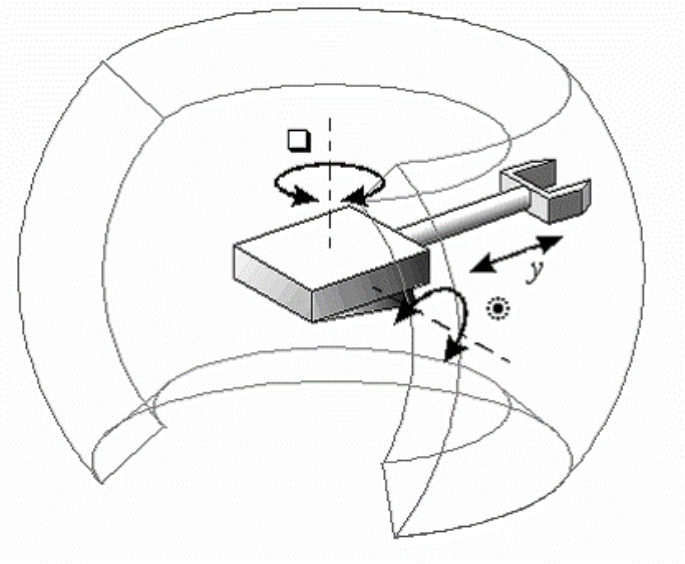

Figure:2.3 Spherical Robot Arm View

Polar is also called as coordinate robot arm. It is difficult to program because it has a global working style. The range of motion of the global robots is limited by the size of their arms. For this reason, larger arms are used to enlarge the range of motion. It is used in processes such as die casting, welding, bending, bending and gluing.

1.2.5 ARTICULATED ROBOT ARM

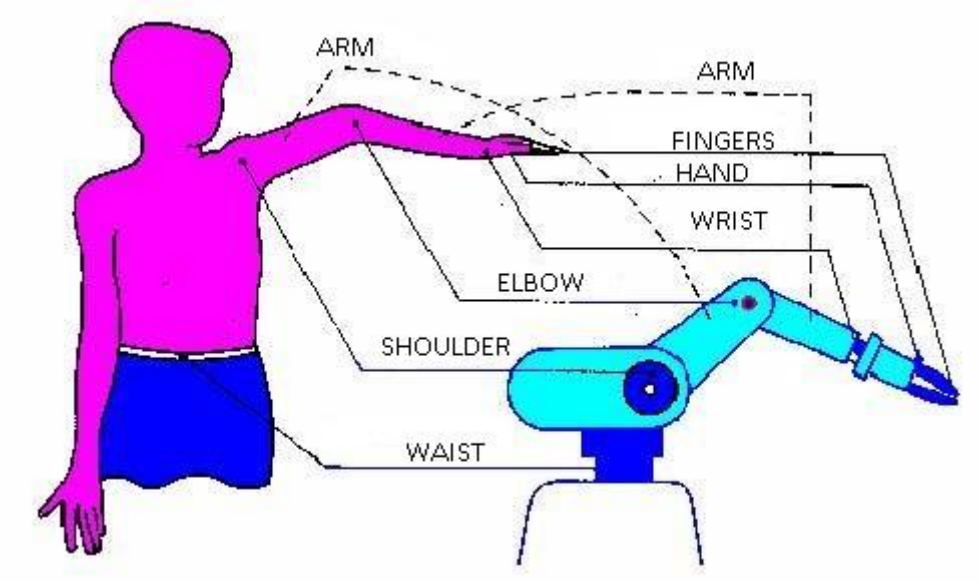

Figure:2.4 Articulated Robot Arm View

Robotic arm with at least 3 rotary joints. Such robots are widely used in sectors such as gas supply, arc welding, spraying machines. The freedom of movement of the robot is directly proportional to the number of joints. Each joint is connected to a separate servo motor. The motion fields vary according to the program being written.

1.2 USAGE AREAS

Using application robots to automate production lines is an easy way to save time and money. Industrial robots also reduce waste and produce high-quality products with continuous precision.

They are Arc Welding ,Spot Welding,Materials Handling,Machine Tending Automation,Painting,Picking ,Packing and Pakketzing,Assembly,Mechanical Cutting ,Grinding,Deburring and Polishing.As we can see , many area robot arms make industrial life easier. Collaborative , Injection Molding ,Machine Tending ,Order Picking ,Palletizing ,Pick and Place ,Vision ,Dispensing ,Machine Loading ,Material Handling, Packaging , Part Transfer ,Press Tending , 3D Laser Vision , Assembly, Cleanroom, Cutting ,Drilling ,Foundry,Laser Cutting,Meat Processing Automation ,Painting Automation ,Refueling ,Sanding ,Thermal Spray,Appliance Automation ,Bonding / Sealing ,Coating ,Deburring .

Each industrial robot application requires unique end of arm tooling, specific reach and payloads, and flexibility. RobotWorx has a large robot and

workcell inventory from name brand robotic companies that allows us to integrate an order quickly.

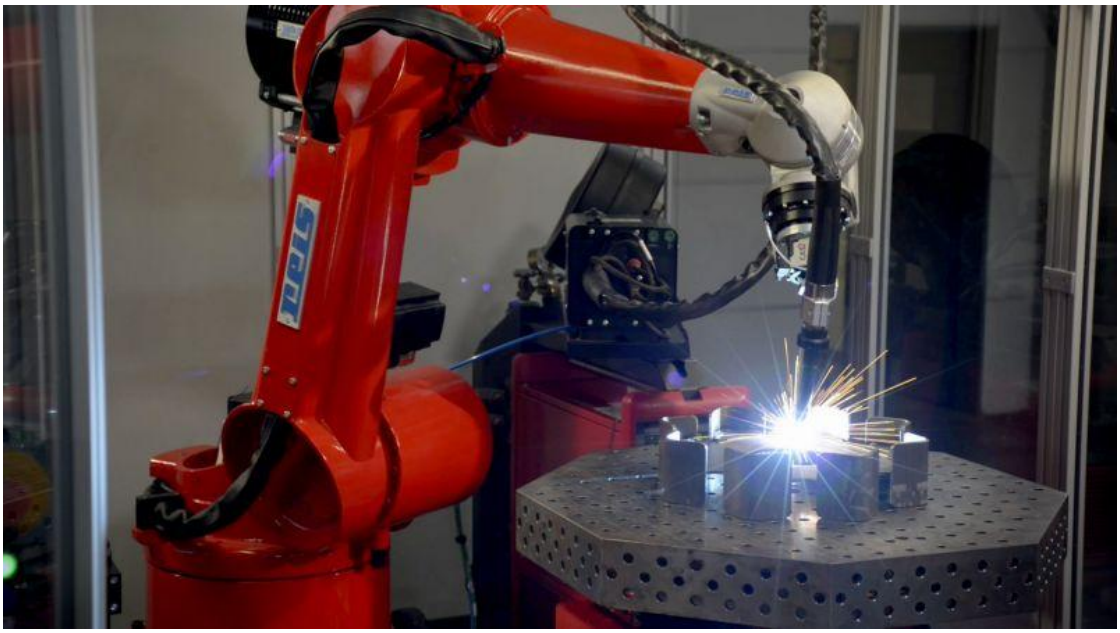

Figure:2.5 Robot Arm Works On Welding

Figure:2.6 Robot Arm Works On Palletzing

2. STRUCTİVE OF INDUSTRIAL ROBOTS

2.1 Manipulator

Mechanically acting and often referred to as "arm" Mechanical unit. At the end of the column there is also a There is a "wrist". Manipulator consists of the following parts.

- Mechanical elements and joints,

- Feedback elements,

- Mechanical elements such as gears, chains, etc. Motion elements using motion.

2.2 End elements(Grippers)

The tip of the manipulator is connected to the wrist means the gripper, tool, apparatus or apparatus used by the robot when performing the desired task .They are the sensor.

2.3 Power unit

It is the unit that supplies energy to the movement elements. Power unit three

There can be different types.

- Electric,

- Hydraulic,

- Pneumatic.

2.4 Control system.

The robot can be regarded as the brain. The main control system

Tasks are given below.

- Starting and finishing the movement,

- Storage of the data required for movement,

- Communication with the outside world - other maids and people.

3. NEXTION HMI OPERATOR PANEL

Nextion is a seamless Human Machine Interface (HMI) solution that provides a control and visualization interface between a human and a process, machine, application or appliance. Nextion is mainly applied to Internet of thing (IoT) or consumer electronics field. It is the best solution to replace the traditional LCD and LED Nixie tube.

Figure 3.1: Nextion Hmı Operator Panel Screen

We will control every step and every axis on robot arm with this nextion hmı operator panel .

480 x 320 Resolution (3.5”)

RGB 65K true to life colours

TFT Screen with integrated 4-wire Resistive Touch Panel

Easy 4 pin interface to any TTL Serial Host

16M Flash memory for User Application Code and Data

On board micro-SD card for firmware upgrade

Visual Area:73.44mm(L)×48.96mm(W)

Adjustable Brightness:0~180 nit, the interval of adjustment is 1%

5V500mA DC recommended power supply

5V145mA power consumption

Figure: 3.2 Nextion Hmı Operator Panel Screen example

Figure: 3.3 Nextion Hmı Operator Panel Screen example 2

4. L298N MOTOR DRİVER

Using the L298 integration with the H Bridge as the motor driver, the dual motor drive capability is provided. In this case, we can drive two DC motors or one stepper motor at 12V and 2A.

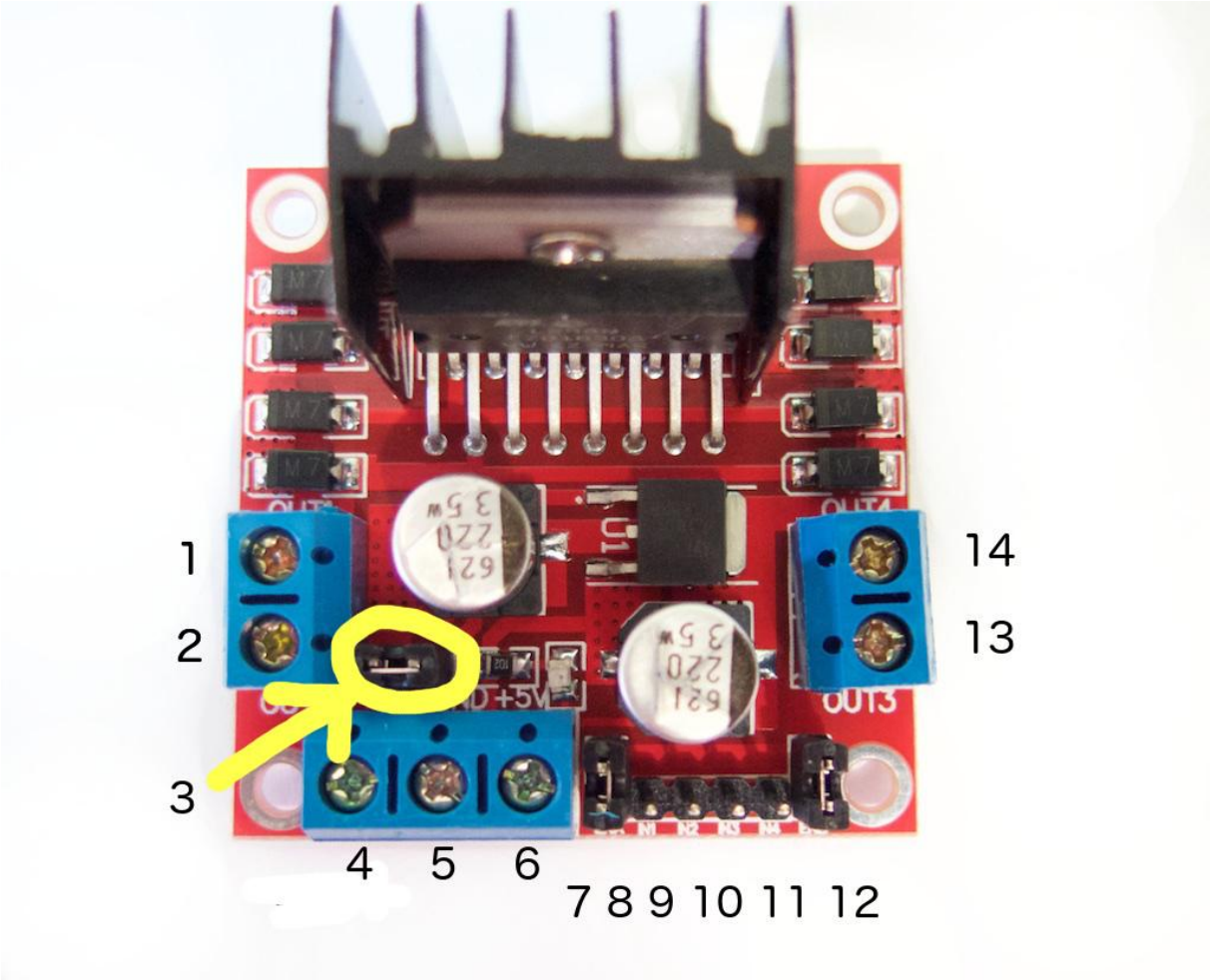

Figure: 4.0 Motor Driver Top View

1. DC motor 1 "+" or stepper motor A+

2. DC motor 1 "-" or stepper motor A-

3. 12V jumper - remove this if using a supply voltage greater than 12V DC. This enables power to the onboard 5V regulator

4. Connect your motor supply voltage here, maximum of 35V DC. Remove 12V jumper if >12V DC

5. GND

6. 5V output if 12V jumper in place, ideal for powering your Arduino

7. DC motor 1 enable jumper. Leave this in place when using a stepper motor. Connect to PWM output for DC motor speed control.

8. IN1

9. IN2

10. IN3 open in browser PRO version Are you a developer? Try out the HTML to PDF API pdfcrowd.com

11. IN4

12. DC motor 2 enable jumper. Leave this in place when using a stepper motor. Connect to PWM output for DC motor speed control.

13. DC motor 2 "+" or stepper motor B+

14. DC motor 2 "-" or stepper motor B

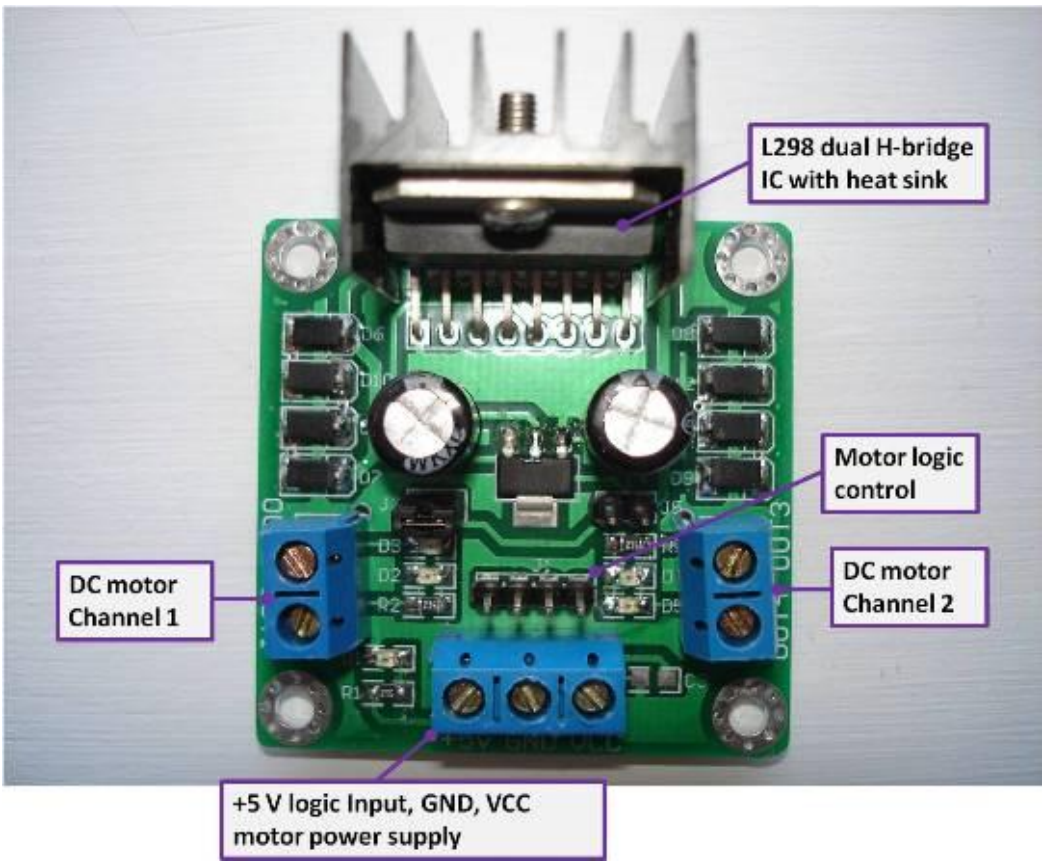

Figure: 4.1 Different Type Motor Driver

5. DC DC CONVERTER

DC-to-DC converter circuits are DC-converter circuits used to adjust current and voltage levels. These are the circuits that are often used in power electronics. We can consider a DC converter transformer as an equivalent circuit. The transformer can increase or decrease the voltage of a DC source in the DC converter, as AC can increase or decrease the voltage of a voltage source. Of course, in parallel with the changes in the tension, the current will increase and decrease. The point to be noted is that the voltage increases and decreases inversely proportional to the current. Current increases when voltage increases, current increases when voltage decreases.

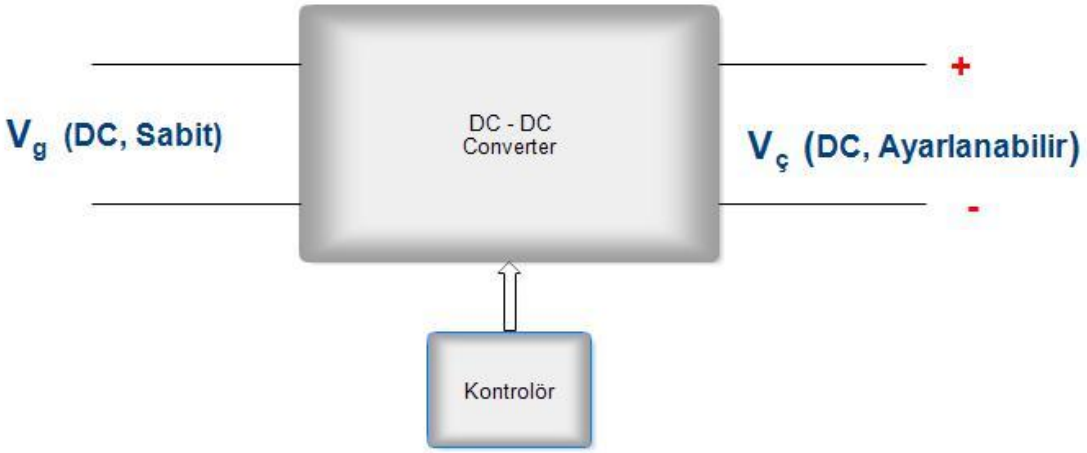

Figure:5.1 Dc-Dc Converter Equations

Vg = DC voltage is assumed to be constant.

Vc = DC voltage is adjustable.

Vc>Vg = This converter is called Buck Converter or down converter.

Vc<Vg = This converter is called Boost Converter or Booster.

The circuits that make up any two of the above conditions are called Buck-Boost Converter.

One of the most well-known and simplest converters among DC-DC converters is the Boost Converter. ... Boost Converter is one of the most important structures among DC converters. The design of the buck is based on obtaining the output voltage by increasing the applied voltage value.

6. ARDUINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

Figure 6.1:Arduino Types

We used Usb Host Shield ,for ps3 game console to communicate with Arduino.

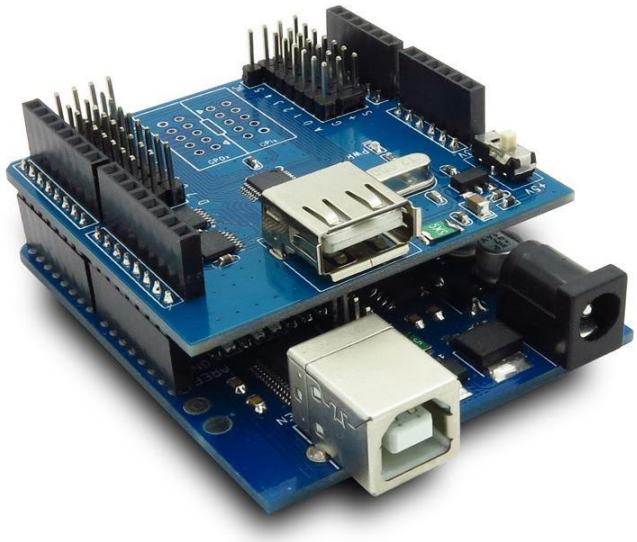

Figure: 6.2 Usb Hos Shield With Arduino Uno R3

7. SERVO MOTOR

The servomotor is analogous to dc or ac motor types as a structure, in addition to these systems there is a potentiometer or a control circuit which measures the position of the encoder and motor shaft (shaft) in its internal structure.

Because of the presence of one dc motor in the dc servo motor, the dc servo motor has received but in addition to the dc motor, it also controls the dc motor shaft with a control circuit and a potentiometer acting as a shaft at the output.

The dimensions and shapes of the servomotors depend on the planned application. The servo motor on the side is similar to servo motors commonly used in robotics. They can operate at low power, depending on the characteristics and application of the servomotor used, they can be supplied with DC voltage sources ranging from 100mA to 2A.

Figure 7.1:MG996 High Torque Servo Motor

3 .1 SYSTEM HMI SCREEN DETAIL

Robots can be controlled in various forms. But they always need an operatore. For operators, they need a system in terms of speeding up transactions, getting necessary information and ease of use. That's why we create interfaces that we call HMI to control robots.

We have six axis on our hmı design.we can increase and decrease every axis.On our hmı screen , it has a six position value.it moves between 0 to 180 degree.Because our servo motor position moves between 0 to 180 degree.we can see every motor position value.

Planned to be made ,Teach button.When we push that button ,system will save every axis position value and when we pres start button, robot will move we saved axis position value.That’s importans for robot arm system.We can do most of what we want on the hmi screen. Thanks to this advanced screen, it is possible to have many simultaneous operations with real time clock.

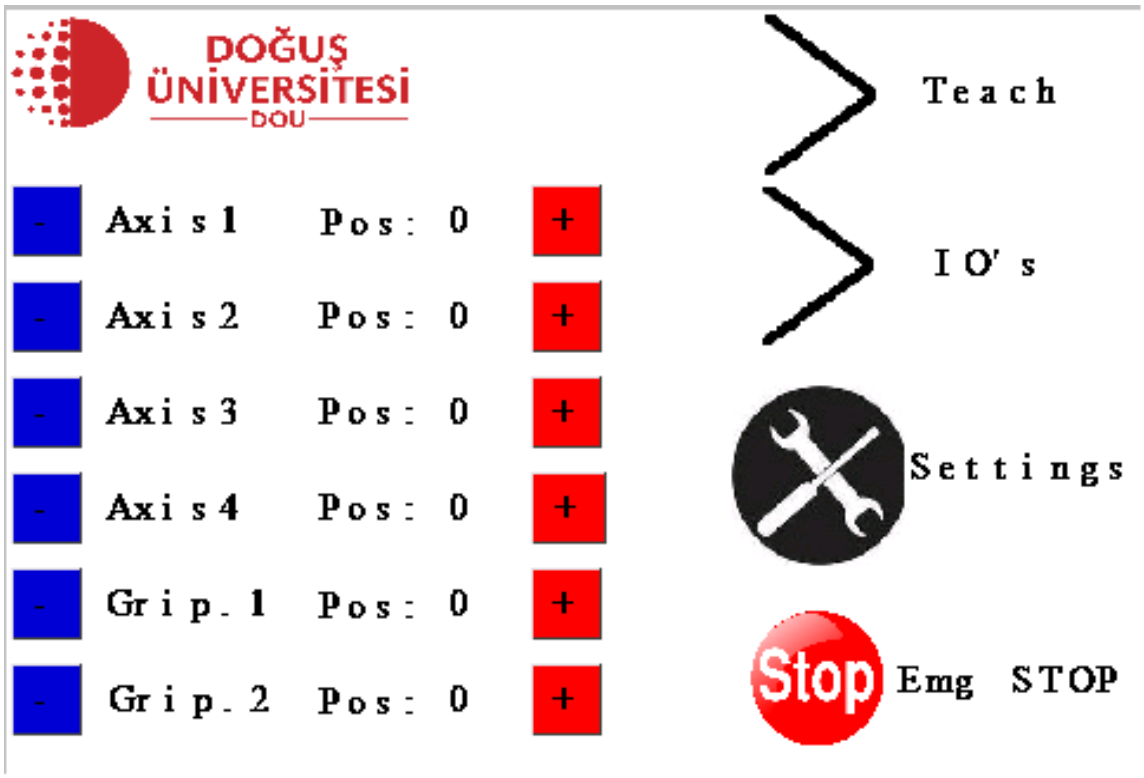

Figure 3.3:Human Machine Interface screen 3

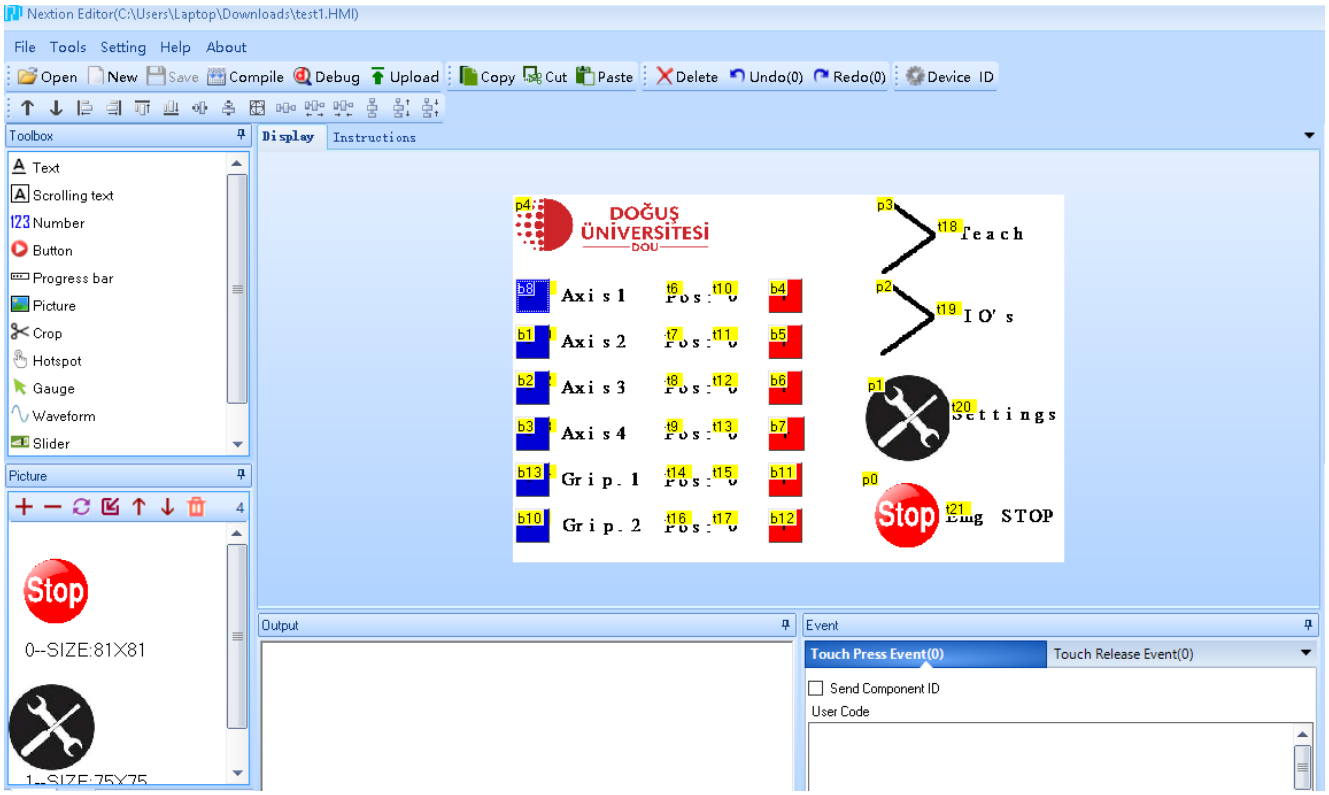

Figure 3.4 : Nextion Editor With HMI Screen

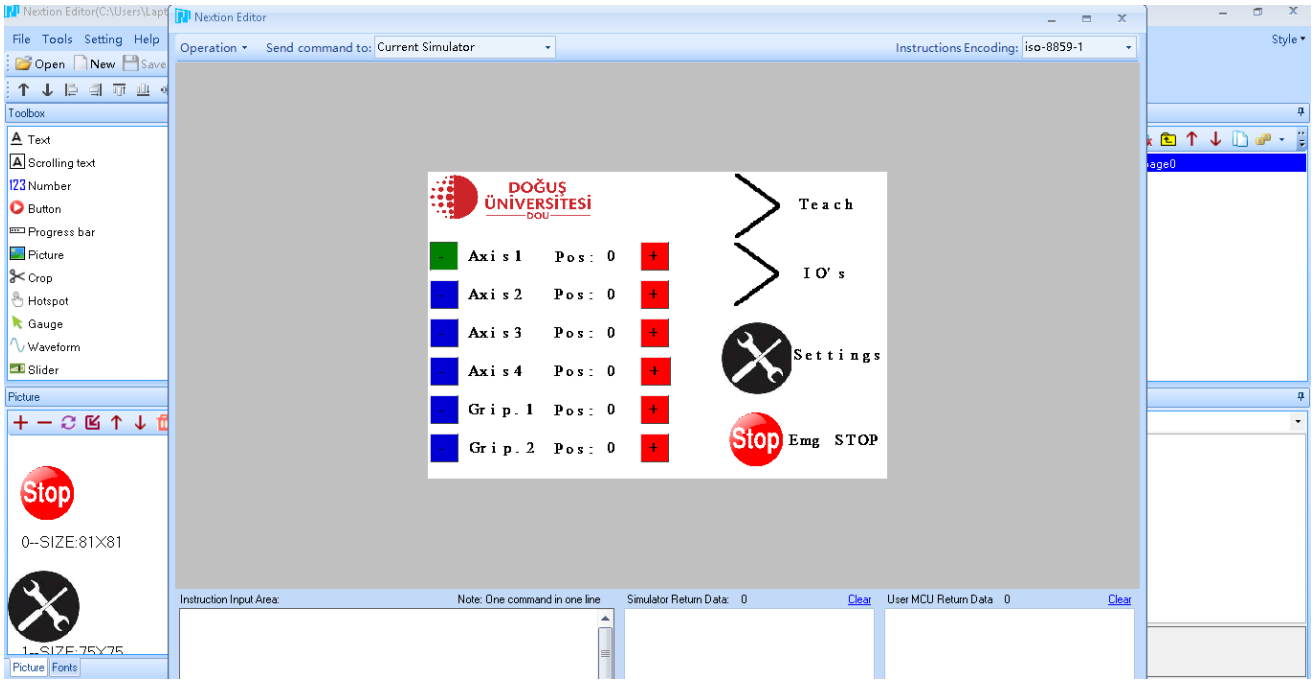

Figure 3.5: Nextion Editor With HMI Screen Simulator Increasing

8. POWER UNIT ON ROBOT ARM SYSTEM

I wanted to integrate the power needed for the robot arm first. I started to implement the system I designed with 7805 integration by supplying the necessary materials. On this entegrator datasheet says that this integrator could give 1 amp of power at its output. But no matter how hard I try, I can not afford it. I see that the products are not genuine and the data in the datasheet is invalid.

Leaving the motherboard I designed in the middle of the day to look for a different solution to this problem. After my research I saw that it was a power source called dc-dc converter and I went to work.

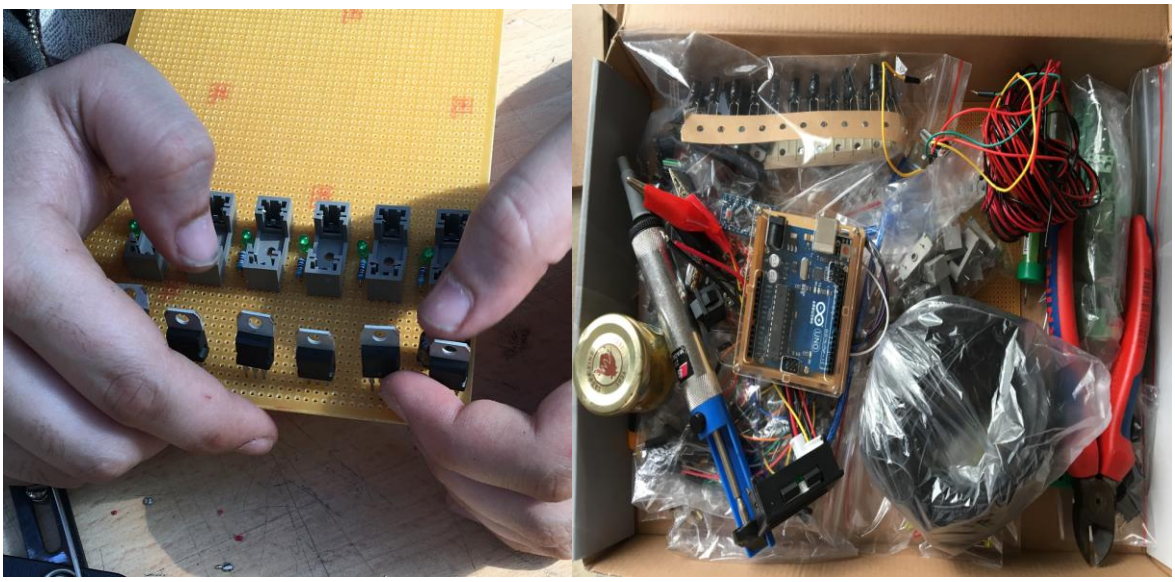

Figure 8.1:7805 Entegrators Testing

The work of robots means that a great need is needed. Robot arms can be powered in various ways. These include hydraulic systems, puneumatic systems and electrical systems. Our system works with electricity but it can be done with many attachments made to the motor if necessary. Each servo motor consumes 1 amper power. So, I use the dc-dc converter.It provides 3 ampers power.We have 5 pieces of dc-dc converter.theree for servo motors and the others for processor feeds. I combined all of this on a card and got a power unit. Input value of the power unit 12 volts and 12 Ampers.

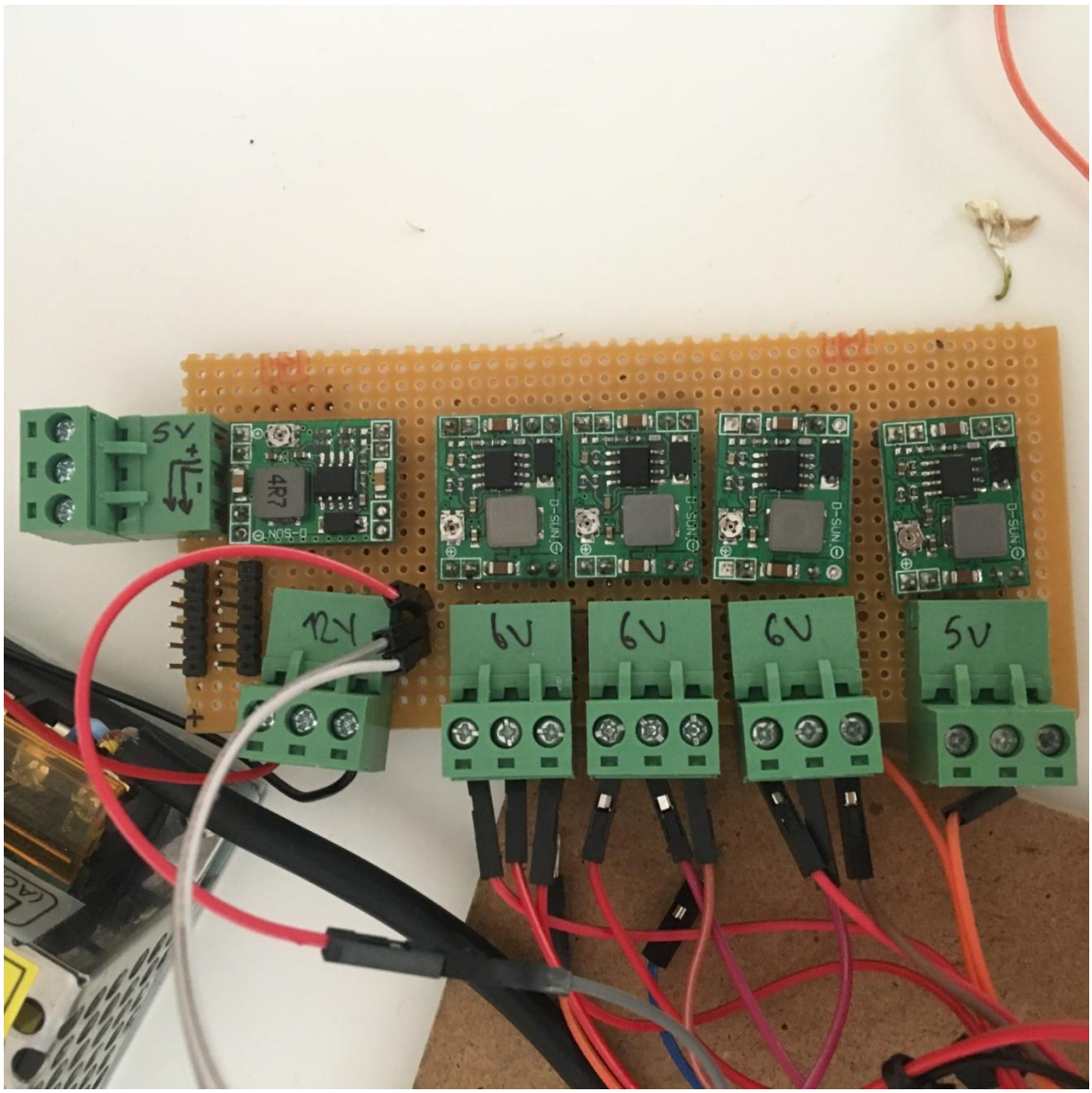

Figure 8.2:Dc-Dc Converter Main Power Supply

9. DRYING SYSTEM

Another section of the robot arms is painted and dried. Followed by polishing. They are much more durable and continuous than humans. Robot arms can move in a lot of heavy material

I applied some of the data I obtained with the experiments I had done in the project. At the beginning of these, Hot air unit made by resistance wire and fan cooperation.Resistance wire is heated by the electric current passing through. Consist of Crom and Nickel. Its thickness is 0.50mm.It can reach very high or very low temperatures compared to the current flowing through this wire, which is used in industrial and many industrial systems. While the length and thickness get a very important temperature degree.

I said that there was a fan in the system.It is used to distribute the temperature on the heated wire into the room. The resistor works with the wire and is energized at the same time. I installed all of them in an insulated cabin and installed them. In this way the temperature values become more accurate and productive.

Figure 9.1:Fan And Heat Control

10. DATA DISPLAY FOR OPERATOR

We control fence wire and fan with arduino.For this,we need roley module, One for one system. The operating voltage on the role was taken from arduino. There are 2 roles used for fan and heater control. We control these role modules with arduino. We can work together at certain times to provide the necessary warmth and controlled cooling , One for one system.

It is very important for the operator to see instantaneous values for efficient operation. Sometimes it is not noticed by the system when there is an error and this causes the work order and the work process to be damaged. That's why,I used Nokia 5110 LCD Display. it easy-to-use LCD display that we can use with Arduino and different microcontroller platforms is a nice graphical LCD projects.

We will obtain a temperature value on this screen by processing the data we have obtained from the integration of LM 35[]. We will write this on the screen to let the operator instantly see the temperature value. The lm35 integration gives us temperatures from 0 to 150 degrees at an analog value. We obtain the temperature value by coding this value with arduino. Each data coming from the analog signal is 10mV.

***analogvoltage = analogRead(A1); //A1 measured**

***analogvoltage = (analogvoltage/1023)*5000;//value convert milivolts.**

***temperature = analogvoltage /10,0;//we have a temperature value.**

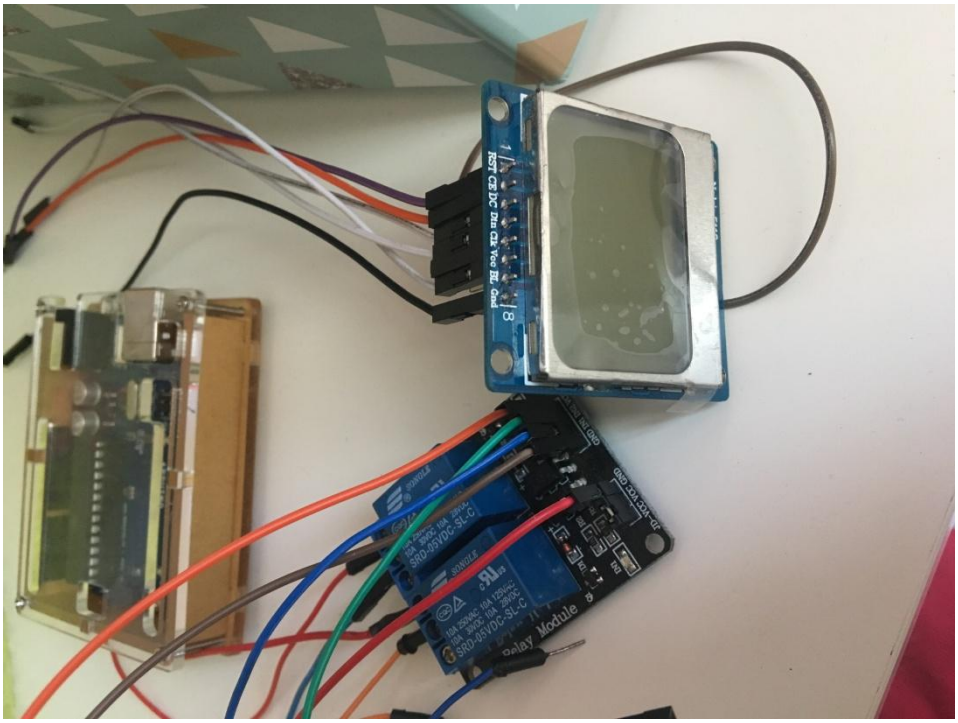

Figure 9.2:Lcd Screen And Roley Control Module

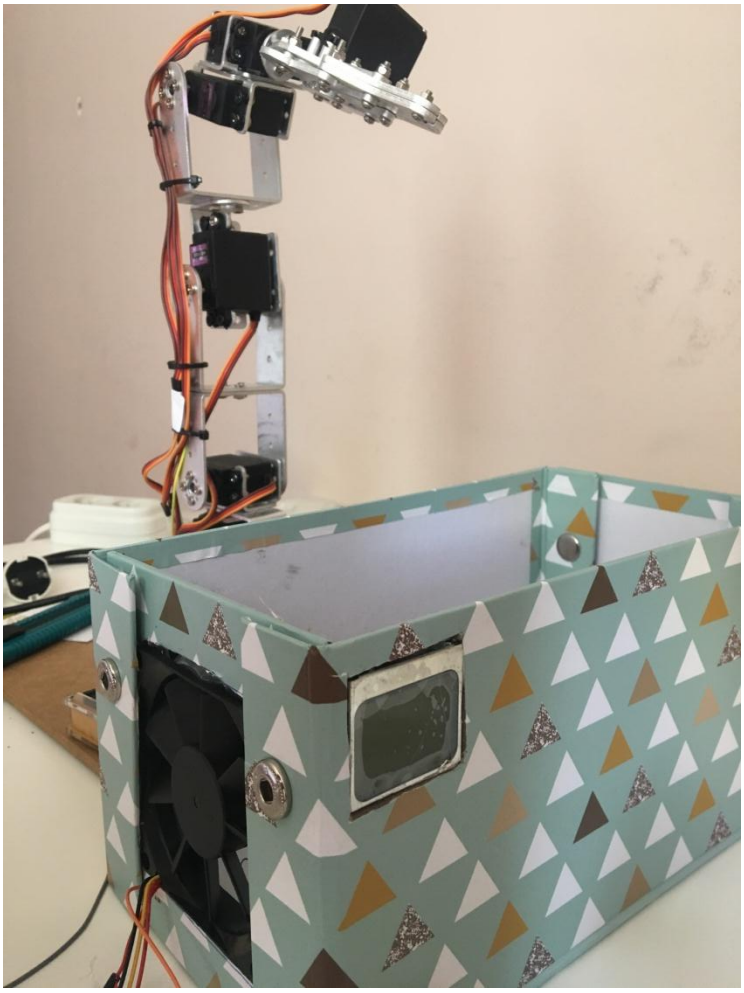

Figure 9.3:Drying Room With Fan and Resistance Wire

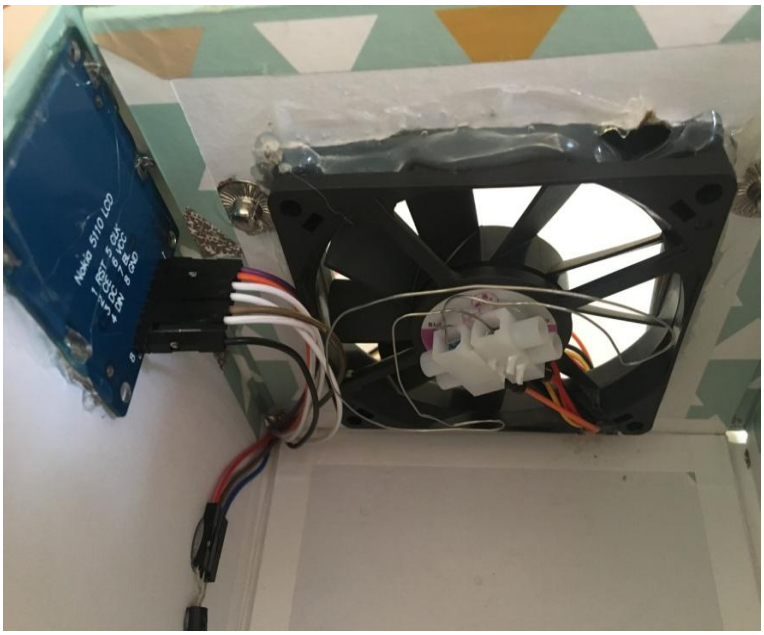

Figure 9.4 :Heat Control System On Drying Room

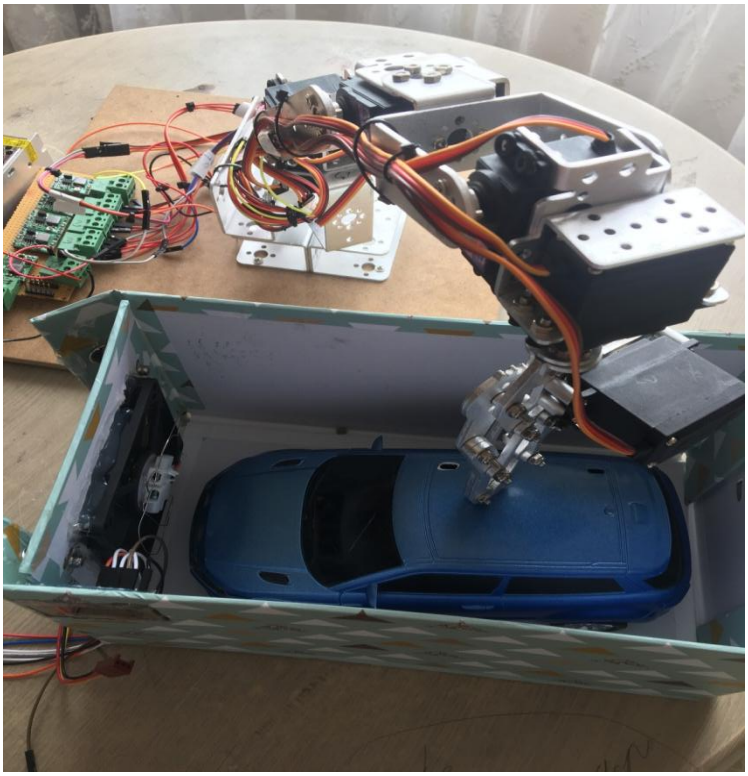

Figure 9.5 : The Car in Drying Room

Figure 9.6 : The Car in Drying Room 2

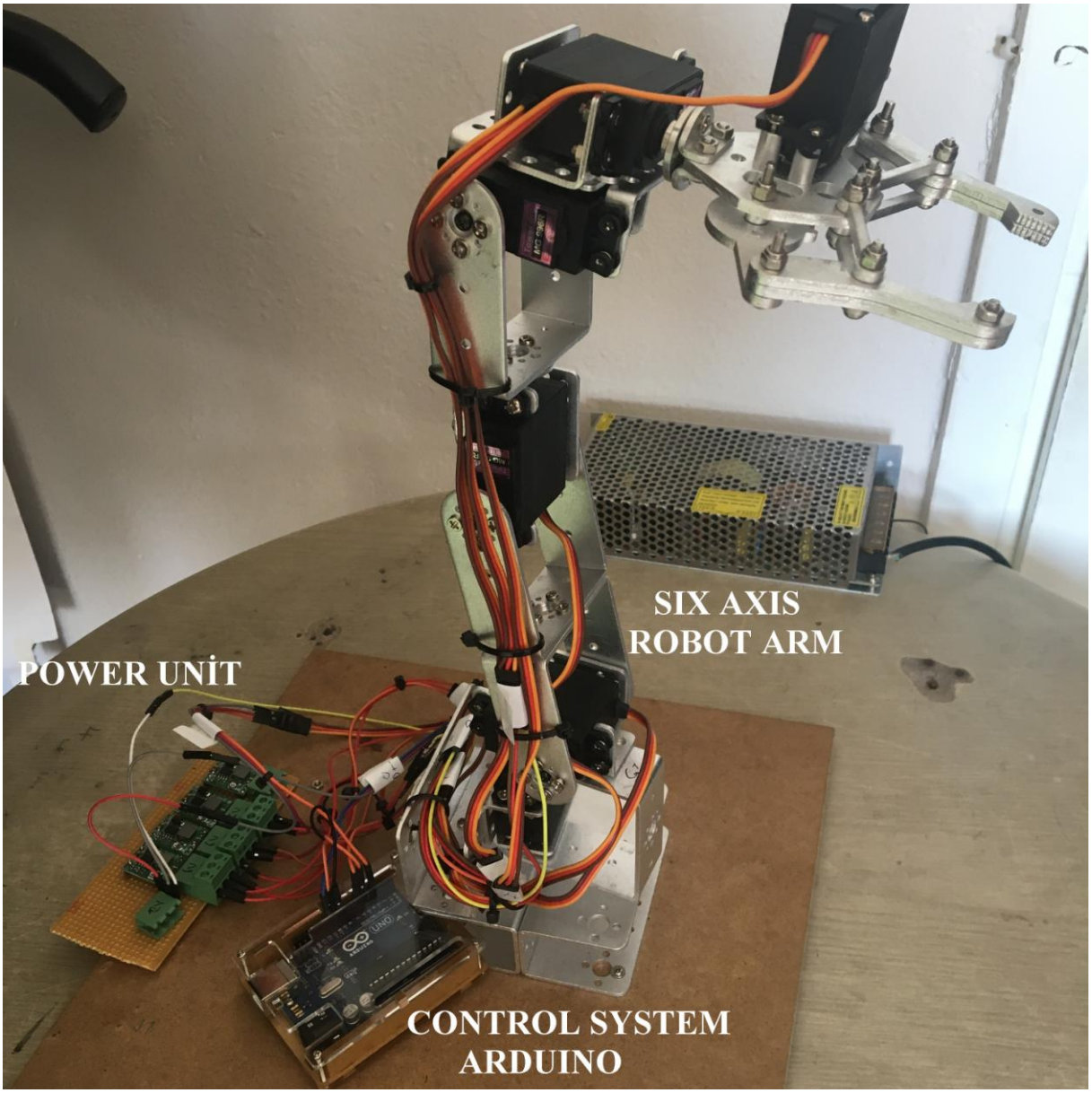

Figure:9.7 Thesis Main Compenents

Power Unit: There are 4 dc-dc converter.Every dc-dc converter has 3 A current and they drive 2 Servo motor.Each Motor has 1.5 A current.Power Unit input value is dc 12 V and 12 A

Control System : We are moving servo motors with arduino on pwm output. We can supply in arduino from our power unit.

Robot Arm: It has a sıx DOF axis.Every axis can move on 0 to 180 degree.Servo motors torque has 13 kg/cm but i could not get that much power. If the engines are stronger, we can get better stability.

11. ROOM AND SYSTEM DESIGN

After designing painting and drying electronic circuits. Their assembly and visual arrangements have begun. Design is important in understanding and walking care of tasks. It is very important to successfully perform all these dyeing and drying processes without damaging the product being produced.

Automated robots are well-suited for high-density paint booth layouts.Whether shelf, wall, or rail-mounted, paint robots offer compact workcell solutions. Painting is often tedious, repetitive work.

Figure 10.1:Industrial Robot Arm Painting

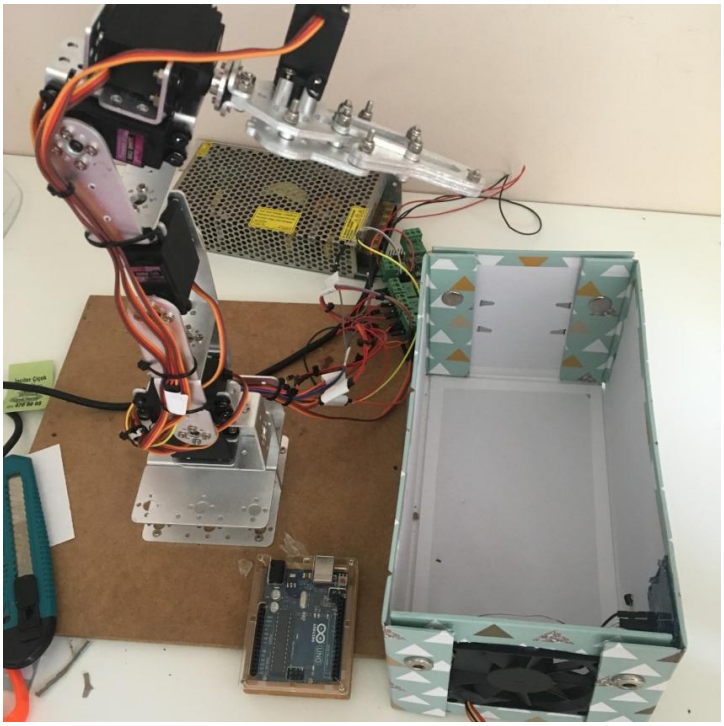

Figure 10.2 : Drying Room And Robot Arm

12. Drying Room Design

I paved the bottom with stones to make the design look nice. the robot arm is expected to make a move for the system to work. I did this using a secret border key. Boundary logic working logic is, as long as it is printed. This room will start working within the desired time by the robot. The stones on the bottom provide a clean environment by allowing water to flow.

Figure 11.1: Room Design And Heat Control System

13. Lower And Upper Parts Of The Car Evaluation

I used wooden materials to remove these heavy loads.This meterial non-slip and solid. This section is one of the important sections. I have to position the car correctly for the whole system to work properly. Otherwise, the robot may not be able to perform arm hold and release correctly.

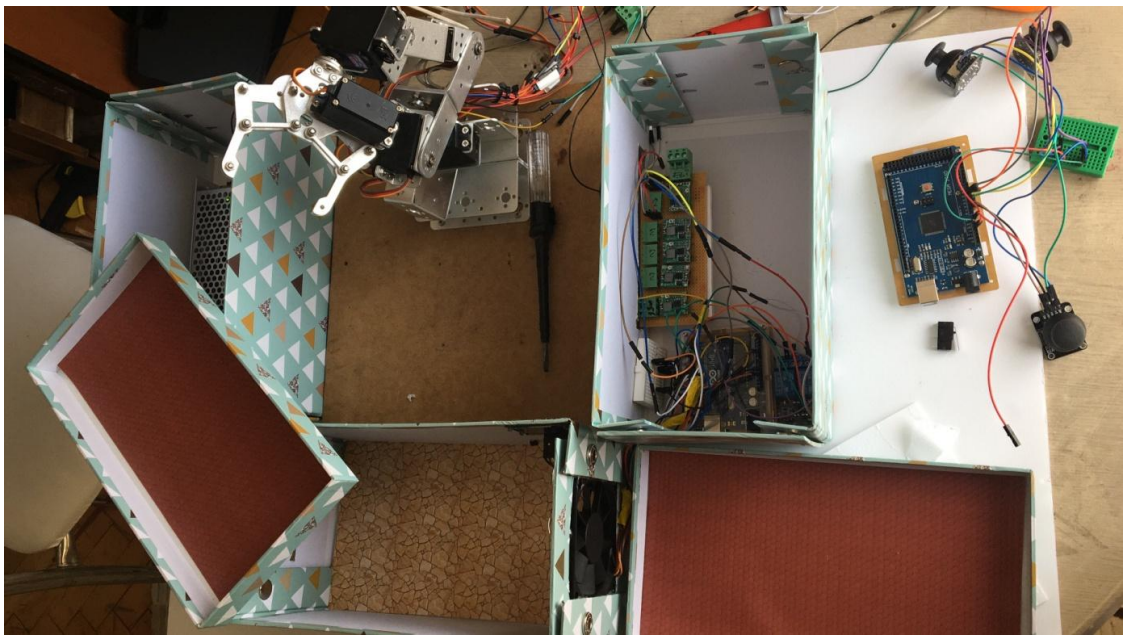

Figure12.1 : Erection Of Designed Parts

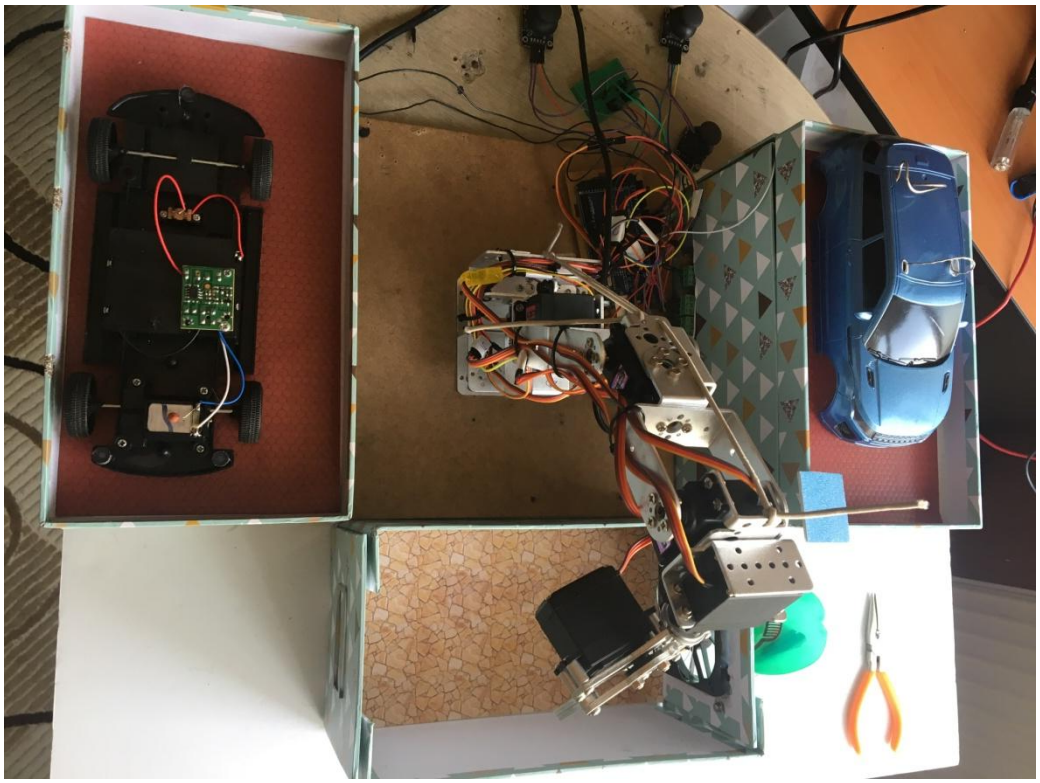

Figure 12.2:The System is Ready To Work

14. Evaluation and Improvement

So we must do axis determination with great precision. The greater the distance between the axes during robot motion, the more problems.Must always be moved at very short intervals in transitions from one axis to the other. At sudden and long distances, the robot will move fast. As a result, the product may be damaged, people in the vicinity may suffer damage. Sudden and rapid movements are damaging to engines. The motors must be selected very steadily in very fast axis movements. If so, the gears of the motors may be damaged or the electronic circuit may overheat and render the motor inoperable. The engines we use have 13 kg of torque. There are 25 kg or 35 kg engines in the same size, but they are costly.

As it is taught in engineering, there is always a better way. A few of them, you can reduce the load on the engines by changing the design.I used two strong springs to provide stress relief to the forced motors in the 1st and 2nd axes with spring-like material.If it is much better than the old one, in an option to strengthen the engines. But replacing the motors means more electric current. We need to design a system that is suitable for design by changing our power supply system when more current is required. Various robot arm designs are available on the internet, but you can always do better. Engineering is always to develop and innovate. We always have to think like that. Especially in the systems where we can imagine the limits of what we can do like robotic arms.

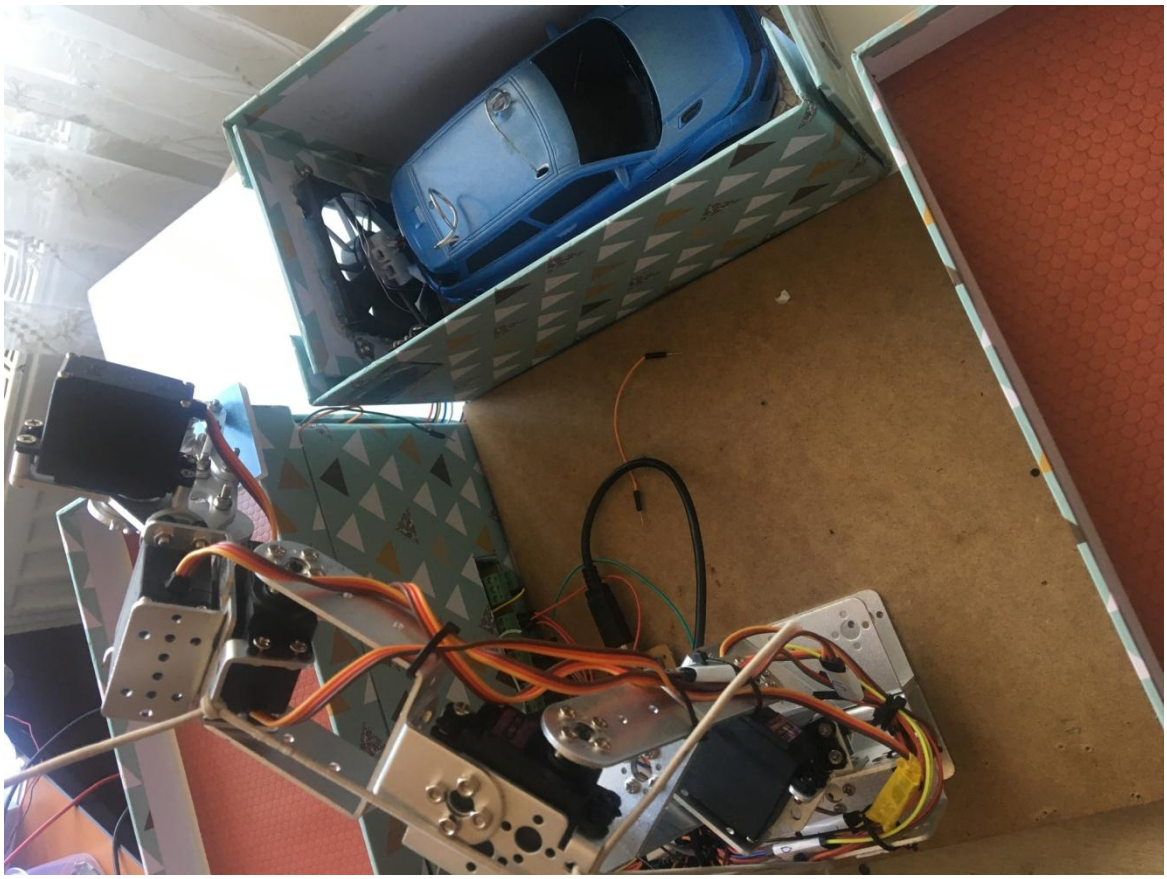

Figure 13.1:The Car In Painting Room

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BIOGRAPHY

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