

بسم الله الرحمن الرحيم



***Computer Systems Engineering.***

***Project title:***

Chopper Clock  
with  
(Time, Date and Messages)

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نهدي مشروعنا هذا لعائلتنا الكريمة ، كما ونقدم هذا المشروع إلى آباءنا والد لى "الأستاذ خليل السلايمة " ووالدتها

"سحر السلايمة " ، وإلى أخواتها العزيزات ، كما ونهدي أيضاً هذا الإنجاز إلى والد حنين "حازم دويك " ووالدتها

"رسمية دويك " وإلى زوجها "ثامر دويك " ، وأخواتها وأخوها .

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## ABSTRACT

Chopper clock is designed on the basis of the phenomenon of persistence of vision. Which means that the human eye and brain can only process 10 to 12 separate images per second, retaining an image for up to a fifteenth of a second. We will use this phenomenon to display a live clock that shows time, date, in addition to messages and simple pictures on a set of rotating LEDs

One of the main problems that confront us in this project of is the instability of the movement of the DC Motor, which led to irregular movement and irregularity of display shapes.

The rotary encoder is used with the DC Motor to solve this problem, so as to apply the phenomenon of persistence of vision appropriately and obtain the required results.

According to Newton`s first law “the fixed body remains constant unless it is affected by another object that changes its motion “. The brain and eye can interpret 10 to 12 separate images in a second. They can hold the image for 15 seconds, If there are set of images one by one in this period of time, they will create an illusion of continuity.

The basic principle of this project is Persistence of Vision (POV) of the human eye. POV mean when human eyes can see image in continue for short duration even after the switching off the power and it gives stable state of display. Example of POV when we are able to see the movie picture in cinema hall.

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## CHAPTER ONE

### INTRODUCTION

In this chapter we will talk about the POV and the motivation for this project, we will talk about the importance of our project and our goals, in section 1.2 we will talk about challenges and problems that we face it, in this section we will show the equipment's for this project.

---

#### 1.1)INTRODUCTION

The chopper clock project was designed on the basis of the application of the phenomenon of persistence of vision. This phenomenon works because the human eye and brain can only process 10 to 12 separate images per second, retaining an image for up to a fifteenth of a second. If a subsequent image replaces it in this period of time it will create the illusion of continuity. If you follow a set of still images, the eye is duped and you imagine that what you see is a continuous movement without any separation between them.

The motivation of choosing this project, because this project implemented in many university in simple way like show clock alone or date and clock, it shows maximum two things not more.

The importance of the project is to study how the phenomenon of persistence of vision was happening, and the ability to trick the eye through the rotation of the Motor at a certain speed.

The goals of this project is not just to make a clock, but also when we open the switch it will show shape, message, clock or date it depends to the program which we upload to the Arduino.

The project consists of a number of diodes that operate at a given frequency to display the result, so that the human eye does not notice any interruption in the formation of the messages or display the shapes or time. It is also requires a power provider, DC Motor (12 Volt) and an Arduino piece.

At the beginning everything will be off and modify of our needed, one Arduino for displaying the results.

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## 1.2)PROBLEM STATEMENT

We faced many problems like hardware problems, especially in the project design and during the connection of the pieces together. And we have also a software problems .

Hardware problems like a project design problems, the inability to control the speed of the DC Motor and determine the right frequency, such as the revolutions per minute (RPM) of the DC Motor maybe not stable; so the display is not stable too. Other problem when we balance the printed circuit board (PCB) over DC Motor, we will need a lot of time.

Another problems, we face is that the project was damaged three times, and we use IR sensor which need more than 12 volt it may exceed 15 volt and it result to burn the Nano Arduino so that we don't use IR sensor so that the display is not stable.

And also we have a connection problems, like some wires or LEDs are damaged, or maybe we do not connect some pieces with each other in a correct way.

Software problems, we do not load the code in correct way by using USB cable and we have some problem in compiler such as like error compiling for board Arduino.

We will require equipment`s for building a project:

- Nano Arduino.
- Male header.
- LEDs.
- Silicon.
- Motor 12V.
- PCB board.
- Resistors.
- IR sensor.
- Jumper wire.
- Standard wires
- Soldering iron.
- Adapter
- Lithium battery.

However, we will have an expected results such as demonstrate a live clock that displays time, date, messages and picture. The time format of HH:MM:SS. The date format DD//MM//YY .Picture maybe like a flower or other shapes.



## CHAPTER TWO

### BACKGROUND

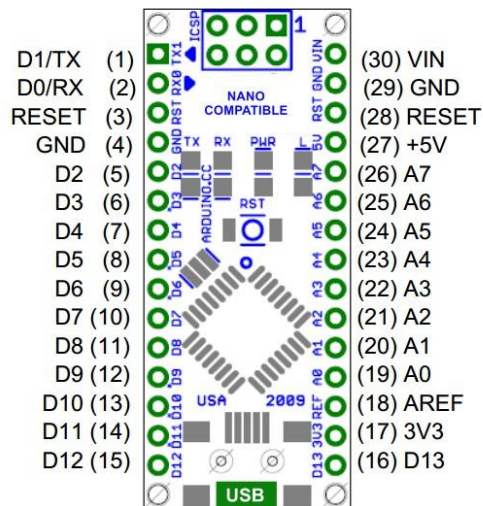
In this chapter we will talk about theoretical background which is discussed in section 2.1, we will explain the required equipment`s and describe them accurately with figures.

In section 2.2 we will talk about literature review, which means talking about projects which are similar to our project accurately, we will talk how other projects similar to our project and how it is different.

### 2.1) THEORETICAL BACKGROUND

#### 1- Arduino Nano :

Microcontroller is one of the most important parts of the project ,which is used to control the progress of all processes in this project . we have used Nano Arduino It contains the same specifications of Arduino Uno but in a smaller form factor. We use pins from D3 to D10 for LEDs and D11 for IR sensor. we choose Arduino rather than PIC because Arduino is board which contain micro controller and some peripherals so we need just a USB cable to plug to computer , while in PIC you need separate AVR/PIC programmer to abload your code to it . Arduino Nano diagram given below in Figure 1 which is from Micro Robotics website.[1]



Figure[1]: Arduino Nano.

## 2- Jumper wires and standard wires :

There are two types of wires used in the connection to connect the pieces with each other .Jumper wires diagram given below in Figure 2 which is from Spark Fun website . [2]  
Standard wires diagram given below in Figure 3 which is from Inside The Mind Of Satons website .[3]



Figure [2]: Jumper Wires.

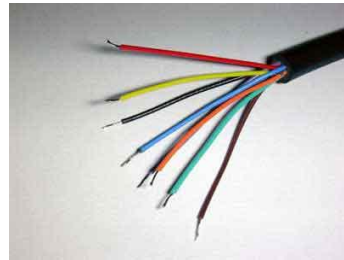


Figure [3]: Standard Wires.

## 3- Adapter:

The 12-Volt adapter can be used instead of using a 12-Volt Lithium battery to feed the pieces with the appropriate current and voltage.

Adapter diagram given below in Figure 4 which is from Flying-Objects website. [4]



Figure [4]: Adapter.

#### 4- DC Motor:

For any project we use Motors to changing energy from electrical to mechanical , in circuit design most important things is Motor performance because Motor affect speed and capability. In this project we use DC Motor, we choose DC Motor because it is simple, not polarized Motor. It`s mean when we change the direction of the Motor, it will rotate forward and backward, and also it has low torque and high revolution per Minute (rpm). The rate of larger Motor near 24 Volt or more, but in this project it is necessary around 12 Volt because when we increase the supply voltage the torque will increase, so that rpm will increase, DC Motor is used for continues circular rotation of the whole circuit assembly .This is important for performance repeated scanning which is necessary for continuous vision of image.

DC Motor diagram given below in Figure 5 which is from RobotShop website.[5]



Figure [5]: DC motor.

## 5- LEDs :

The main part of this project is turning the LEDs on the circuit, the LEDs are using to display numbers , characters, and pictures like flower or other shapes . We used almost 8 LEDs , this LEDs connected with each pins of Arduino ports . We can use coloring LEDs .

We use these LEDs to show clock, date, message, shapes .

LEDs diagram given below in Figure 6 which is from Instructables website .[6]



Figure [6]: LEDs.

## 6- PCB board:

We use Printed Circuit Board (PCB) because it reduce the number of wires that we use it, small size as compare to other circuit, and it is cheaper than other boards.

The advantages of PCB board:

1. Highly reliable.
2. It is economical.
3. Easy to install.
4. Cost efficient.

PCB diagram given below in Figure 7 which is from Rees52 website [7].

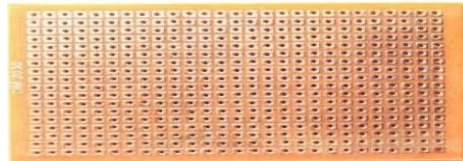


Figure [7]: PCB board.

## 7- Resistors:

The usage of resistors are for control the amount of current in circuit , we will use almost 8 resistors , all of them 220 ohms.

Resistors diagram given below in Figure 8 which is from Sparkfun website .[8]

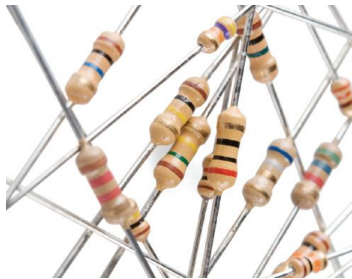


Figure [8]: Resistors.

## 8-IR sensor:

The Infrared Reflective Sensors use for detecting lines and edges. They can also be used to for close range obstacle detection. These sensors transmit an IR infrared beam and then measure the reflection.

IR sensor diagram given below in Figure 9 which is from the e-store website .[9]



Figure [9]: IR sensor

### 9- Lithium Battery:

We use it for supply the voltage to Arduino and LEDs . We use three Lithium battery because we need approximately 12 Volt.

Lithium Battery diagram given below in Figure 10 which is from Jaycon systems website .[10]



Figure [10]: Lithium Battery

---

## 2.2) LITERATURE REVIEW

There are many of projects that similar as this project ,it has been applied in many Engineering Colleges in many Universities. And the most of these projects were applied on YouTube.

One of these projects:

### **1- DIGITAL PROPELLER CLOCK USING ARDUINO :**

This project was published in an International Journals , on Satellite Conference ICSTSD 2016 International Conference on Science and Technology for Sustainable Development, Kuala Lumpur, MALAYSIA, May 24-26, 2016.

“This project was started with a simple principle which is frequently encountered in our everyday life, which is Persistence of Vision. This phenomenon makes one feel fast moving/changing objects to appear continuous. A television is a common example; in which image is re-scanned every 25 times, thereby appear continuous. Further, a glowing object if rotated in a circle at fast speed, it shows a continuous circle. By modifying this basic idea, 8 LEDs can be rotated in a circle, showing 7 concentric circles. But if these LEDs are switched at precise intervals, a steady display pattern can be shown.”[11]

### **2- The Design and Construction of a low cost Propeller LED Display :**

This project was published in Global Journal of researches in engineering Electrical and electronics engineering by Sheikh Rafik Manihar, Mr. Komal Prasad Dewangan By & Mr. Ajay Kumar Dansena , March 1-3-2012.

“This project using bright light emitting diodes for displaying the characters and symbols on its assembly. That’s why this project is named as ‘PROPELLER LED DISPLAY. ‘ This is the phenomenon which is related to vision capability of human eye by which an afterimage is thought to persist for approximately 1/25th of a second. So, if someone is observing the images at a rate of 25 images per second, then they appear to be continuous.”[12]

### **3- Propeller Clock Persistence of Vision :**

This project was implemented in Electronics Club Of IIT Kanpur presents ,it has been applied by JOY BHATTACHARJEE & PRANAY SHARMA.The project mentor ARPIT NEMA .

“The propeller clock is a linear array of light emitting diodes, rotating at a high angular velocity to generate a circular screen. Now by synchronising these light emitting diodes, and keeping in mind the concepts of persistence of vision and limit of resolution, we can display a clock.”[13]



#### **4- Low Cost Propeller LED Display :**

This project was published in International Journal of Application or Innovation in Engineering & Management (IJAEM) , on 2, February 2015.

“As this project needs to rotate whole circuit assembly, there must be some prime mover attached to it, for rotation. So, the term ‘Propeller’ is used. This project uses bright light emitting diodes for displaying the characters and symbols on it assembly. That’s why this project is named as ‘PROPELLER LED DISPLAY’. The propeller Display is a linear array of light emitting diodes, rotating at a high angular velocity to generate a circular screen. The basic principle behind propeller LED display is “persistence of vision”. This is the phenomenon which is related to vision capability of human eye by which an after image is thought persist for approximately 1/25<sup>th</sup> of a second. So if someone is observing the image at a rate of 25 images per second then they appear to be continuous. Cinema and films also based on this principle.”[14]

#### **5- PROPELLER CLOCK :**

This project was published in Preparation of Papers for IEEE JOURNAL OF “PROPELLER CLOCK” Mechanically Scanned LED Clock , UTTARAKHAND TECHNICAL UNIVERSITY, by Bhanu Pratap, Khushboo Kumari, Ankita Raturi & Abhishek Joshi , on May 2013 .

“This project is a different view of holo graphical clock construct in linear array arrangement. It will be the coordination of electrical, electronics and some mechanical engineering. This “illusion” is based on inertia of human eye. The Motor spins at a constant rate such that the LEDs rotate around a centre pivot point. As the LEDs spin around they light up sequentially such that they will display the current time. The Motor spinning fast enough that the human eye will perceive all of the display is on at once, and the viewer will be able to read the time constantly. If LED formed digits will periodically and frequently enough flash, they will appear solid and steady. “[15]

#### **6- Propeller LED Display :**

This project was published in INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ELECTRICAL, ELECTRONICS, INSTRUMENTATION AND CONTROL ENGINEERING , by Ancy David , KJ Josphin , Sreejith S , Thomasukutty Zacharia , Asst. Prof Anish Benny , Asst. Prof Neenu Rose Antony , in 2016 .

“This project was started with a simple principle which is frequently happening in our day today life, which is Persistence of Vision (POV). Whenever the light from an image strikes on the retina, the eye retains the impression of that light for a particular fraction of seconds (1/16<sup>th</sup>)

depending on the brightness of the image even after the image has been removed from the human sight. Most of the existing LED displays consumes large amount of energy due to more number of LEDs used. In the present work virtual displays are used in order to reduce the number of LEDs. The propeller is subjected to rotate above 1000 rpm to obtain virtual display.” [16]

The differences between our projects and other projects that other projects do fan which display clock alone, or date with message, but our projects display 4 things in one fan, which is shape, messages , clock and date, other difference that we use just 8 LEDs other projects use more then 8 LEDs.

In this chapter we will talk about description of our project accurately which is discussed in section 3.1 , next part in this chapter is diagrams , in section 3.2 we talk about general block diagram and it is figure, in section 3.3 we will show the detailed block diagram and talk about it , in section 3.4 we will talk about circuits for our project , we will show DC motor circuit ,Nano Arduino circuit , and whole system circuit and talk about them.

---

#### 3.1) METHODS DESCRIPTION

Chopper clock is a linear array of light emitting diodes , we are using Red LEDs ; because it gives more beautiful results and more easy to use . It do by Motor for rotating object ,this rotate happened by light – emitting diode LEDs for give the result which are time , date , messages and shapes , that’s why we name it “Chopper clock with time , date , and massages”. The LEDs are turn on and off one after another. At the beginning of rotate; it will be in rapid way with several thousands of RPM.

Initially the system will display a form of shape, then the clock will be displayed and below of it shows the date .But the messages will rotate around the whole of Chopper Clock.

We use Nano Arduino for download the code in memory. Memory consists of Flash Memory (32KB , which 2KB used by for bootloader ) , SRAM (2KB) and EEPROM (1KB ) . When running the Nano Arduino will activate the code and show the results.

---

### 3.2) GENERAL BLOCK DIAGRAM

This diagram show our project in general , it show that we connect the adapter and DC motor to Nano Arduino then with 8 LEDs to display date , clock ,messages and shapes , with a lithium battery to charge the Arduino. This shown in figure [11] below .

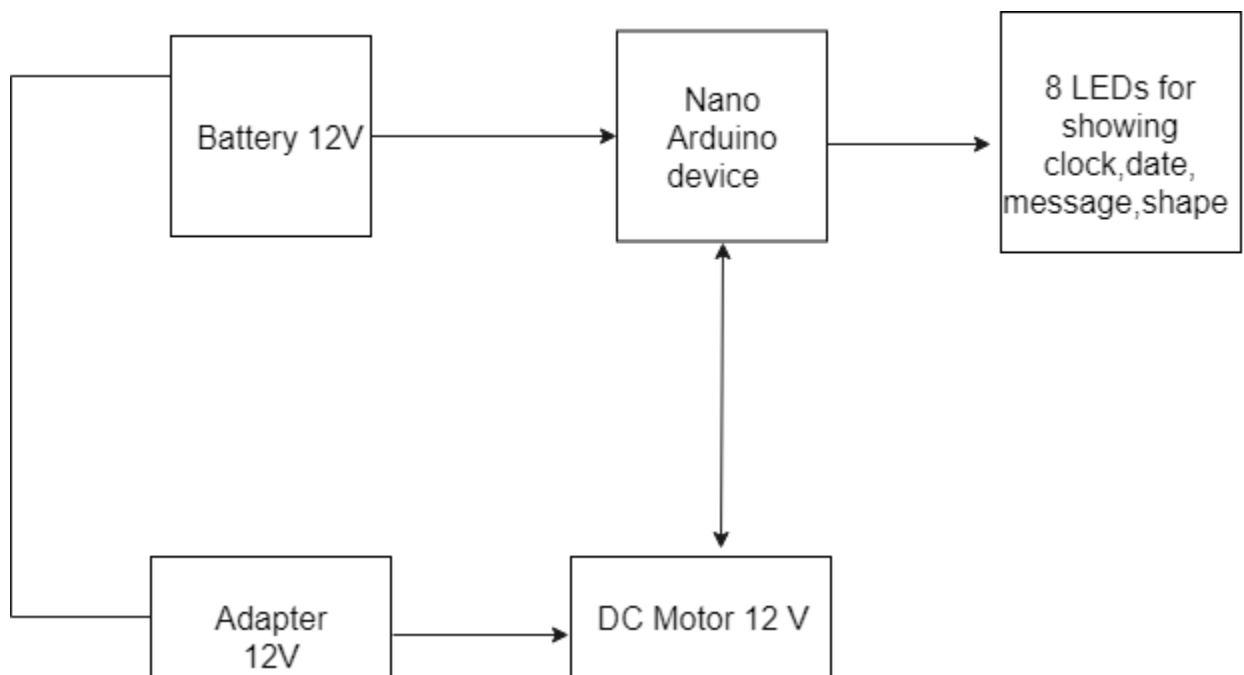


Figure [11]: General Block Diagram.

---

### 3.3) DETAILED BLOCK DIAGRAM

This diagram show the circuit of our project in more clarification , it show that we connect our project to power supply to give voltage from 4 to 6 volt to display in good way , it show that we use IR sensor to staple the display . this shown in figure [12] below.

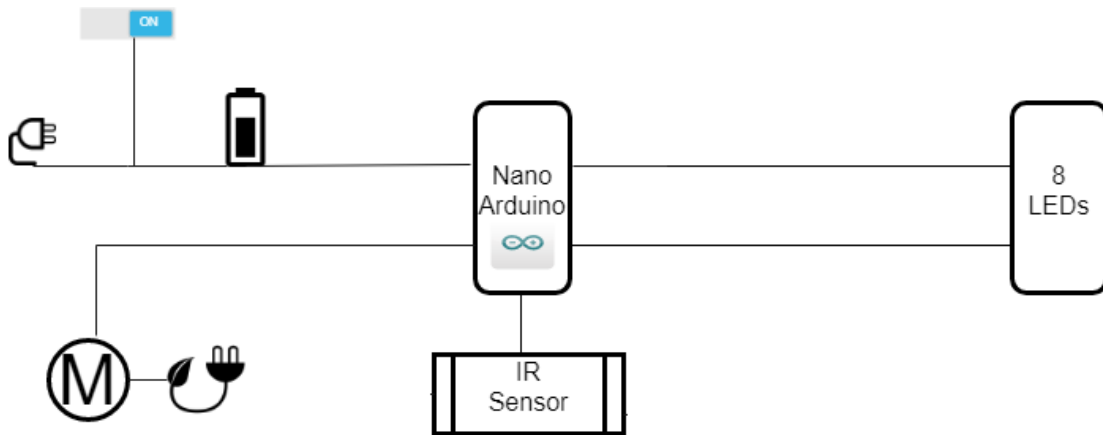


Figure [12]: Detailed Block Diagram.

### 3.4) SCHEMATIC DIAGRAM

#### 3.4.1) SYSTEM CIRCUIT

This diagram show project circuit clearly , it show that we connect LEDs to Arduino Nano by using bins D2-D9 , and bin D10 to IR sensor , we connect Vin with VCC , and switch to Vin and ground . this shown in figure [13] below.

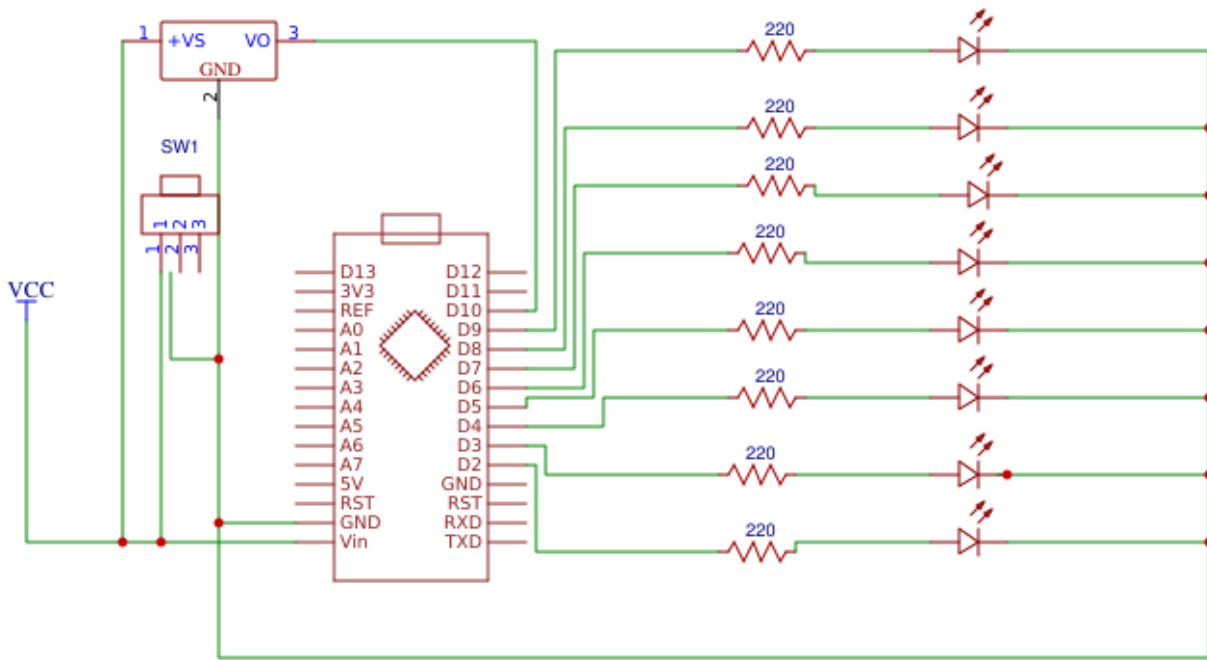
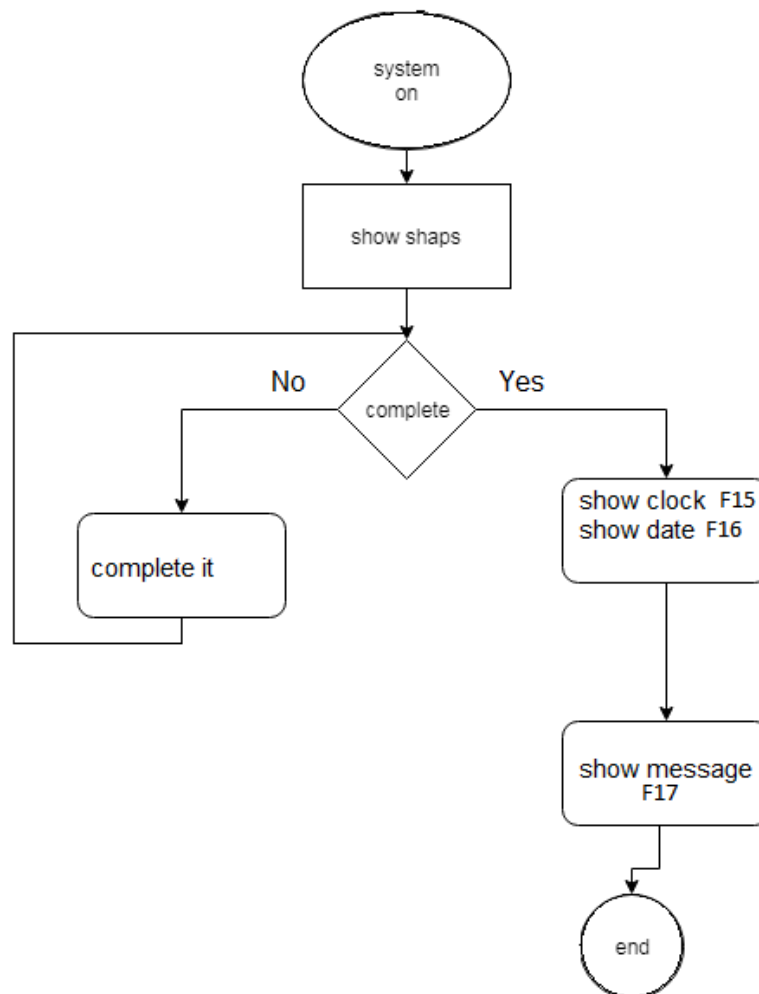


Figure [13]: System Circuit.

If we turn on the Motor ,the system shows shape , if the shape is complete then shows clock , date and messages.

A Flowchart of all systems given below in Figure 14.



Figure[14]: System Flow Chart.

This flowchart shown how the clock is set . If the clock is display as a wall clock.

A flowchart of clock given below in Figure 15 .

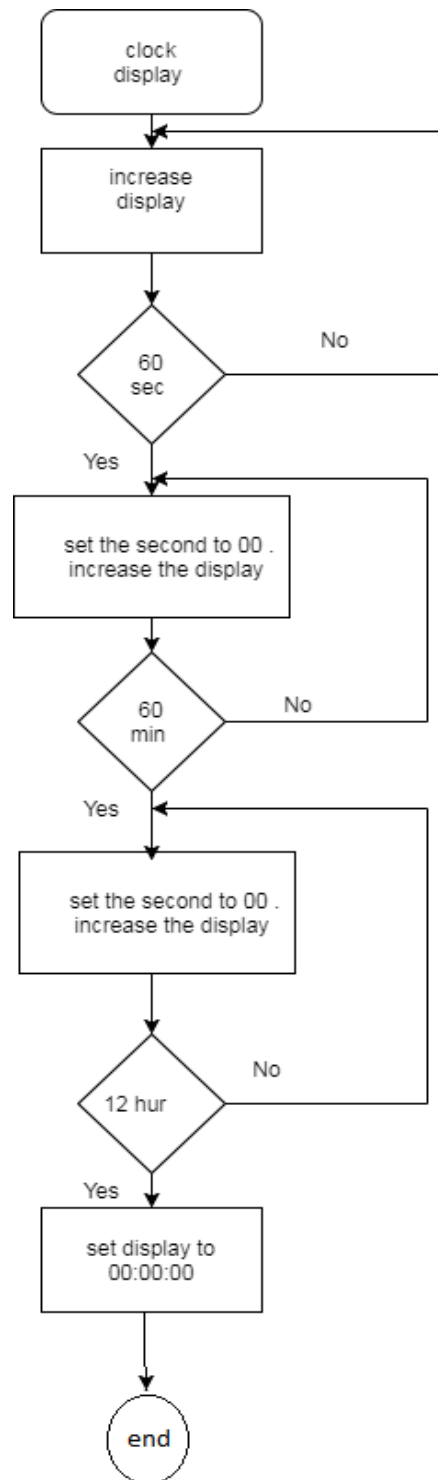


Figure [15]: Clock Flowchart.



This flowchart shown how the date is set . The date shows below the clock . The date format is : Day / Month / Year .

A flowchart of the date given below in Figure 16 .

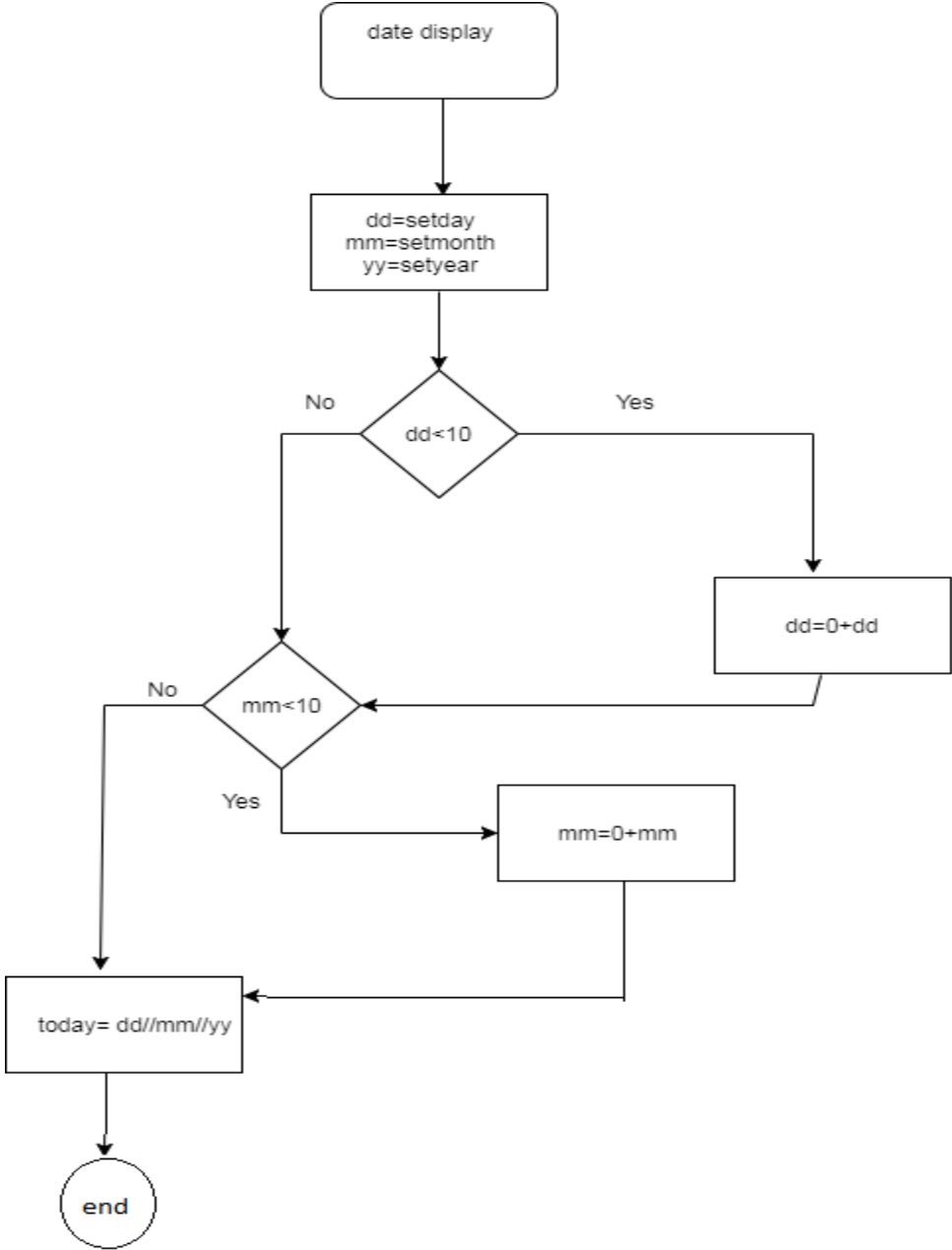


Figure [16]: Date Flow Chart.

This flowchart shown how the messages are display . When the system is on , the messages are display "HELLO " , "TALA" and some characters like "A","V","Y","L".

A flowchart of the messages given below in Figure 17.

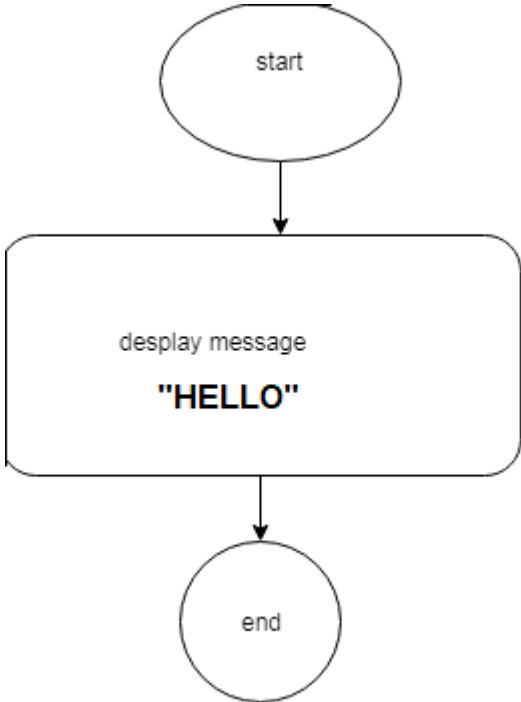


Figure [17]: Message Flow Chart.

## CHAPTER FIVE

### IMPLEMENTATION AND TESTING

#### 5.1) IMPLEMENTATION AND RESULTS

To implement our project we do separated Arduino programs .we do code for showing different shapes like flower or circles, other code for alphabets like A , V , L , Y . we do other code for showing word like HELLO , and code for showing clock ,other code for showing date.

This is some code for showing alphabets:

“

```
int _[] = {0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0};
int A[] = {1,1,1,1,1,1,1,1,0,0, 0,0,0,1,1,0,0,0,1,1,0, 0,0,1,1,0,0,0,1,1, 1,1,1,1,1,1,1,1,0,0};
int B[] = {1,1,1,1,1,1,1,1,1,1, 1,1,0,0,1,1,0,0,1,1, 0,1,1,0,1,1,0,1,1,0, 0,0,0,1,1,1,1,0,0,0};
int C[] = {0,0,1,1,1,1,1,1,0,0, 0,1,0,0,0,0,0,0,1,0, 1,0,0,0,0,0,0,0,0,1, 0,1,0,0,0,0,0,0,1,0};
int D[] = {1,1,1,1,1,1,1,1,1,1, 1,1,0,0,0,0,0,0,1,1, 0,1,1,0,0,0,0,1,1,1, 0,0,0,1,1,1,1,0,0,0};
int E[] = {1,1,1,1,1,1,1,1,1,1, 1,1,1,1,1,1,1,1,1,1, 1,1,0,0,1,1,0,0,1,1, 1,1,0,0,1,1,0,0,1,1};
int F[] = {1,1,1,1,1,1,1,1,1,1, 1,1,1,1,1,1,1,1,1,1, 0,0,0,0,1,1,0,0,1,1, 0,0,0,0,1,1,0,0,1,1};
int G[] = {0,0,1,1,1,1,1,1,0,0, 0,1,1,0,0,0,0,1,1,0, 1,1,0,1,0,0,0,0,1,1, 0,1,1,1,0,0,1,1,1,0};
int H[] = {1,1,1,1,1,1,1,1,1,1, 0,0,0,0,1,1,0,0,0,0, 0,0,0,0,1,1,0,0,0,0, 1,1,1,1,1,1,1,1,1,1};
int I[] = {1,1,0,0,0,0,0,0,1,1, 1,1,1,1,1,1,1,1,1,1, 1,1,1,1,1,1,1,1,1,1, 1,1,0,0,0,0,0,0,1,1};
int J[] = {0,1,1,1,0,0,0,0,0,0, 1,1,0,0,0,0,0,0,0,0, 1,1,1,1,1,1,1,1,1,1, 1,1,1,1,1,1,1,1,1,1};
int K[] = {1,1,1,1,1,1,1,1,1,1, 0,0,0,1,1,1,1,0,0,0, 0,0,1,1,0,0,1,1,0,0, 1,1,0,0,0,0,0,0,1,1};
int L[] = {1,1,1,1,1,1,1,1,1,1, 1,1,1,1,1,1,1,1,1,1, 1,1,0,0,0,0,0,0,0,0, 1,1,0,0,0,0,0,0,0,0};
int M[] = {1,1,1,1,1,1,1,1,1,1, 0,0,0,0,0,0,1,1,1,0, 0,0,0,0,0,0,1,1,1,0, 1,1,1,1,1,1,1,1,1,1};
```

```

int N[] = {1,1,1,1,1,1,1,1,1, 0,1,1,1,0,0,0,0,0, 0,0,0,0,0,1,1,1,0,0, 1,1,1,1,1,1,1,1,1};
int O[] = {0,0,1,1,1,1,1,1,0,0, 1,1,0,0,0,0,0,0,1,1, 1,1,0,0,0,0,0,0,1,1, 0,0,1,1,1,1,1,1,0,0};
int P[] = {1,1,1,1,1,1,1,1,1,1, 0,0,0,0,0,1,1,0,1,1, 0,0,0,0,1,1,1,0,1,1, 0,0,0,0,0,0,1,1,1,0};
int R[] = {1,1,1,1,1,1,1,1,1,1, 0,0,0,0,1,1,1,0,1,1, 0,0,0,1,0,1,1,0,1,1, 1,1,0,0,0,0,1,1,1,0};
int S[] = {1,1,0,0,0,0,1,0,0,0, 1,0,0,0,0,1,0,0,1,0, 0,1,0,0,0,1,0,0,0,1, 0,0,1,1,1,0,0,1,1,0};
int T[] = {0,0,0,0,0,0,0,0,1,1, 1,1,1,1,1,1,1,1,1,1, 1,1,1,1,1,1,1,1,1,1, 0,0,0,0,0,0,0,0,1,1};
int U[] = {1,1,1,1,1,1,1,1,1,1, 1,0,0,0,0,0,0,0,0,0, 1,0,0,0,0,0,0,0,0,0, 1,1,1,1,1,1,1,1,1,1};
int V[] = {0,0,1,1,1,1,1,1,1,1, 1,1,0,0,0,0,0,0,0,0, 1,1,0,0,0,0,0,0,0,0, 0,0,1,1,1,1,1,1,1,1};
int W[] = {1,1,1,1,1,1,1,1,1,1, 0,1,1,0,0,0,0,0,0,0, 0,1,1,0,0,0,0,0,0,0, 1,1,1,1,1,1,1,1,1,1};
int X[] = {1,1,1,0,0,0,0,1,1,1, 0,0,1,1,1,1,1,1,0,0, 0,0,1,1,1,1,1,1,0,0, 1,1,1,0,0,0,0,1,1,1};
int Y[] = {0,0,0,0,0,1,1,1,1,1, 1,1,1,1,1,1,0,0,0,0, 1,1,1,1,1,1,0,0,0,0, 0,0,0,0,0,1,1,1,1,1};
int Z[] = {1,1,1,1,0,0,0,0,0,1, 1,0,0,1,1,1,0,0,0,1, 1,0,0,0,0,1,1,1,0,1, 0,0,0,0,0,0,0,0,1,1};
int dash[] = {0,0,0,0,1,1,0,0,0,0, 0,0,0,0,1,1,0,0,0,0, 0,0,0,0,1,1,0,0,0,0, 0,0,0,0,1,1,0,0,0,0};
//int dot[] = {1,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,1,1, 0,0,0,0,0,0,0,0,1,1, 0,0,0,0,0,0,0,0,0,0};
int colon[] = {0,0,0,0,0,0,0,0,0,0, 0,0,1,1,0,0,1,1,0,0, 0,0,1,1,0,0,1,1,0,0, 0,0,0,0,0,0,0,0,0,0};
int leftbracket[] = {0,0,1,1,1,1,1,1,0,0, 0,1,1,0,0,0,0,1,1,0, 0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0};
int rightbracket[] = {0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0, 0,1,1,0,0,0,0,1,1,0, 0,0,1,1,1,1,1,1,0,0};
int one[] = {/*1,1,1,1,1,1,1,1,1,1,*/ 1,1,1,1,1,1,1,1,1,1};
int two[] = {1,1,1,0,0,0,1,1,1,0, 1,0,1,1,1,0,0,0,1,1, 1,0,0,0,1,1,1,0,1,1, 1,0,0,0,0,0,1,1,1,0};
int three[] = {0,0,1,1,0,0,0,1,1,0, 1,1,0,0,1,1,0,0,1,1, 1,1,0,0,1,1,0,0,1,0, 0,1,1,1,1,1,1,1,1,0};
int four[] = {0,0,0,1,1,1,0,0,0,0, 0,0,0,1,0,1,1,1,0,0, 1,1,1,1,1,0,0,1,1,1, 0,0,0,1,0,0,0,0,0,0};
int five[] = {1,0,0,1,1,1,1,1,1,1, 1,1,0,1,1,0,0,0,1,1, 1,1,0,1,1,0,0,0,1,1, 0,1,1,1,0,0,0,0,1,1};
int six[] = {0,1,1,1,1,1,1,1,1,0, 1,0,0,0,1,0,0,0,1,1, 1,0,0,0,1,0,0,0,1,1, 0,1,1,1,0,0,0,1,1,0};

```

```
int seven[] = {1,1,1,0,0,0,0,0,1, 0,0,1,1,1,0,0,0,0,1, 0,0,0,0,1,1,1,0,0,1, 0,0,0,0,0,0,1,1,1,1};
int eight[] = {0,1,1,1,0,1,1,1,1,0, 1,0,0,0,1,1,0,0,0,1, 1,0,0,0,1,1,0,0,0,1, 0,1,1,1,0,0,1,1,1,0};
int nine[] = {0,1,1,1,1,1,1,1,1,0, 1,1,0,0,0,1,0,0,0,1, 1,1,0,0,0,1,0,0,0,1, 0,1,1,0,0,0,1,1,1,0};
int zero[] = {0,0,1,1,1,1,1,1,0,0, 1,1,0,0,0,0,0,0,1,1, 1,1,0,0,0,0,0,0,1,1, 0,0,1,1,1,1,1,1,0,0};
```

```
int ledAdresses [] = {3,4,5,6,7,8,9,10};
```

```
double timeBetweenColumns = 3;
```

```
double timeBetweenLetters = 6;
```

```
void setup(){
```

```
    pinMode(3, OUTPUT);
```

```
    pinMode(4, OUTPUT);
```

```
    pinMode(5, OUTPUT);
```

```
    pinMode(6, OUTPUT);
```

```
    pinMode(7, OUTPUT);
```

```
    pinMode(8, OUTPUT);
```

```
    pinMode(9, OUTPUT);
```

```
    pinMode(10, OUTPUT);
```

```
}
```

```
void printLetter(int letter[]){
```

```
int y;

for (y=0; y<8; y++){
    digitalWrite(ledAdresses[y], letter[y]);
}
delay(timeBetweenColumns);

for (y=0; y<8; y++) {

    digitalWrite(ledAdresses[y], letter[y+10]);
}
delay(timeBetweenColumns);

for (y=0; y<8; y++){

    digitalWrite(ledAdresses[y], letter[y+20]);
}
delay(timeBetweenColumns);

for (y=0; y<8; y++){

    digitalWrite(ledAdresses[y], letter[y+30]);
}
```

```
delay(timeBetweenColumns);

for (y=0; y<8; y++){

    digitalWrite(ledAdresses[y], 0);
}

delay(timeBetweenLetters);
}

void loop(){

    printLetter(V);

    //printLetter(dot);
    /* printLetter(K);
    printLetter(O);
    printLetter(D);
    printLetter(E);
    printLetter(M);*/
```

```
delay(80);
```

```
}”
```

When we implement our project the result shown in this figures:



Figure [18]: Flower shape





Figure [19]: Circle shape



Figure[20]: Character "V"

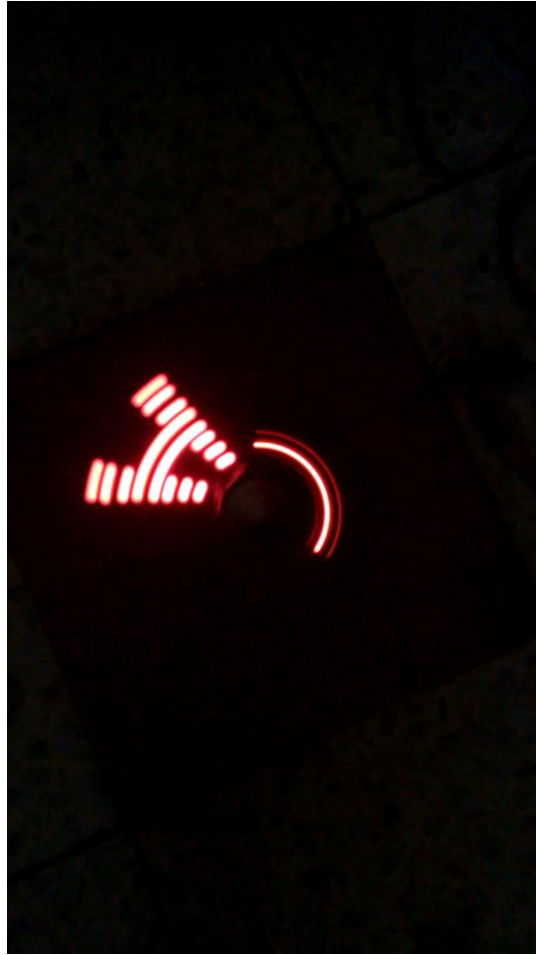


Figure [21]: Character "A"

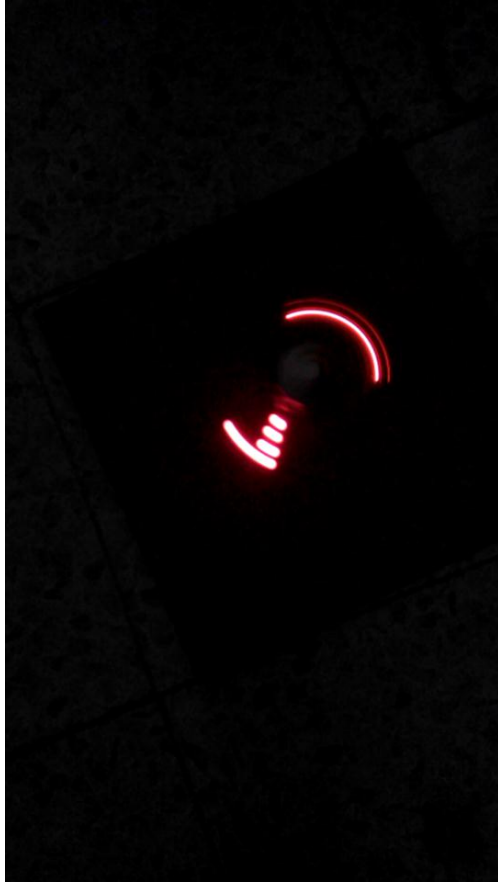


Figure [22]: Character "L"

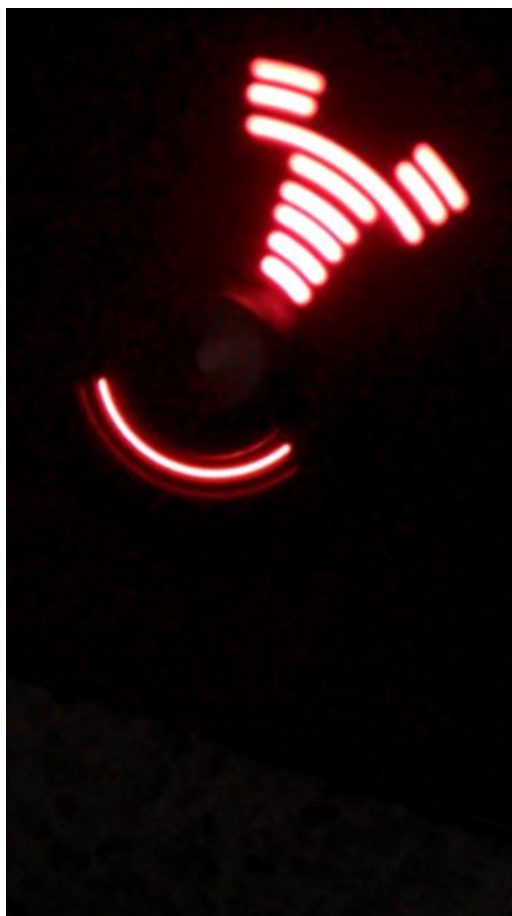


Figure [23]: Character “Y”

To test clock, date and message you can see them on Video, because it is difficult to take pictures for them.

In our project we choose voltage and speed for DC Motor by this equation:

$$V=I \cdot R$$

Where: Current 1A

Resistant for Motor 3-6 Ohm

$$V = 1 \cdot 4 = 4V.$$

$$\text{RPM}=251$$

$$\text{Torque} = 150(\text{N} \cdot \text{m})$$

$$\text{Angular speed} = \text{rpm} \cdot 2 \cdot 3.14 / 60$$

$$26.27 \text{ rad/s}$$

## CONCLUSION

In this project we studied carefully the phenomenon of persistence of vision and how to apply it, we designed the system completely, and we identified all the components needed to implement the project .

In this semester we fully implement the project and run and test it. We make the system simple and stable as possible. Nano Arduino used to implement the system, in addition to a DC Motor to rotate the system forward or backward.

We face some problems like IR sensor , it need more than 15 volt and Arduino will burned , so that the display not stable , other problem that human eyes process the light in different way of camera , so that we can't do videos for our project in good way .

Our interesting decision that we display not just a clock , we display date, messages , figures ,we display a live clock and date as DD:MM:YY.

We decided that in the future people can make alarm with the clock , or make a clock and date in better way, or solve the problem of IR sensor.

## REFERENCES

[1] Micro Robotics , Sunday , 12-11-2017,11:30 am.

<https://www.robotics.org.za/NANO3C>

[2] SparkFun , Sunday , 12-11-2017 , 11:30 am.

<https://www.sparkfun.com/products/11026>

[3] Inside The Mind Of Satons , Sunday , 12-11-2017 , 11:30 am , published on August 28, 2010  
. <http://blog.mattsatorius.com/touring/audio/standard-wiring-color-guide/>

[4] Flying-Objects ,Sunday,12-11-2017, 11:30 am .

<https://www.flying-objects.nl/en/power-adapter-12-volt-2-ampere.html>

[5] RobotShop,Sunday , 12-11-2017 , 8:00 pm .

<http://www.robotshop.com/en/12v-dc-motor-251rpm-encoder.html>

[6] Instructables , Sunday , 12-11-2017 , 11:30 am , LED Throwies , by Q-Branch in art .

<http://www.instructables.com/id/LEDs/>

[7] Rees52 , Sunday , 12-11-2017 , 11:30 am .

<http://rees52.com/288-multi-purpose-pcb-board-30-x-15-cm.html>

[8] Sparkfun , Sunday,12-11-2017 , 11:30 am .

<https://learn.sparkfun.com/tutorials/resistors>

[9]The E-store,Thursday,19-4-2018,9:30 am.

<https://www.mgsuperlabs.co.in/estore/IR-Sensor-TCRT5000L>

[10] Jacon Systems,Thursday,19-4-2018,9:30 am.

<https://www.jayconsystems.com/3-7-volt-rechargeable-lithium-battery-1000-mah.html>

**[11]** DIGITAL PROPELLER CLOCK USING ARDUINO, Sunday, 12-11-2017, 11:30 am, published in an International Journals, on Satellite Conference ICSTSD 2016 International Conference on Science and Technology for Sustainable Development, Kuala Lumpur, MALAYSIA, May 24-26, 2016.

<http://www.internationaljournals.org/IJECE/2016/Special-Issues/ICSTSD-ICEEOT/IJECE-ICSTSD-P118.pdf>

**[12]** The Design and Construction of a low cost Propeller Led Display , Sunday , 12-11-2017 , 11:30 am , published in Global Journal of researches in engineering Electrical and electronics engineering by Sheikh Rafik Manihar, Mr. Komal Prasad Dewangan By & Mr. Ajay Kumar Dansena , March 1-3-2012.

[https://globaljournals.org/GJRE\\_Volume12/6-The-Design-and-Construction-of-a-low-cost-Propeller.pdf](https://globaljournals.org/GJRE_Volume12/6-The-Design-and-Construction-of-a-low-cost-Propeller.pdf)

**[13]** Propeller Clock Persistence of Vision , Sunday , 12-11-2017 , 11:30 am , implemented in Electronics Club Of IIT Kanpur presents ,it has been applied by JOY BHATTACHARJEE & PRANAY SHARMA.The project mentor ARPIT NEMA .

<http://students.iitk.ac.in/eclub/assets/documentations/summer09/PropellerClock.pdf>

**[14]** Low Cost Propeller LED Display , Sunday ,12-11-2017 ,11:30 am , published in International Journal of Application or Innovation in Engineering & Management (IJAIEM) , on 2, February 2015.

<http://www.ijaiem.org/Volume4Issue2/IJAIEM-2015-01-21-38.pdf>

**[15]** PROPELLER CLOCK , Sunday , 12-11-2017 , 11:30 am , published in Preparation of Papers for IEEE JOURNAL OF “PROPELLER CLOCK” Mechanically Scanned LED Clock , UTTARAKHAND TECHNICAL UNIVERSITY, by Bhanu Pratap, Khushboo Kumari, Ankita Raturi & Abhishek Joshi , on May 2013 .

[http://www.irdindia.in/journal\\_itsi/pdf/vol1\\_iss5/2.pdf](http://www.irdindia.in/journal_itsi/pdf/vol1_iss5/2.pdf)

**[16]** Propeller LED Display , Sunday , 12-11-2017 , 11:30 am , published in INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN ELECTRICAL, ELECTRONICS, INSTRUMENTATION AND CONTROL ENGINEERING , by Ancy David , KJ Josphin , Sreejith S , Thomasukutty Zacharia , Asst.

<https://www.ijireeice.com/upload/2016/april-16/IJIREEICE%2015.pdf>