

Makan - A Smart Home

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Abstract—Makan: A Smart Home contains the features which are in high demand in this rapidly advancing world. Through the ages, the people have paved their ways to bring ease in there day to day life. We have taken a step forward in the same notion. Our project contains autonomously controlled room, which respond to the stimuli like sunlight, temperature etc. It has a variety of sensors spread across the room and working towards making the user comfortable. Alternative to the presently available expensive assistant gadget the device can be used which is relatively cheap.

I. INTRODUCTION

Smart Home is defined as a sensor controlled housing which can bring comfort to those living it in a variety of ways as mentioned below -

A. Secure Door

The Secure Door is an important element in the project. It consists of the RFID EM-18 module which helps in verifying and registering the ID of the person entering in the room. Further, it can help in customizing the room according to the person, which can include the speed of the fan, colour and brightness of the light etc. Thus it helps in making the room more comfortable and suitable to the user.

B. Morning Greeting Window

Early to rising is always considered better. Keeping that in mind, the curtains are designed to unwind in the early morning by the help of LDR. Further, it would close in the night in absence of any light.

C. Temperature Dependent Fan

The fans are controlled using the temperature of the room. The fans will automatically start at a defined temperature and then it will vary linearly with the variation, this will save energy and make the room comfortable for living. Further, the temperature is being displayed using an LCD screen, for being used as a reference by the user for switching on AC or any routine activity.

D. Smart Dustbin

The neat room is always a necessity. So to bring a smarter alternative to the user to go to the bin, this device is used. It opens automatically by sensing the presence of a user and then closes automatically after they go away.

E. Eco Lighting

Electricity efficient and saving technology has been used. In the morning the lights will automatically go off and in the night it will turn on. So, it will help in saving a lot of electricity. For tuning the light, the project has been equipped with an LDR and PIR sensor which would be sensing the sunlight.

II. EQUIPMENTS

A. Elements of Construction

TABLE I
COMPONENTS AND NO. OF UNITS

Sr. No.	Components	Quantity
1	Arduino UNO	4
2	HC-SR04 Ultrasonic Sensor	1
3	DC Motor	4
4	Micro Servo Motor SG90	1
5	Temprature Sensor DS18B20	1
6	PIR Sensor HC-SR501	1
7	LDR	1
8	I2C LCD 20X4 Module Shield	1
9	RFID EM-18	1
10	Gears	As Required
11	Motor Driver L293D	2
12	Breadboard	2
13	Electric Bulb	1
14	Relay	4X1
15	Jumper Wire	As Required

B. Description

I) *Arduino Uno:* It is ATmega328P based microcontroller board. It has a total of 20 pins -

I. 6 pins for analog input.

II. 14 for digital I/O (6 can be used as PWM output)

It has 16 MHz quartz crystal, a power jack, a reset button, a USB port and an ICSP header.



Fig. 1. Arduino Uno With Cable



Fig. 3. DC Motor

2) *HC SR04 Ultrasonic Sensor*: It is a distance measuring device which works on the basis of the measurement of the time taken for the ultrasonic beam to be received after being reflected by the surface of an obstacle. It has four pins Vcc, Trigger, Echo, Ground.



Fig. 2. HC SR04 Ultrasonic Sensor

3) *DC Motor*: It is a simple rotating device which works as a converter for electrical to mechanical energy. It works on the principle of electromagnetism and is available in a variety of range of RPM. The one used in the project is are 500 RPM motors.

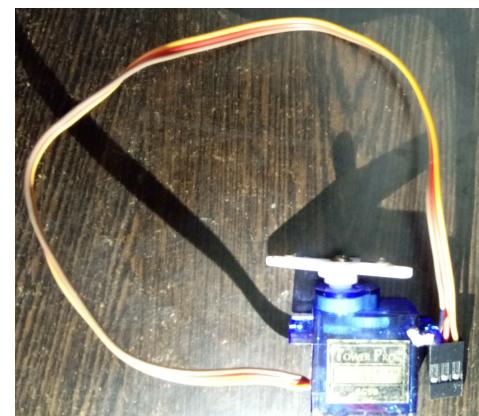


Fig. 4. Micro Servo Motor SG90

4) *Micro Servo Motor SG90*: It is a type of servo motor which is very small and light-weighted. Servo motor is characterized by the factor that the net rotation of these motors are rad and high power output.



Fig. 5. Temperature Sensor DS18B20 Module

6) *PIR Sensor HC-SR501*: PIR stands for Passive Infrared Sensor which is based on the used of infrared radiations. It is highly sensitive and requires the low power supply. It is used to sense activities within a defined sensing range of 120 degrees at a distance of 7 meters.

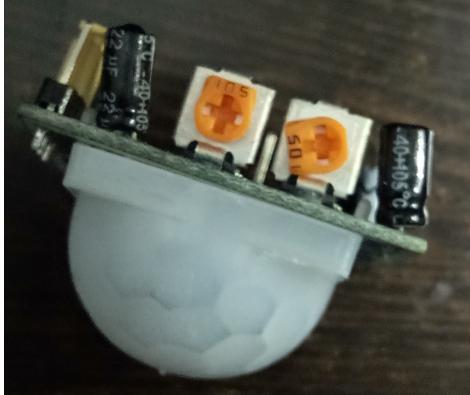


Fig. 6. PIR Sensor HC-SR501

7) *LDR*: LDR stands for Light-Dependent Resistor. As the name suggests, its resistance depends on the intensity of light which falls on the resistor. It is used to control the circuit on the basis of light like the temporary cut-off if the light intensity exceeds a given limit. It is a two terminal device and is highly compact in size.

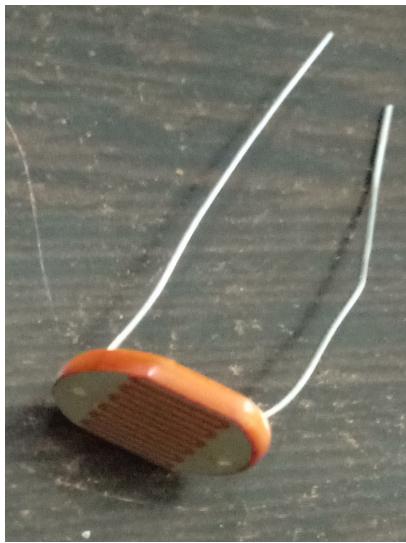


Fig. 7. Light-Dependent Resistor

8) *I2C LCD 20X4 Module Shield* : It is LCD display module with I2C which help in convert 16 pin system in 4 pin systems. It has 4 rows which display a total of 20 characters each. In the project, a yellow display was used.



Fig. 8. I2C LCD 20X4 Module Shield

9) *RFID EM-18*: It is a variant of RFID which can be connected directly to a microcontroller for sending data of the card which has been scanned. It works with an RFID tag of the frequency of 125 KHz.



Fig. 9. RFID EM-18

10) *Gears*: Gears were used for the smooth flow of the doors. It consisted of straight and circular shaped gear.



Fig. 10. Gears

11) Motor Driver L293D: It is a typical motor driver IC which help in rotating a dc motor bidirectionally. It has a total of 16 pins and can control a set of motors together.

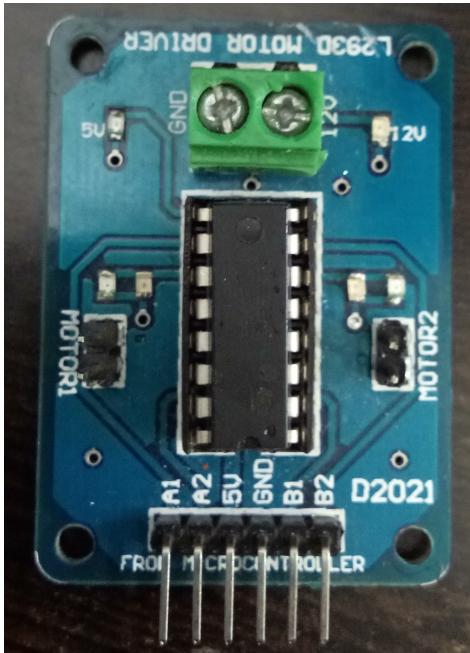


Fig. 11. Motor Driver L293D

12) Breadboard: We used 2 breadboards of model number BREADBOARD-GL12. It has 840 tie points: 128(5 point group) and 8 bus of 25 connected each.

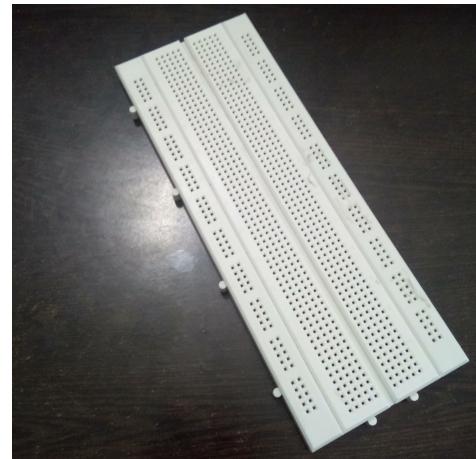


Fig. 12. Breadboard

13) Electric Bulb and Holder: In the project, a 60 W electric bulb and its corresponding holder is used.



Fig. 13. Electric Bulb and Holder

14) Relay: Relays are used to control the voltage supply for the circuit for various purposes including lighting, motor rotation etc. It is available in a variety which includes 2, 4 and above the number of channels. It can be controlled using a microcontroller like Arduino.



Fig. 14. Relay Board

III. CIRCUIT DESIGNS

A. Secure Door

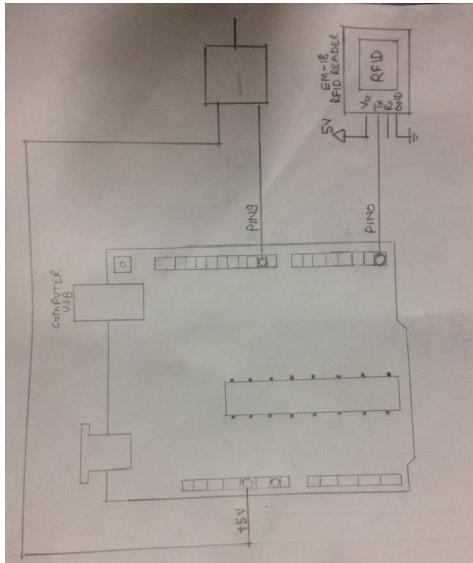


Fig. 15. Secure Door

B. Morning Greeting window

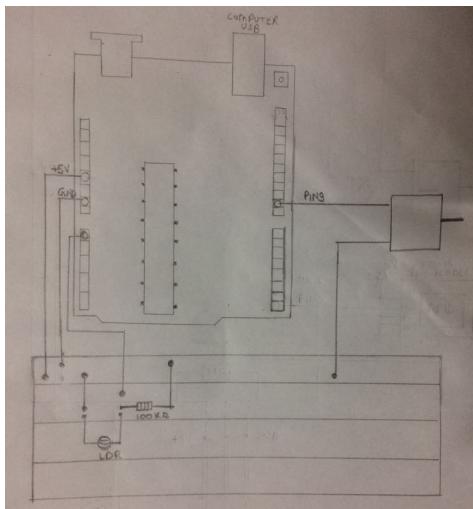


Fig. 16. Morning Greeting Winfow

C. Temperature Dependent Fan

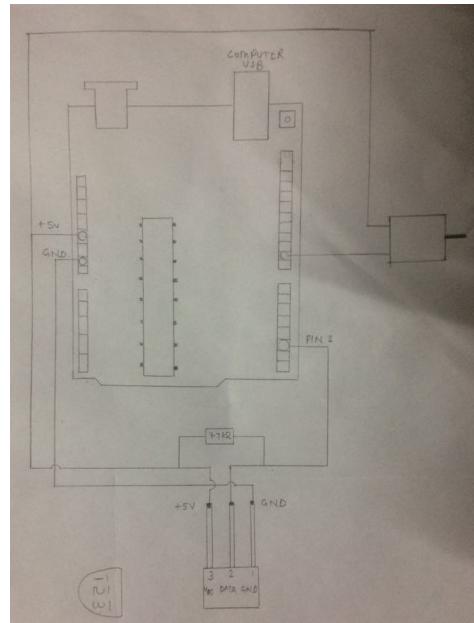


Fig. 17. Temperature Dependant Fan

D. Smart Dustbin

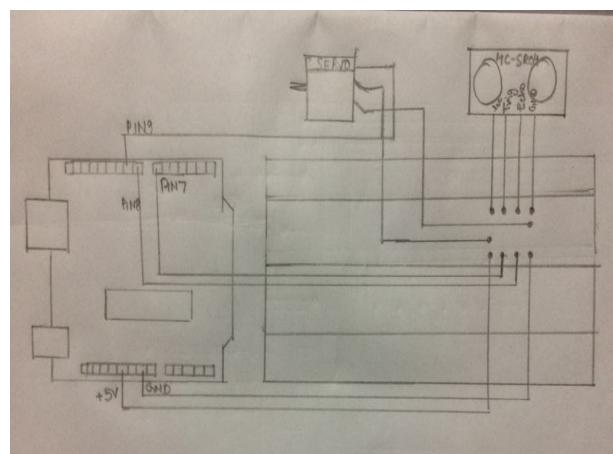


Fig. 18. Smart Dustbin

E. Eco Lighting

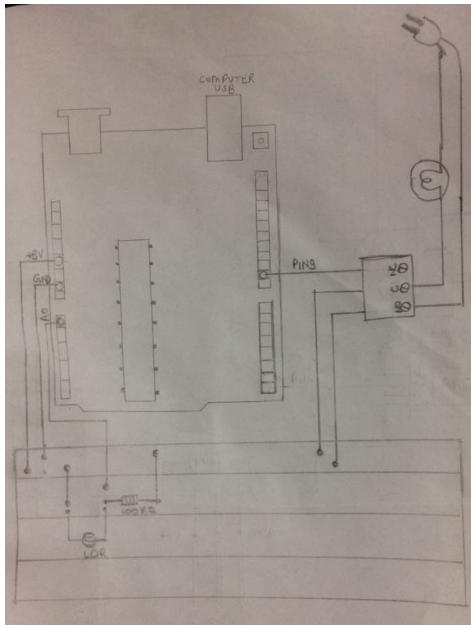


Fig. 19. Eco Lighting

IV. RESULTS AND DISCUSSION

The project is highly helpful in providing home assistance at a very low rate as compared to any other present methods. The components and their prices are as follows -

TABLE II
COMPONENTS AND THEIR PRICE

Sr. No.	Components	Quantity	Price (in INR)
1	Arduino UNO	4	1880
2	HC-SR04 Ultrasonic Sensor	1	170
3	DC Motor	4	1200
4	Micro Servo Motor SG90	1	170
5	Temprature Sensor DS18B20	1	230
6	PIR Sensor HC-SR501	1	180
7	LDR	1	10
8	I2C LCD 20X4 Module Shield	1	1831
9	RFID EM-18	1	830
10	Motor Driver L293D	1	200
11	Breadboard	2	200
12	Electric Bulb	1	50
13	Relay	4X1	290
14	Jumper Wire	NA	340
15	Battery 9V	4	80

So, the total price used in the project is 7662 INR. By the help of Arduino Mega of price 899 INR, we can reduce the cost by an amount of 1000 INR, and having nearly the same response.

V. FUTURE SCOPE AND IMPROVEMENT

A large number of Improvements can be added to the Smart Home is very low amount using the initial setup -

A. Secure Door

A feature that can be added to the Secure Door are as follows:

1. A database having the interest of the people using the room like the intensity and colour of the light, the speed of the fan, the favourite painting etc. When the person scan the card those features will be implemented in the room.
2. Additional features like fingerprint sensor, retina sensor, face detection etc to make the room safer.

B. Morning Greeting Window

Features that can be added to the Window are:

1. Depending on the humidity and weather the control can be enhanced.
2. Voice command system.

C. Temperature Dependent Fan

Features that can be added to the Temperature Dependent Fan are:

1. Moisture control can be added.

D. Smart Dustbin

Features that can be added to the Smart Dustbin are:

1. Foul smell removal system.
2. Garbage sorting and alarm when the dustbin reaches the full capacity.

E. Eco Lighting

Features that can be added to the Eco Lighting are:

1. Light intensity and colour variation on the basis of the time and environment.

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