Proteus Simulation for Arduino based Automatic Rain Shade

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***Abstract* —Home Automation is the need of the hour. Thus, a system to prevent washed clothes from getting wet by rain while hanging on the clothesline have been developed by using Proteus simulation platform. This problem occurs when the user is not at reachable area when the rain occurs. Sensing and driving of the system is controlled by the Rain sensor module and the Arduino UNO micro-controller in the simulator. The system checks the conditions of rain as '1' and '0' and the two servo motors rotate by 90 degrees when the state is '1'. Once the state is made '0', the servo motors come back to their original position. The hardware part is shown using the AutoCAD 2020 software and the circuit of the project is simulated using Proteus Simulation software.**

Keywords — Arduino UNO, Rain Sensor, Servo Motors, Proteus Circuit Simulator

I. INTRODUCTION

Nowadays due to the day to day struggling routine at work place, people are not able to pay attention at the things going on in their home. Thus, Home automation has got an upper hand and needs to be implemented at homes. Technology has been developed immensely which would make home automation get implemented in people's homes.

Research on the field of Home Automation has been done using technologies like IOT, Metering System and Gesture Recognition etc. **[1 – 5]**

Swapnil Thakare eta.al. **[6]** has reported a work on IoT and AI bases Home Automation System.

Technology has made people's life easier day by day. Thus, nowadays circuit simulators have started coming in the market which helps in simulating a hardware circuit in the software which makes designing electrical circuits easier. Proteus 8.6 and Tinkercad are some software used.

Research on various fields using circuit simulators like Proteus and Tinkercad has been .

Qing Wang eta.al. **[10]** has reported a Design and simulation for temperature measurement and control system based on PT10 using Proteus Simulator

Taslim Ahmed eta.al. **[11]** has reported a design of Automatic High Precision Solar Tracking System with an Integrated Solar Sensor using the Proteus Circuit Simulation Software.

Salam J. Yaqoob eta.al. **[12]** has reported an implementation of photovoltaic panel model based on two-diode model designed using Proteus Circuit Simulation Software in Dec. 2019

After studying Research papers on fields like Home Automation and papers which used circuit simulators, the present paper reports a simulation for a system which can be used in the terrace to protect our clothes from getting wet from rain when we are not at homes.

II. METHODOLOGY/EXPERIMENTAL

Following are the components from the Proteus simulation software to generate the circuit for the system.

A. Components

1. ARDUINO UNO R3 BOARD:

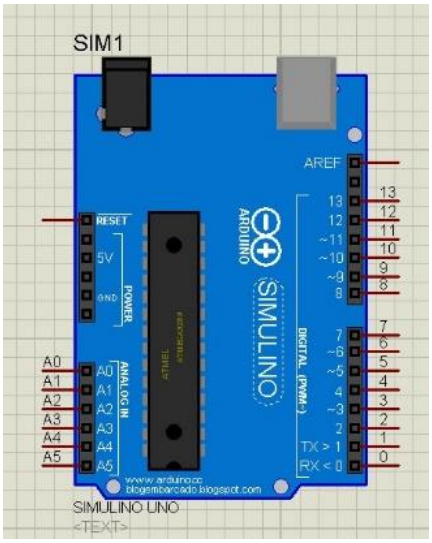

Fig. 1: Arduino UNO R3 Board

2. RAIN SENSOR:

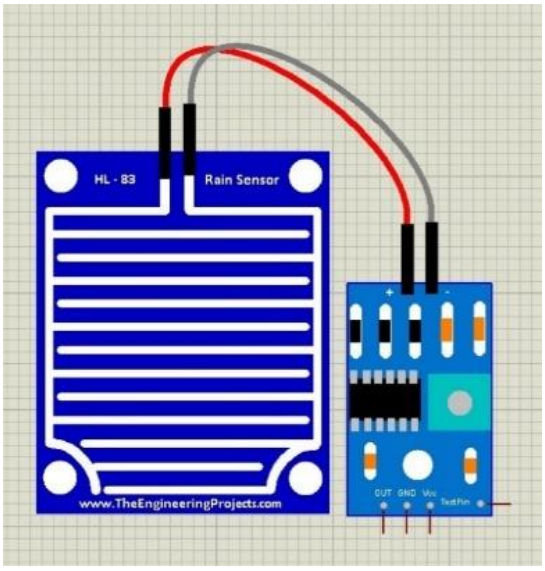

Fig. 2: Rain Sensor

3. SERVO MOTOR:

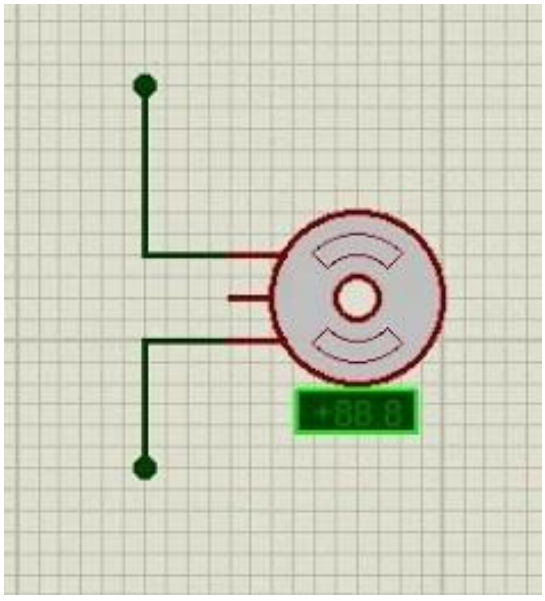

Fig. 3: Servo Motor

4. VIRTUAL TERMINAL:

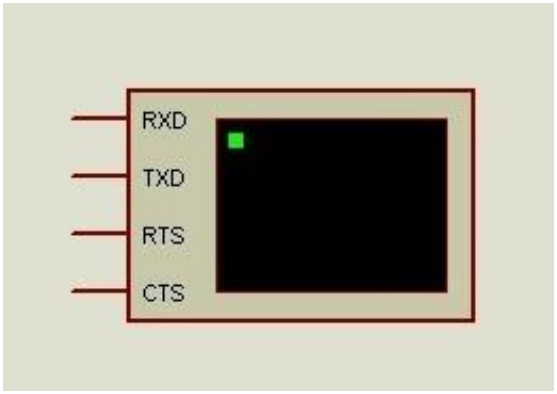

Fig. 4: Virtual Terminal

B. Algorithm and Flowchart

1. ALGORITHM FOR THE FLOW OF THE SYSTEM:

Steps taken by the system to get the result:

STEP 1: First the state of the rain sensor has been changed from '0' to '1'.

STEP 2: This change in state has been recorded by the Arduino board.

STEP 3: According to the code uploaded in the Arduino board, the servo motors have moved in the anticlockwise direction.

STEP 4: Once the change in state is changed back from '1' to '0', the servo motors would move in clockwise direction.

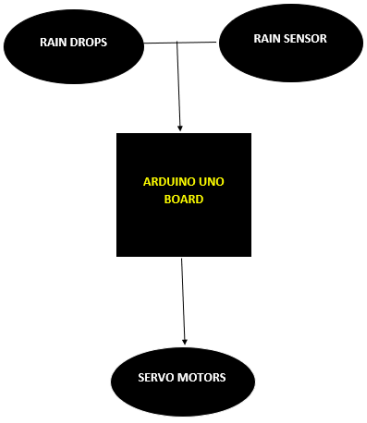

Fig. 5: Flow Chart

C. *Circuit Diagram*

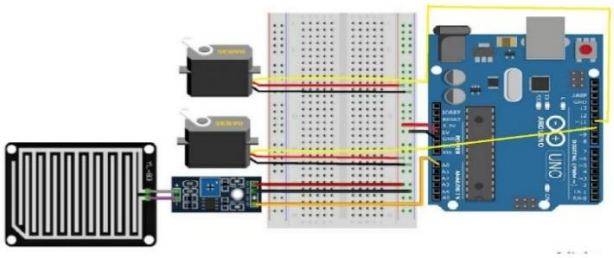

Fig. 6: Circuit Diagram for the System

- The above Circuit diagram depicts the actual hardware components of the Automatic Rain Shade using Arduino.
- The System has been designed using Proteus Simulator and **AutoCAD 2020** Software.

D. *Code Discussion*

CODE SNAPSHOT:

The Following snapshots are the snapshots of the code from the **Arduino 1.8.12** Software for the system.

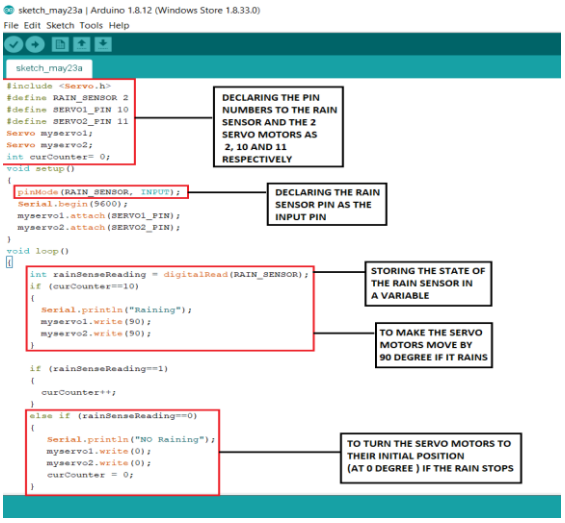

Fig. 7: Important part of the code

SOME IMPORTANT POINTS ON THE CODE:

- A counter of 10 has been used in the program to take some delay and check whether it is raining or some drops of water have fallen on the sensor.
- While driving assembly in real, analog values ranging between **0 to 1023** will be taken into consideration and according to it, if statements will be set for **RAINING** and **NO RAINING** conditions.

ALGORITHM FOR THE CODE:

STEP 1: Include servo library.
STEP 2: Define rain sensor and servo motor pins
STEP 3: Create servo object to control servo.
STEP 4: Set counter variable to 0.
STEP 5: In void setup, declare rain sensor pin as input, attach servo motors and set data rate in bits per second for serial data transmission.
STEP 6: In void loop, read rain sensor value and store in variable rainsenseReading.
STEP 7: If rainsenseReading is equal to one increase curCounter.
STEP 8: If curCounter reach end of delay timer print raining on serial monitor and move both servo motors by 90 degree.
STEP 9: Else check rainsenseReading . If it is equal to zero print no raining on serial monitor and restore servo to initial position
STEP 10: Reset curCounter to zero. Add some delay for proper function.

E. *Complete Circuit on Proteus*

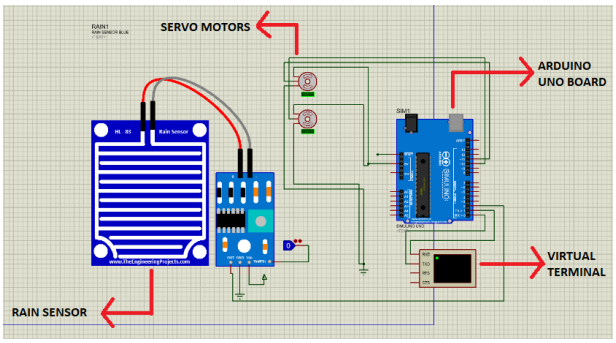

Fig. 8: Figure showing all the components of the system on the Proteus Simulator

F. *Test Cases*

1. Rain Sensor State:
   a) **'1': RAINING**
   b) **'0': NO RAINING**
2. Servo motor State:
   a) **'0' degree: Initial Position**
   b) **'90' degree: Final Position**

III. RESULTS AND DISCUSSIONS

The following images are the images from the **Proteus Simulator** and **AutoCAD 2020** Software. The project has been made completely on these two software.

Discussion for the Proteus Simulation Results

Images for the Proteus Simulation Results

Discussion for figure 9:

The figure shows the initial circuit when the system is in OFF condition. The image depicts following components:

1. Rain Sensor Module
2. Arduino UNO
3. 5V Supply given to the Arduino Uno
4. 2 Servo Motors

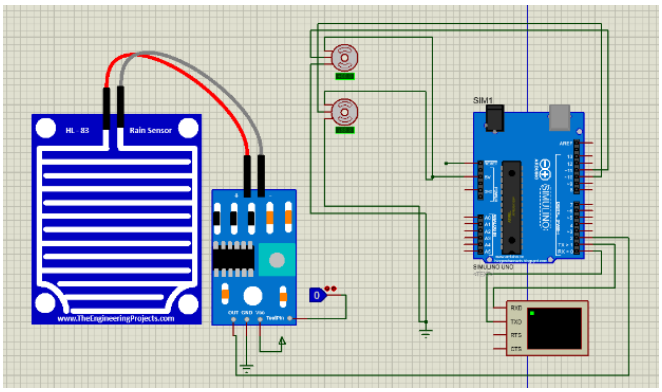

Fig. 9: Image depicting Components

Discussion for figure 10:

The figure shows the condition when the system is in ON condition.

- The figure shows that the there is **NO RAIN** and the rain sensor state is **'0'**.
- The Serial Monitor shows **"No Raining"**.
- The position of the Servo Motors is **0 degree**.

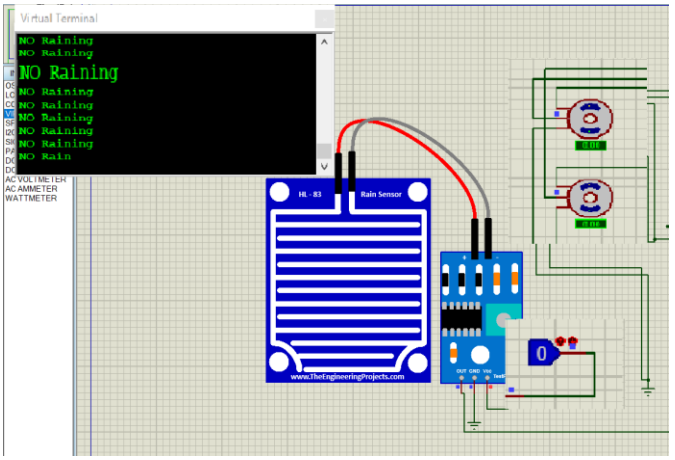

Fig. 10: Image depicting **'No Raining'**

Discussion for figure 11:

The figure shows the condition when the system is in ON condition.

- The figure shows that it is **RAINING** and the rain sensor state is **'1'**.
- The Serial Monitor shows **"Raining"**.
- The position of the Servo Motors is **90 degree**.

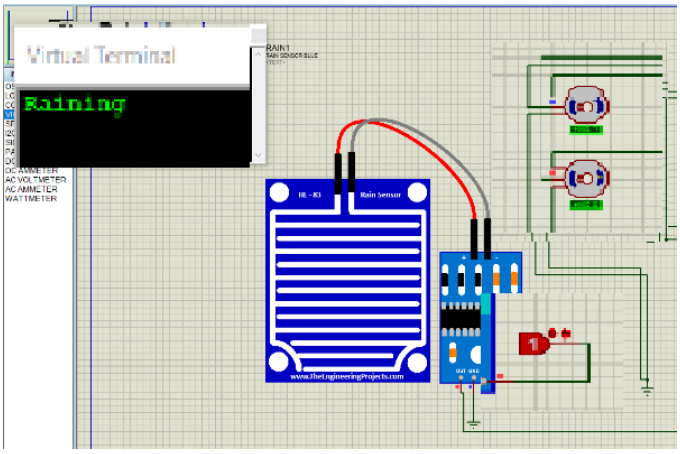

Fig. 11: Image depicting **"Raining"**

Discussion for the AutoCAD Drawings

Images for the AutoCAD Drawings

Discussion for figure 12:

The figure shows the **ORTHOGRAPHIC FRONT VIEW** of the house.

- The figure shows that the house has a Ground floor and a First floor.
- The First floor consists of a room and attached balcony to it.
- It shows the two servo motors attached at the corners of the room on the outside.
- The two roofs (one above the other) are in between the ceiling and the top of the room.

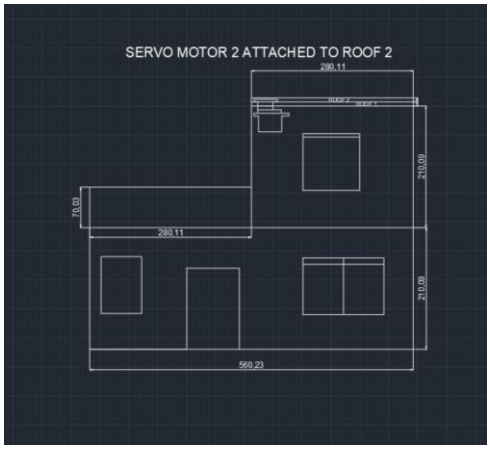

Fig. 12: **FRONT VIEW** of the House

Discussion for figure 13:

The figure shows the **ORTHOGRAPHIC LEFT HAND SIDE VIEW** of the house.

- The figure shows the two servo motors attached to the two roofs i.e. Servo Motor 1 to Roof 1 and Servo Motor 2 to Roof 2 respectively

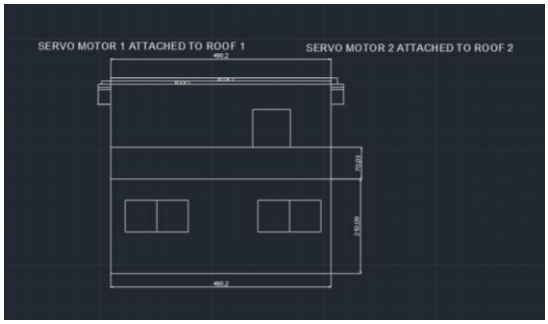

Fig. 13: **LEFT HAND SIDE VIEW** of the House

Discussion for figure 14:

The figure shows the **ORTHOGRAPHIC TOP VIEW** of the house.

- The figure shows that the main circuit and the rain sensor is on the top of the house.
- The circuit is properly covered where as the rain sensor is exposed to the environment.

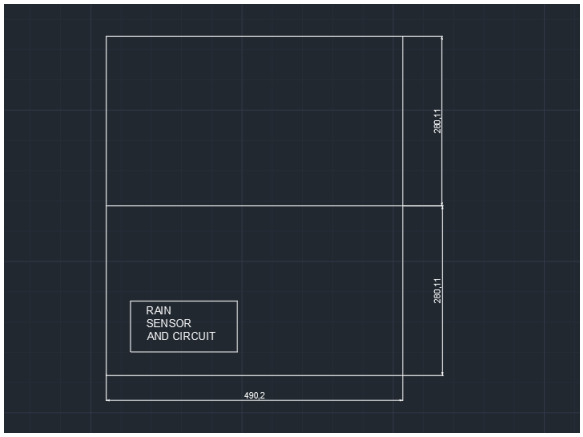

Fig. 14: **TOP VIEW** of the House

Discussion for Roof Mechanism

Discussion for figure 15:

The figure shows the initial position of the roof.

- The figure shows the initial position of the roof when **NO RAIN** is recorded by the rain sensor.
- The figure shows the position of respective servo motor attached to the respective roof.
- The roofs are one above the other.

Images for the Roof Mechanism

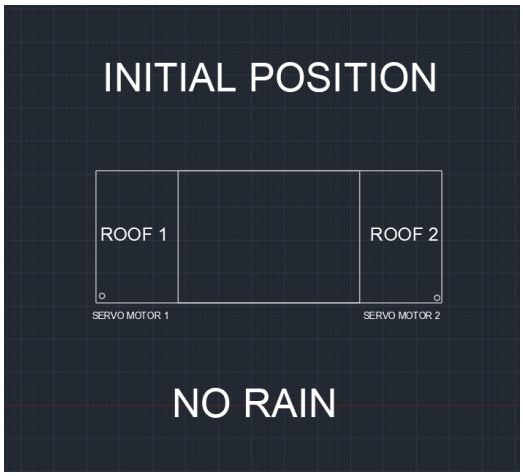

Fig. 15: Initial Position of the Roof
(Servo motors at 0 degree)

Discussion for figure 16:

The figure shows the final position of the roof.

- The figure shows the final position of the roof when **RAINING** is recorded by the rain sensor.
- The roofs cover the clothes and protect them from getting wet

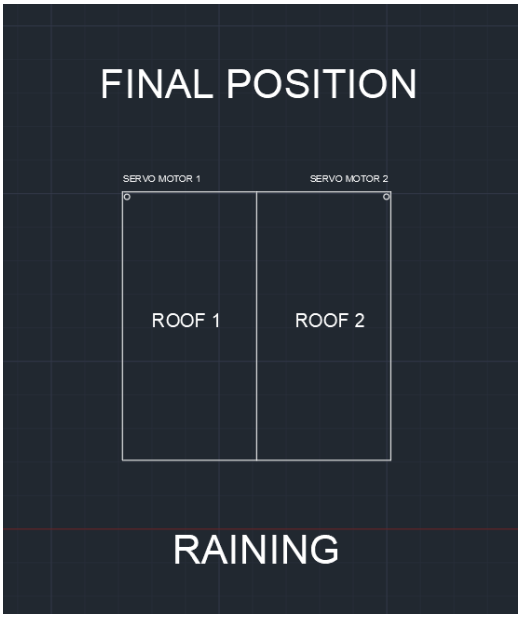

Fig. 16: Final Position of the Roof
(Servo motors at 90 degree)

IV. FUTURE SCOPE

1. The project can be implemented in houses by using the hardware components in place of the components used in the simulation software.

V. CONCLUSION

The Automatic Rain Shade system has been implemented successfully using Proteus and AutoCAD 2020 software. The response given from the servo motors is correct with respect to the input given by the Rain Sensor.

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