

Mechrella

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Abstract

Objective: This paper comprises the new way of construction and designing of mechanical roof for the controlled environment. **Methods:** Retractable roofs are those roofs which are used now days to cover the stadiums from the top so that there won't be hindrance for the audience and players to see and play match in adverse weather conditions. Mechrella is kind of roof designed to be used for industries purpose where products and raw materials are dried or stored in open chambers. So this idea will be helpful in unfamiliar weather conditions. **Finding:** It was found that some industries that used to dry their raw material and products in direct sunlight suffered losses in unwanted rain shower so, Mechrella was sought an idea for such industries. It works automatically without any manual button. This idea is different, as before this retractable roof for stadiums were used and those were expensive to install in small levels industries. But this idea of Mechrella is cheaper and also easily portable. **Application:** It is cheap to install so it can be used in big as well as small scale industries to cover the roof in unwanted rain shower. Example: spices industries, dry flower industries etc.

Keywords: Arduino Uno, Nylon Taffeta, Power Data Transmission Cable for Arduino Rain Water Sensor, Servo Motors

1. Introduction

If there is one technological advancement that would certainly make living easy and convenient, then automation and innovation would be the answer. The implementation of innovative organizational concepts is considered to be highly important for a company's competitiveness, so far there has been a little idea of Mechrella¹. Mechrella is a new idea of creating something innovative and cheaper to be used in industries. Mechrella is combination of two words that is mechanical and umbrella. It is a new concept of covering the roof automatically without manually pressing any button.

Retractable roof covered stadiums are presently in use to provide a controlled environment for outdoor sports events. Recently the present applicants have developed a stadium building with an improved retractable roof

to take advantage of the natural environment when the weather is fine. Essentially the invention consists of a retractable roof, for a stadium building, comprising a central arch separating a pair of end segments, one end segment being fixed, central arch being movable to a position above the fixed end segment, the other end segment being movable accurately laterally to a position transverse to its closed position and laterally external to the central arch. In another aspect the central arch has two barrel vaults movable into nesting relationship above the fixed end segment with the barrel vault adjacent the movable end segment nesting below the barrel vault which is adjacent the fixed end segment².

Retractable roofs are currently in use in stadiums. They are expensive and are not for industrial use whereas Mechrella can be used in industries with less capital investment.

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2. Materials and Methods

2.1 Steps Involved

The required raw material for the prototype of project was collected and outer wooden frame of the model was then created. Then two big round cut wooden pieces were installed parallel to each other and perpendicular to the wooden case. A rain water sensor was placed outside of those circles (basically on the edge of box) and two servo motors then installed. Their shafts were joined to the circle in such a way that they were moving freely in the direction of the rotating motors. Thereafter programming as per requirement was done with Arduino i.e. when there were water droplets on the rain water sensor then it was sending signal to Arduino³. After getting signal, Arduino was passing command to motor to move in 180 degrees in forward direction and when there were no water droplets on rain water sensor then it was moving backward 180 degrees⁴. The nylon taffeta (umbrella cloth) which was parallel to the base was installed on the both circles and stretched in such a way that it created hollow covered space in between when motors were 180 degree in forward direction⁵ as shown in Figure 1. It was placed tightly so that there was no leakage when roof was closed. Then all connections were made linked to each other using wires as shown in Figure 2. At last power supply was given to Arduino and motors through Arduino adapter.

2.1 Arduino Programming

```
#include<Servo.h>
Int servoPin1=7;
Int servoPin2=8;
Int buzzer=13;
Servo Servo1;
Servo Servo2;
Int nRainDigitalIn=2;
Int nRainVal;
Boolean bIsRaining=false;
String strRaining;
Void setup() {
    Serial.begin(9600);
    pinMode(3, INPUT);
    Servo1.attach(servoPin1);
    Servo2.attach(servoPin2);
    pinMode(buzzer.OUTPUT);
}
Void loop() {
    nRain=analogRead(A0);
```



Figure 1 Prototype of Mechrella.

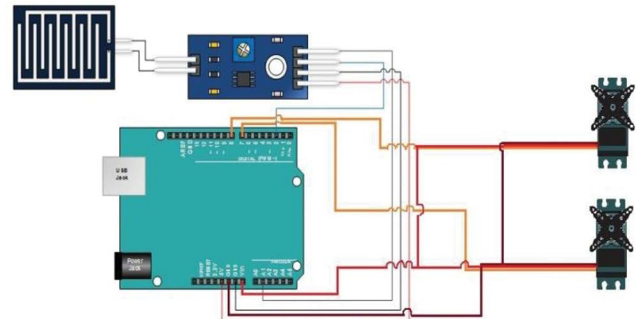


Figure 2 Circuit diagram.

```
bIsRaining=
!(digitalRead(nRaindigitalIn);
    if (bIsRaining) {
        stRaining="Yes";
    }
    Else {
        stRaining="No";
    }
Serial.print("Raining:");
Serial.print(strRaining);
Serial.print("Moisture level:");
Serial.println(nRainVal);
Delay(500)
    If(nRainVal<850) {
        Servo1.write(260);
        Servo2.write(260);
    }
    Else {
        Servo.write(12);
        Servo.write(12)
    }
}
```

3. Problem Formulation

3.1 Need

There are many industries which use direct sunlight for carrying out their major processes like the spice industries dry their products or raw materials to make required product. So, sometimes when there are unpleasant environmental conditions like sudden rain showers, these industries can suffer huge loss. The problem aggravates if available manpower is not enough so as to store the material at right place before it gets wasted or decayed. Therefore, this new concept was introduced.

3.2 Significance of Purposed Work

In this, rain sensors are used to be placed outside the industry where this design is to be installed to monitor the environmental conditions. Whenever there will be rain or more humidity, it will pass the signal to microcontroller. This signal is then passed to the motors having gears on its shaft. The gears would be placed in such a way so that roof could be slide correctly towards the required direction. When there will be no rain and good sunlight, the water droplets on the sensor dry out and there will be no signal sent to the microcontroller. So, the controller will pull the roof to backward direction. Also, in order to save electricity solar panels can be installed.

4. Results and Discussion

When there is rain or humidity, rain water sensor passes the signal to microcontroller which is sent to the motors to rotate it in clockwise direction. There are two big wooden circles having cloth on it and connected to the motors. So as per rotation, the cloth will also move in the direction of shaft of the servo motor and roof will be subsequently closed. When there will be no rain then rain water sensor will not pass any signal to microcontroller. Consequently, a signal will be passed to the servo motor to rotate it in anticlockwise direction subjecting the opening of the roof.

5. Conclusion

This prototype can prove to be an asset to any organization that may require this design to be installed for different

uses depending upon their requirement. Also, this novel approach can be extended to a real design and some more functionality and advancements can be added to this idea just to increase the scope of this project on which the work is going on. This project can be used not only in industries but also in different private fields. For e.g.-Private Swimming Pools to cover the pool in rain, Open Theatre: to keep the performances going on irrespective of any rain showers and also in vehicle parking. This project idea can bring a new step to industry revolution and modernized world.

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7. References

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