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RAIN DETECTION AND CLOTHES PROTECTION

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Abstract : This paper presents an automatic rain detection and clothing protection system that makes use of a servo motor, an Arduino UNO, and a rain sensor. The device is intended to protect clothing left outside by automatically spotting rain and moving it to a protected spot. When rain is detected, a rain sensor that tracks the weather sends signals to the Arduino microcontroller. After processing the input, the microcontroller drives a servo motor to transfer the clothing into a protected area. The mechanism reverses the motion and puts the clothing back in its original exposed position as soon as the rain stops. Because of its affordability, energy efficiency, and ease of use, this solution can be integrated into IoT systems and used in smart home applications.

Keywords : Shelter Mechanism, Rain Detection, Weather-Based Control, Clothes Protection, Automation, Arduino UNO, Rain Sensor, Servo Motor**.**

I. INTRODUCTION

These systems reduce manual intervention and offer convenience by using automation technology to detect rain and take quick action to prevent garments from becoming saturated. A servo motor attached to a mechanical arm that spreads a cover over the clothing and a rain sensor module for rain detection are two of the components in this project that are integrated and controlled by an Arduino Uno microcontroller. When the rain sensor module detects moisture or rainfall, it signals the Arduino, which in turn causes the servo motor to move the mechanical arm. This automation returns the arm to its natural position and guarantees that clothing is promptly protected during rainy seasons.

II. LITERATURE PAPER

[1], Ramesh R., Anila Nambiar, and Rajendra M. Jotawar's study "Smart Roof for Protecting Food Grains and Clothes from Birds and Rain" (2024) describes a smart roof system intended to protect clothing and food grains from environmental elements including rain and bird damage. By using sensors to identify environmental changes, the technology automatically modifies the roof for the best possible protection. Reliable weather defense and effective, hands-free operation are made possible by microcontrollers, which process sensor data and regulate actuators. This study emphasizes how automation and sensor-based technologies can be combined to simplify daily tasks and minimize the need for human intervention. The suggested strategy, which prioritizes cost-effectiveness and energy efficiency, opens the door for broad implementation in smart home and agricultural environments.

[2], Using rain and light-dependent resistor (LDR) sensors, Athaya Atsiq, Andryan Gunawan, and Amin Alqudri Dwi Nugraha created an automatic clothes drying system in 2022 that is managed by an Arduino UNO microcontroller. The problem of drying garments outside in erratic weather is addressed by this approach. While the LDR sensor tracks light intensity to evaluate drying conditions, the rain sensor senses precipitation and automatically moves clothing to a protected place. The method puts the clothing back in their exposed position to dry when the weather improves. A system that combines several sensors is responsive and effective. The system is a useful addition to smart home automation since it is inexpensive and user-friendly, utilizing the versatile and reasonably priced Arduino UNO.

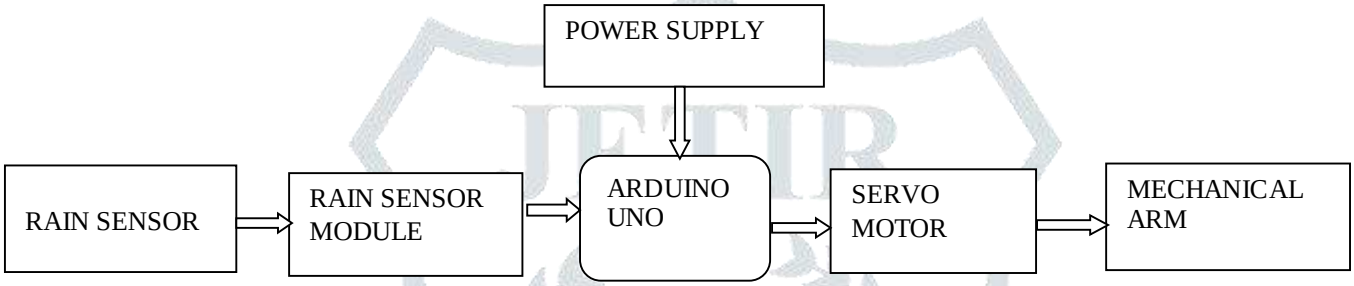
[3], The 2022 paper "Automatic Clothes Retriever (ACR)" by Rico Wijaya, Ivan Alexander, Adira Dzaky, and Muhammad Faisal Fadhil describes a unique method that allows garment collection to be automated in response to environmental conditions. The system uses an ESP32 microprocessor in conjunction with sensors such as Light Dependent Resistors (LDRs) and rain sensors to monitor sunlight and rainfall. When the device detects unfavorable conditions, such rain or insufficient sunlight, it mechanically retracts the garments to protect them. Additionally, the ACR features a mobile application that enhances user control and convenience. This approach highlights automation technological advancements, particularly for routine household tasks, and establishes the foundation for future advancements in smart home systems.

[4], Rajalakshmi, Sangeetha, Yaswini, and Mathivathana Oviya Pavai T. presented a clothes-hanging system in their 2020 study, "Clothes Hanging System." It was intended to make drying clothing easier while also accommodating different environmental circumstances. Using real-time weather data, the device moves garments automatically to shield them from the elements. The technology minimizes the need for user involvement while ensuring effective and hassle-free drying through the use of sensors and control mechanisms. The goal of the project is to provide a workable, affordable solution that uses automation to improve convenience. The suggested approach addresses typical issues with conventional clothes-drying techniques and shows potential uses in smart home settings. The development of intelligent systems for domestic tasks is aided by this study.

[5], The article is titled "Rain Water Detecting and Self-Active Cloth Retrieval Machine." In a 2016 study, Ashwini Modi, Shivaraja K, Sharana Kumara K, and Sharmas Vali S. presented a self-activating textile retrieval system that detects rainwater and protects clothing from sudden downpours. A method to remove the clothing and move them to a secure location is automatically triggered by the system's usage of a rain sensor to detect rainfall. By removing the need for manual intervention, this device seeks to prevent clothing from becoming wet while left outside. By integrating mechanical actuation for outdoor clothing management with weather detection technologies, the study showcases an inventive approach to automation. The method provides a solution to an issue, particularly in areas where rainfall is erratic.

III. METHODOLOGY

A. BLOCK DIAGRAM

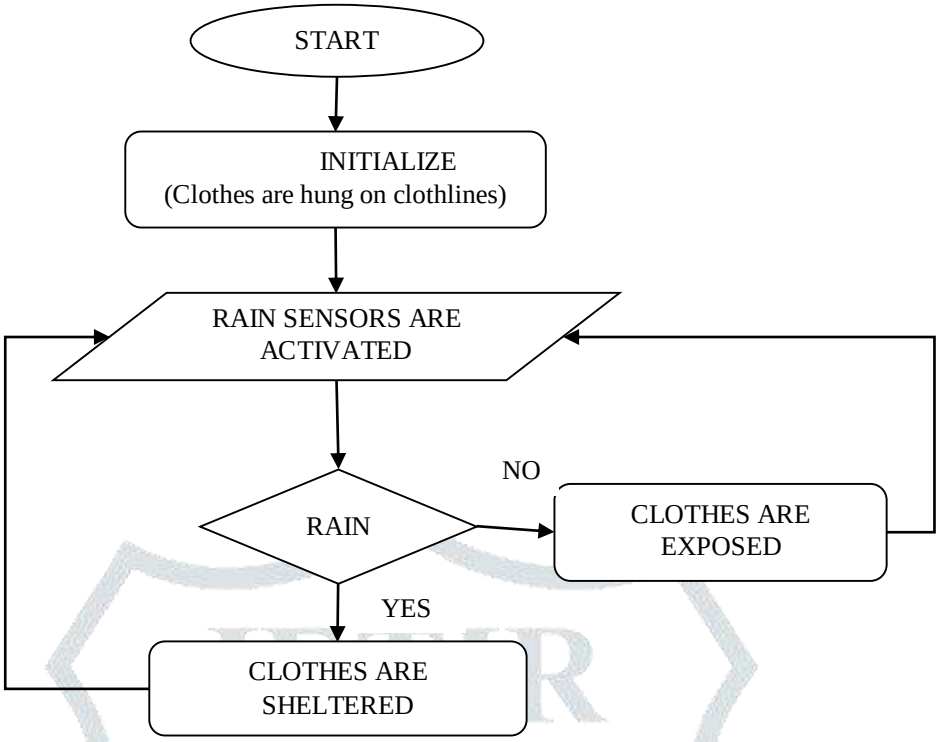


The components of an automatic rain detection and garment protection system based on Arduino are depicted in the block diagram above. wherein we have utilized parts such as an Arduino Uno, a mechanical arm, a servo motor, a power supply, and a rain sensor or rain sensor module.

B. WORKING

The rain detection and clothing protection system's operation is based on automated reactions to environmental conditions and real-time monitoring. An Arduino UNO serves as the system's primary processing unit, taking in data from the rain sensor and managing the servo motor that moves the clothing. The rain sensor first senses weather changes, particularly the occurrence of precipitation. When the sensor detects rain, it signals the Arduino UNO, which then turns on the servo motor. To save the clothing from becoming wet, the servo motor then transports them to a shelter or other sheltered location. The sensor sends a signal back to the Arduino when the rain stops and it can no longer detect moisture, which causes the servo motor to move the clothing back to the exposed area to dry. In addition to reducing the need for manual intervention and dynamically adjusting to changing weather conditions, this automated procedure guarantees the effective management of outdoor clothing. The combination of the servo motor, Arduino UNO, and rain sensor offers an economical and energy-efficient way to protect clothing in inclement weather.

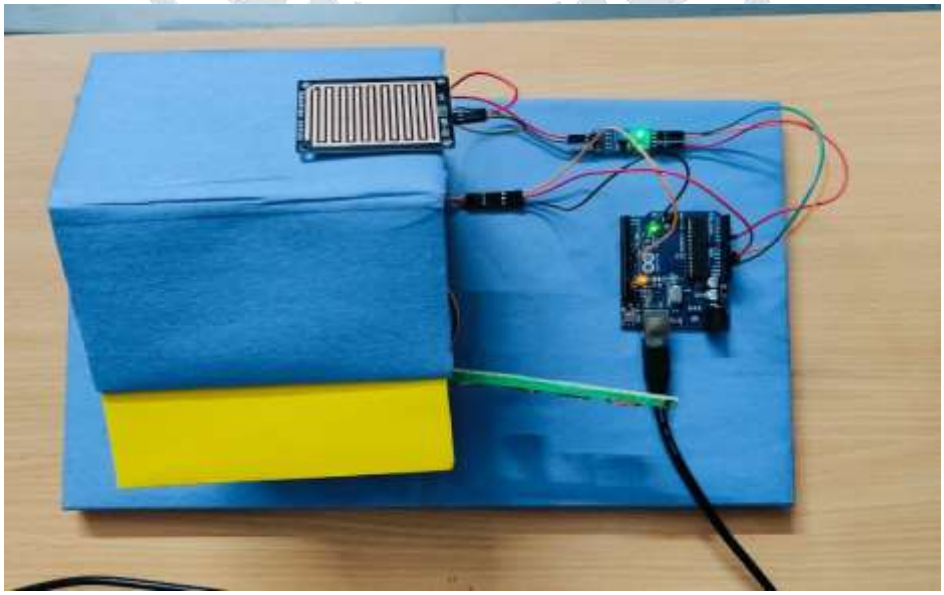
C. FLOWCHART



An automated system designed to shield clothing hanging on a clothesline from rain is seen in the flow chart above. Rain sensors are triggered once the garments are first hung on the line. Rainfall is regularly monitored by these sensors. The clothing stay uncovered and the system keeps checking the weather if there is no sign of rain. On the other side, the system acts to protect the clothing by either covering it or relocating it to a protected area if it detects rain. Constant monitoring and protection are ensured by the continuous loop operation of this process.

IV. RESULTS

The prototype of the proposed system is shown in the below Figure :



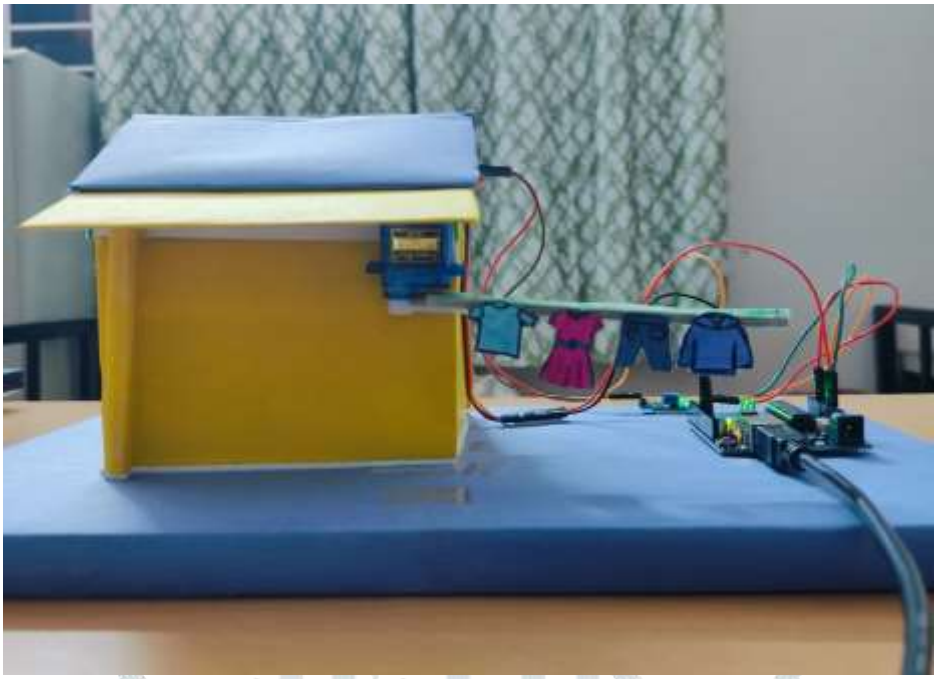


Fig 1: When rain is not detected, cloths are exposed to the outer space.

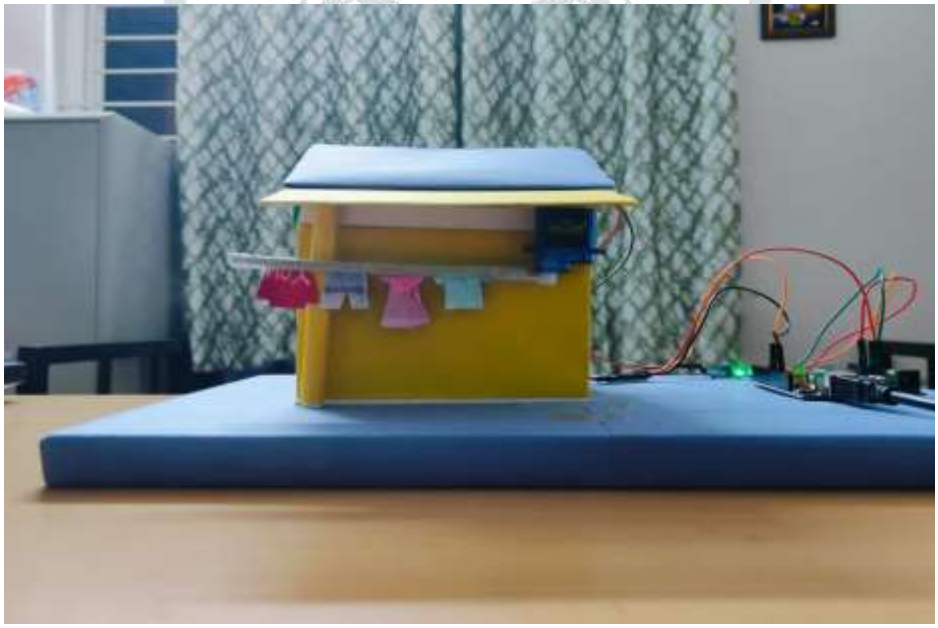


Fig 2: When the rain is detected , clothes are moved towards the sheltered area.

V. APPLICATIONS

1. Balconies at homes.
2. Common Drying Spaces.
3. Units for Outdoor Storage.
4. Laundry Facilities on the Roof.
5. Terraces and Patios.

VI. REFERENCES

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