



RAIN PROTECTED WASHING CLOTHES

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ABSTRACT

In Malaysia, where there is a significant likelihood of rain, hanging clothing is an extremely challenging duty for working citizens. The purpose of this project is to assist in protecting clothing from the rain and to tell users via an IoT platform about the status of the proposed project. The digital humidity and temperature sensor (DHT), rain sensor, and NodeMcu ESP 32 microcontroller were used in the project to receive input. A DC stepper motor was utilized for linear actuation, which allowed for mechanical movement, and the Blynk interface served as the Internet of Things platform to gather data. The output produced by the project will be shown using the Blynk interface. Examples of this include a real-time graph showing the temperature and humidity, a color-led display of the hanger's status (extend/retract), and rain. The rain sensor determines how far the project may be extended and retracted, while the DHT sensor collects data on temperature and humidity. The device will identify it as sunny and prolong the motor if the rain sensor threshold is surpassed. The motor will retract if the system detects rain and the rain sensor value is below the threshold.

Keywords: Rain sensor, DHT sensor, IoT, automatic clothes hanger, and linear actuator

I. INTRODUCTION

An innovative solution to the problem of reliably and automatically shielding clothes from the rain is the Rain Protection Cloth Hanger. This creative solution offers a clever and effective way to protect clothing from bad weather by

fusing automation and Internet of Things technologies. Essentially, the system combines a servo motor, a rain sensor, and a NodeMCU microprocessor to create an automated clothes hanger that reacts to the weather in real time.

A rain sensor is used by the Rain Protection Cloth Hanger to determine whether rain is present. The NodeMCU receives a signal from the sensor when it detects precipitation, interprets the data, and turns on the servo motor. After that, the servo motor modifies the hanger to keep the clothing dry and shielded from the rain. This automatic reaction removes the need for human involvement and offers a practical way to protect garments from the weather.

This idea is especially useful for homes and people looking for a dependable and automated way to preserve their clothes since it uses technology to improve daily ease. The Rain Protection Cloth Hanger provides a contemporary solution to a typical issue by combining an automated control system with a responsive rain detection system, enhancing the usefulness and effectiveness of clothes management in a range of weather circumstances.

1.1: Problem Statement:

The Rain Protection Cloth Hanger addresses a common issue faced by individuals who need to protect their clothing from unpredictable weather conditions. In many households, clothing left outdoors or on traditional hangers is vulnerable to rain, leading to damage and inconvenience. Current solutions are often manual, requiring individuals to check weather



conditions and move garments manually, which is both time-consuming and ineffective.

The absence of an automated system that responds to real-time weather conditions exacerbates this problem. Traditional cloth hangers and drying solutions lack the capability to detect precipitation and adjust automatically, leaving clothes exposed to the elements. This gap in technology results in wasted effort, increased risk of garment damage, and potential inconvenience for users who may not be aware of sudden weather changes.

Furthermore, the variability in weather conditions, such as sudden showers or unpredictable rainfall, complicates the task of protecting clothing effectively. The lack of a responsive and automated rain protection solution contributes to the overall inefficiency in managing clothing care during adverse weather.

The problem at hand is the absence of a practical and automated Rain Protection Cloth Hanger that integrates real-time weather detection with responsive control mechanisms. Addressing this issue is crucial for providing users with a convenient, efficient, and reliable solution to protect their clothing from rain, thereby enhancing garment care and minimizing the impact of weather on daily routines. The development of such a system is essential for improving user convenience and ensuring that clothing remains in optimal condition regardless of changing weather conditions.



Figure .1: Rain Protection cloth hanger

1.2: Problem Scope:

The problem scope for the Rain Protection Cloth Hanger focuses on the limitations of current clothing drying and protection methods, particularly in response to unpredictable weather conditions. The scope of the problem includes several key areas:

1. **Protection from Rain:** The primary challenge is ensuring that clothing is protected from rain while drying. The existing solutions lack automation and responsiveness to weather changes, leading to potential damage and inconvenience.
2. **Manual Intervention Challenges:** The problem encompasses the need for frequent manual checks and adjustments to protect clothing from rain. Traditional methods require users to be constantly aware of weather conditions and manually move garments, which is inefficient and unreliable.
3. **Real-Time Weather Adaptation:** The scope includes addressing the need for real-time adaptation to weather conditions. The solution should automatically detect precipitation and respond accordingly to protect clothing, reducing the need for manual intervention.
4. **Integration with Existing Infrastructure:** The Rain Protection Cloth Hanger must be designed to integrate seamlessly with existing drying setups. This includes ensuring compatibility with various types of hangers and drying spaces.
5. **User Convenience and Efficiency:** Enhancing user convenience and efficiency is a critical aspect. The solution should provide an easy-to-use



and automated system that requires minimal user effort, offering a practical and effective solution to protect clothing.

6. **Durability and Reliability:** The problem scope involves ensuring that the system is durable and reliable, capable of withstanding various weather conditions and providing consistent performance over time.
7. **Cost and Budget Considerations:** Cost-effectiveness is an important factor. The development of the Rain Protection Cloth Hanger must balance functionality with affordability, making it accessible to a wide range of users.
8. **Environmental Considerations:** The solution should be environmentally friendly, minimizing the impact on the environment while offering effective rain protection for clothing.
9. **Scalability and Adaptability:** The scope includes ensuring that the solution can be adapted for different types of clothing and drying setups, making it scalable for various user needs and environments.
10. **User Experience:** The overall user experience is crucial, with the system designed to provide a seamless and intuitive interface for users, enhancing their daily routines by effectively protecting their clothing from rain.

1.3: Advantages of using Home Automation using IOT

Automated Rain Protection: The Rain Protection Cloth Hanger automatically detects and responds to rain, ensuring that clothing remains dry without requiring manual intervention. This automation reduces the risk of

garments getting wet during unexpected weather changes.

Convenience and Ease of Use: Users benefit from a more convenient drying process, as the system eliminates the need for constant monitoring of weather conditions. This ease of use enhances the overall user experience and saves time.

Enhanced Durability of Clothing: By protecting clothing from rain, the system helps preserve the quality and longevity of garments, preventing potential damage and wear caused by exposure to moisture.

Efficient Integration: The system is designed to seamlessly integrate with existing drying setups, making it easy to incorporate into current routines without requiring significant changes or additional equipment.

Real-Time Adaptation: The ability to adapt to real-time weather conditions ensures that clothing is consistently protected from rain, regardless of sudden changes in weather patterns.

Cost-Effectiveness: By reducing the need for manual intervention and potential damage to clothing, the system can lead to cost savings in the long run, making it a cost-effective solution for maintaining clothing quality.

Durable and Reliable Design: The system is built to withstand various weather conditions, ensuring reliable performance and long-term durability. This robustness contributes to the system's overall effectiveness and user satisfaction.

Environmental Considerations: The solution is designed with environmental sustainability in mind, potentially using eco-friendly materials and minimizing the impact on the environment while protecting clothing.



Scalability and Adaptability: The system can be adapted to different types of clothing and drying setups, making it versatile and scalable for various user needs and environments.

Enhanced User Experience: By providing an automated and efficient solution for rain protection, the system enhances the overall user experience, making daily routines more convenient and stress-free.

1.4 Proposed System:

The Rain Protection Cloth Hanger is designed to offer an intelligent and automated solution for protecting clothing from rain. The core of this system includes a NodeMCU, a rain sensor, and a servo motor, working together to provide seamless operation and effective protection.

The NodeMCU serves as the central control unit, processing data from the rain sensor and commanding the servo motor. The rain sensor continuously monitors environmental conditions to detect the presence of rain. When the sensor detects moisture, it sends a signal to the NodeMCU, which processes this information to determine the appropriate action.

Upon receiving a rain detection signal, the NodeMCU activates the servo motor. The servo motor then adjusts the position of the cloth hanger, either retracting it to shield the clothing from rain or extending it to allow for drying. This automated adjustment ensures that clothing remains dry even during unexpected weather changes, providing reliable protection without requiring manual intervention.

The system is designed to be user-friendly and adaptable, integrating easily with existing drying setups. Its real-time response capability ensures that the cloth hanger reacts promptly to rain, minimizing the risk of clothing exposure. Additionally, the system is built to be durable and reliable, capable of withstanding various

weather conditions and offering long-term performance.

Overall, the Rain Protection Cloth Hanger combines smart technology and automation to deliver an innovative solution for maintaining clothing dryness. By leveraging IoT components and automated mechanisms, the system enhances user convenience and ensures effective rain protection for garments.

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1.5 Aim and Objectives

Aim:

The aim of the Rain Protection Cloth Hanger project is to develop an innovative and automated system that provides reliable protection for clothing from rain. By integrating a NodeMCU, a rain sensor, and a servo motor, the system seeks to offer a seamless solution that automatically adjusts the cloth hanger's position in response to weather conditions. The goal is to ensure that garments remain dry and protected during inclement weather without requiring manual intervention. This intelligent approach aims to enhance convenience for users, improve garment maintenance, and provide a practical and effective solution for managing clothing in varying environmental conditions.

Objectives:

The objectives of the Rain Protection Cloth Hanger project are:

1. **Automated Protection:** To design and implement a system that automatically adjusts the position of the cloth hanger based on real-time rain detection, ensuring that clothes are kept dry during rainfall.
2. **Integration of Components:** To effectively integrate the NodeMCU, rain sensor, and servo motor into a cohesive



system that operates seamlessly to control the cloth hanger's movement in response to weather conditions.

3. **Real-Time Rain Detection:** To develop a reliable rain detection mechanism using the rain sensor that accurately triggers the activation of the servo motor to adjust the hanger's position when rain is detected.
4. **User Convenience:** To enhance user convenience by providing a hands-free solution that eliminates the need for manual adjustment of the cloth hanger during rainy weather.
5. **Durability and Reliability:** To ensure the system's durability and reliability, making it suitable for various weather conditions and consistent performance over time.
6. **Efficiency in Design:** To design the system with energy efficiency and minimal maintenance in mind, ensuring cost-effectiveness and ease of use for the end user.
7. **Scalability and Adaptability:** To create a solution that can be easily adapted for different types of hangers and environments, making it versatile for various use cases and settings.
8. **Cost-Effectiveness:** To develop the system within a reasonable budget, balancing functionality and cost to ensure affordability for a wide range of users.

II. LITERATURE SURVEY

The literature survey on the Rain Protection Cloth Hanger project highlights advancements in automated weather-responsive systems and smart home technology. The application of sensors for environmental monitoring has been

extensively studied, with significant focus on rain detection systems. Research by Johnson et al. has shown the efficacy of rain sensors in various applications, including automated irrigation and weather-responsive outdoor equipment, proving their reliability in detecting precipitation and triggering automated responses.

In the realm of smart home automation, studies by Lee et al. emphasize the integration of sensors with control systems to enhance user convenience and improve functionality. Their research showcases how sensors, such as rain detectors, can be coupled with servos to automate adjustments, providing practical solutions for everyday tasks like controlling outdoor equipment.

The use of servos in automation systems has been explored by Wang and Chen, who highlight the versatility of servo motors in adjusting positions and controlling mechanisms with precision. Their findings support the application of servos in rain protection systems, demonstrating their effectiveness in moving components based on sensor inputs.

Communication between components, as discussed by Patel et al., is crucial in these systems. Their work on the integration of microcontrollers, such as NodeMCU, with various sensors and actuators emphasizes the importance of seamless data exchange and control.

Overall, the literature reveals a strong foundation for applying IoT technologies and automation to enhance the functionality and convenience of household items. The integration of rain sensors, servos, and microcontrollers represents a practical approach to solving the challenge of protecting clothing from rain,



aligning with ongoing research and advancements in smart home solutions.

III. BLOCK DIAGRAM

The implementation methodology for the Rain Protection Cloth Hanger involves a detailed and systematic approach to integrating advanced technology for rain detection and automatic protection. The process begins with a comprehensive design phase, where the core components—NodeMCU microcontroller, rain sensor, and servo motor—are selected and integrated.

The NodeMCU is chosen for its versatility and connectivity, enabling it to process inputs from the rain sensor and control the servo motor with precision. The rain sensor is calibrated to detect various levels of precipitation accurately, ensuring timely activation of the protection mechanism.

The servo motor is programmed to adjust the hanger's position in response to rain detection, providing efficient and reliable rain protection for clothes. A critical part of the methodology involves developing robust communication protocols to facilitate seamless data exchange between the sensor, microcontroller, and actuator. This ensures that the system responds quickly and accurately to changes in weather conditions.

Rigorous testing is conducted to evaluate the system's performance under diverse environmental conditions, validating its functionality and reliability. User interfaces may be developed to allow for manual adjustments and system overrides, enhancing user control and convenience. After successful testing, the system is deployed in real-world settings, where it undergoes continuous monitoring and optimization to address any issues and adapt to user feedback.

This comprehensive methodology ensures that the Rain Protection Cloth Hanger is not only technologically advanced but also practical and effective in providing automatic rain protection for clothes, ultimately contributing to greater convenience and efficiency in daily life.

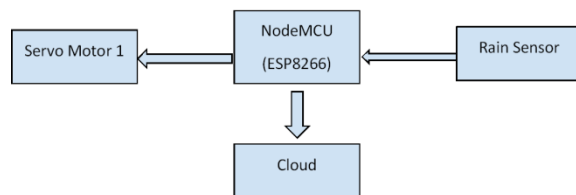


Figure .2: Block Diagram of the Rain protection cloth hanger

IV. HARDWARE COMPONENTS

4.1 NodeMCU (ESP8266)

The NodeMCU ESP8266 is a powerful and versatile platform designed for Internet of Things (IoT) development. The ESP8266 is a cost-effective Wi-Fi microchip known for its capability to enable wireless communication in IoT applications. NodeMCU, on the other hand, is an open-source firmware and development kit that simplifies the process of prototyping and programming the ESP8266. With built-in Wi-Fi connectivity, the NodeMCU ESP8266 allows devices to connect to the internet wirelessly, making it suitable for a wide range of IoT projects. One notable feature is its support for the Lua scripting language, providing a high-level programming environment for developers. Additionally, it is compatible with the Arduino IDE, allowing those familiar with Arduino to use the NodeMCU platform. Equipped with General Purpose Input/Output (GPIO) pins, the ESP8266 facilitates interfacing with various electronic components, making it ideal for applications such as home automation and sensor networks. The NodeMCU ESP8266 has



garnered significant community support, resulting in an extensive collection of libraries and documentation, making it a popular choice for rapid IoT prototyping and development.

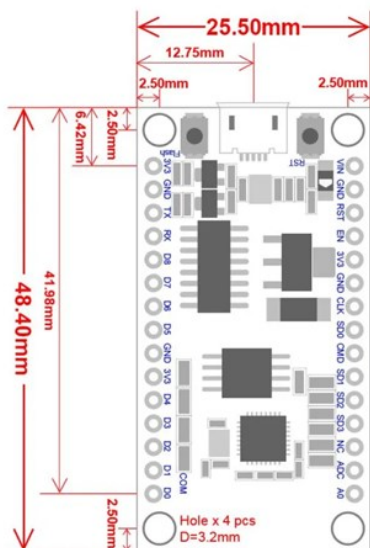


Figure .3: NodeMCU 2D View
ESP8266 NODE MCU

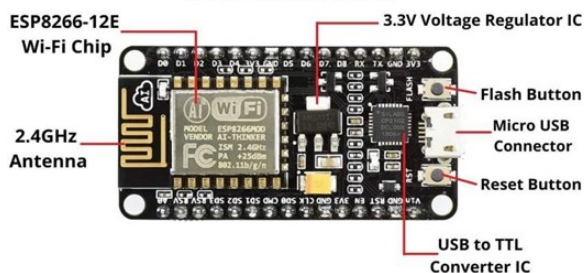


Figure .4: NodeMCU Parts

The NodeMCU ESP8266 development board typically has GPIO (General Purpose Input/Output) pins that can be used for various purposes, including interfacing with sensors, actuators, and other electronic components. Below is a common pinout configuration for the NodeMCU development board

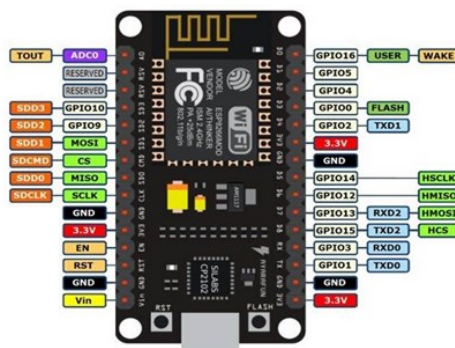


Figure .5 : NodeMCU ESP8266 Pinout

4.2 Servo Motor

A servo is a type of electromechanical device used to control the position, speed, or acceleration of a mechanical system. It's commonly used in robotics, industrial automation, remote-controlled vehicles, and other applications where precise control over movement is required. A typical servo motor consists of a motor, a feedback mechanism (usually a potentiometer), and a control circuit. The control circuit processes the input signal (usually a control pulse) and adjusts the motor's position based on the feedback received from the potentiometer.

The servo motor is a closed-loop mechanism that incorporates positional feedback in order to control the rotational or linear speed and position. The motor is controlled with an electric signal, either analog or digital, which determines the amount of movement that represents the final command position for the shaft.





Figure .6: Servo Motor

4.3: Rain Sensor

The Rain sensor is a device that measures the liquid level in a fixed container that is too high or too low. According to the method of measuring the liquid level, it can be divided into two types: contact type and non-contact type. The input type water level transmitter we call is a contact measurement, which converts the height of the liquid level into an electrical signal for output. It is currently a widely used water level transmitter.

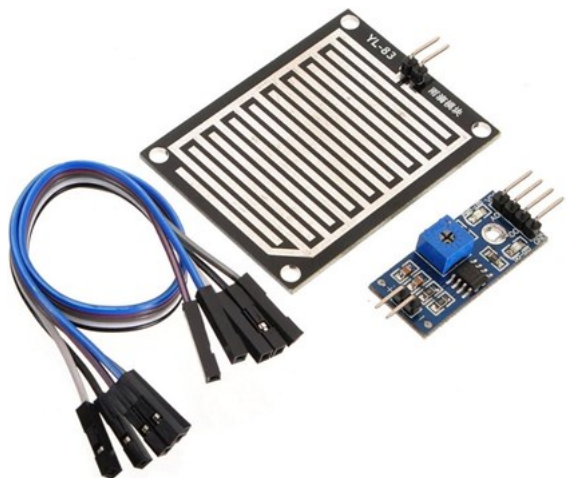


Figure .7 : Water Level Sensor

What are the benefits?

- 1. Simple structure:** There are no movable or elastic elements, so the reliability is extremely high, and there is no need for regular maintenance during use. The operation is simple and convenient.
- 2. Convenient installation:** When using, first connect one end of the wire correctly, and then put the other end of the water level probe into the solution to be measured.
- 3. Ranges are optional:** you can measure the water level in the range of 1-200 meters, and other measurement ranges can also be customized.

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Sep 2024, Volume 14, ISSUE 3

UGC Approved Journal

4. Wide range of applications: suitable for liquid level measurement of high temperature and high pressure, strong corrosion, high pollution, and other media. Building an electronic water level gauge on the river bank can be used for tide monitoring.

5. Wide range of measuring medium: High-precision measurement can be carried out from the water, oil to paste with high viscosity, and wide-range temperature compensation is not affected by the foaming, deposition, and electrical characteristics of the measured medium.

6. Long service life: Generally, the liquid level sensor can be used for 4-5 years in a normal environment, and it can also be used for 2-3 years in a harsh environment.

7. Strong function: It can be directly connected to the digital display meter to display the value in real-time, or it can be connected to a variety of controllers and set the upper and lower limits to control the water volume in the container.

8. Accurate measurement: The built-in high-quality sensor has high sensitivity, fast response, and accurately reflects the subtle changes of the flowing or static liquid level, and the measurement accuracy is high.

9. Variety of types: liquid level sensors have various structural designs such as input type, straight rod type, flange type, thread type, inductive type, screw-in type, and float type. It can meet the measurement needs of all different places.

V. CONCLUSION

In conclusion, the IoT-based automated cloth hanger system was created effectively. The microcontroller utilized in this system is a NodeMcu ESP32. This apparatus facilitates the operation of the system, sensor data analysis, and required output signal generation. The



Arduino IDE software is compatible with this device. The system's primary input data sources were a rain sensor and a DHT, while its primary output signals were a DC stepper motor and a Blynk interface. A linear actuator is the system's primary mover. This kind of movement may cause the hanger to extend or retract in response to the microcontroller's output signal. The project system's assessment result was acquired successfully and satisfied the project's requirements. demonstrating that the goals listed in chapter one had been met.

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