ARCS

Electro Mavericks

AUTOMATIC RETRACTABLE
CLOTHESLINE SYSTEM

Project Proposal

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By

Electro Mavericks

Problem Description

Although traditional clothesline systems have been in use for decades, they have issues and limitations that make it difficult to properly dry clothes, especially when there is unpredictably bad weather. Rain can cause a big problem since wet clothes left out in the open during a heavy downpour take a long time to dry.

Users may not be able to bring their clothes inside during rain if they are away from home or unable to monitor the rainy weather, which exacerbates the issue. As a result, clothing may be exposed to the rain for extended periods of time, potentially harming the fabric or shortening its lifespan.

Similar to this, customers who have busy schedules or who are away from home could find it difficult to manage their laundry. As a result, clothes may not dry during the day if the user is not home to leave them outside or bring them inside, and it may be challenging to constantly put clothes outside and bring them inside when it rains throughout the day.

Motivation and Justification

The above problems and obstacles of conventional clothesline structures make it clear that there may be a need for a more efficient and convenient clothesline solution that may adapt to different climate conditions and life. An innovative clothesline system might offer a solution to these issues.

We identified a definite need for a more effective and weather-resistant clothesline system that can adjust to various weather conditions based on the survey's results. Respondents emphasized the drawbacks and shortcomings of conventional clothesline systems, such as the inconvenience of having to continuously put out and take in clothes when it rains throughout the day, clothes not drying during the day due to the user's absence, and clothes getting wet by rain.

When developing this product, accuracy and simplicity were our top priorities. We also wanted to build it as affordably as possible so that everyone could use it. To ensure that our solution genuinely satisfies the demand, we conducted a poll to support our suggested remedy and validate the problem we chose.
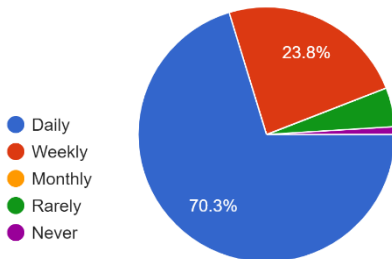
To solve these problems, we suggest a retractable clothesline system that makes use of advanced materials and smart technology to detect weather changes and modify the retracting cycle as necessary. The components of our solution would include things like sensors that would automatically retract the clothesline or cover the drying space when they see rain or a lot of humidity. We can give users a sustainable and practical alternative to conventional clotheslines and clothes dryers by offering a more effective and weather-resistant clothesline solution.

Overall, the survey findings gave a clear justification for the problem we chose and confirmed the demand for the remedy we suggested. We are dedicated to creating a product that not only satisfies consumer needs but is also reasonably priced and available to everyone.
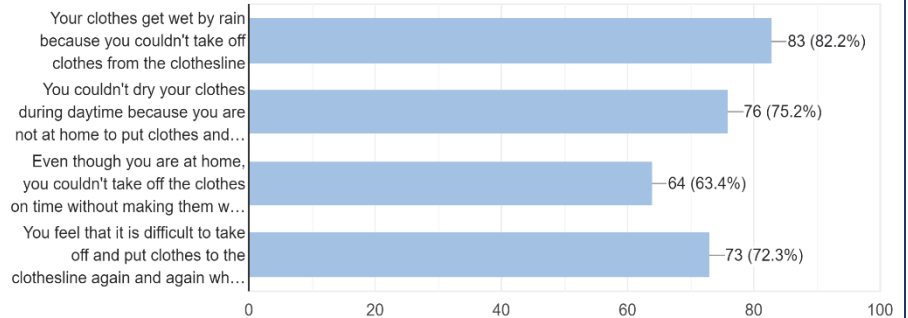
Survey Results

1. How often do you use a clothesline to dry your clothes?
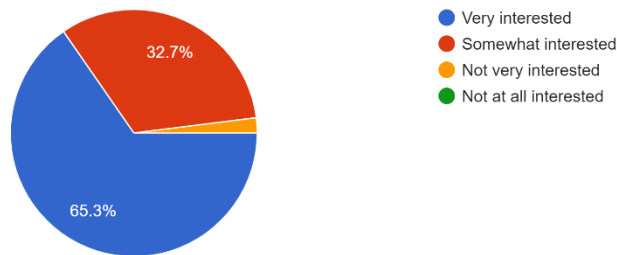101 responses

- Daily
- Weekly
- Monthly
- Rarely
- Never

70.3%
23.8%

4. If you have faced any of below situations? (Select all that apply)
101 responses

Your clothes get wet by rain because you couldn't take off clothes from the clothesline	83 (82.2%)
You couldn't dry your clothes during daytime because you are not at home to put clothes and…	76 (75.2%)
Even though you are at home, you couldn't take off the clothes on time without making them w…	64 (63.4%)
You feel that it is difficult to take off and put clothes to the clothesline again and again wh…	73 (72.3%)

5. How interested are you in a product that provides a solution to the issues you listed in question 3?
101 responses

- Very interested
- Somewhat interested
- Not very interested
- Not at all interested

32.7%
65.3%

9. Do you have any additional Feedback or Suggestions for the Automatic Retractable Clothesline product?

17 responses

Actually this will be a great invention which can easier the day today tasks of human.

Should be durable and low maintenance cost

අවුවේ වේලෙන කොලිටීයටම හෝ වැඩි කොලිටීයෙන් තියෙන පරිදි නිපැයුමක් ආවොත් මදායම පාන්තිකයාට වුවද වැඩි මීලකට විකිනිය හැක.
සැඟු, විදුලිය හෝ වැය වන ඉන්ධන සඳහා පිරිවැය පිලිබඳ
ක්‍රියාවලියේ සහ ප්‍රතිඵලයේ ගුනාත්මක බව
ඉඩ
අවුවේ වේලීමේදී ඇඳුම් වල සිදුවන වර්ණ විපර්යාසය අවම කරගැනීම

Make it affordable

It's good if you can make it cost effective, responsive (retract before it starts raining) and reliable (not getting tangled up).

If you can add a solar panel for it, then it will save more power and beneficial for our electricity bill

Technical Feasibility

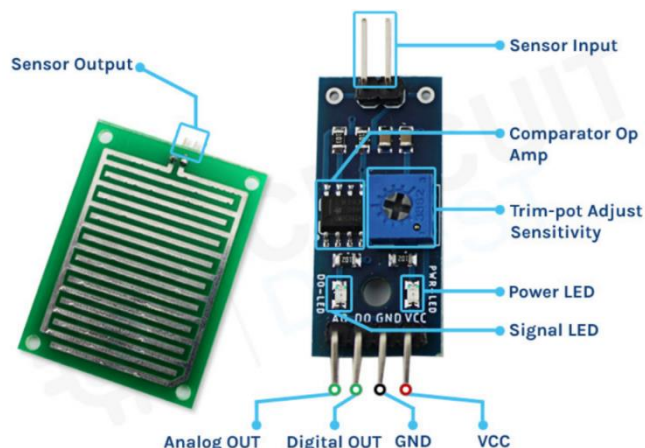## HARDWARE REQUIREMENTS

1) Rain Sensor

- A rain sensor is a low-cost electronic sensor that acts as a switch and can be used to detect rain or water drops.
- The switch is typically in the open position, and it closes when rain or water drops touch the Sensing Pad surface.
- The Sensing Pad and the Sensor Module are the two major components of the rain sensor.
- The Sensing Pad sends data to the Sensor Module, which analyzes it.
- Both digital output (DO) and analog output (AO) are available from the sensor.

S P E C I F I C A T I O N S:

Parameter Name	Technical condition
Operating Voltage	3.3V – 5V
Operating Current	15 mA
Comparator chip	LM393
Sensitivity	Adjustable via Trim pot
Output type	Analog output voltage (AO) and Digital switching voltage (DO)
LED lights indicators	Power (red/green) and Output (red/green)
Sensing pad	5cm x 4 cm nickel plate on one side.
Module PCB Size	3.2cm x 1.4cm

Source: https://www.electroduino.com/rain-sensor-module-how-its-works/

Structure and Circuit Configuration

Source: https://circuitdigest.com/microcontroller-projects/interfacing-rain-sensor-with-arduino

2) ATmega328P Microcontroller

ATmega328P is a popular low-power CMOS 8-bit microcontroller which achieves high processing speeds of up to 1 MIPS per MHz because of its robust RISC design. It is a flexible option for a variety of embedded systems because it has 32KB of programmable flash memory, 1KB of EEPROM, and 2KB of SRAM. Additionally, it is compatible with a wide range of programming tools and provides a variety of peripherals, including ADC, USART, SPI, and I2C interfaces.
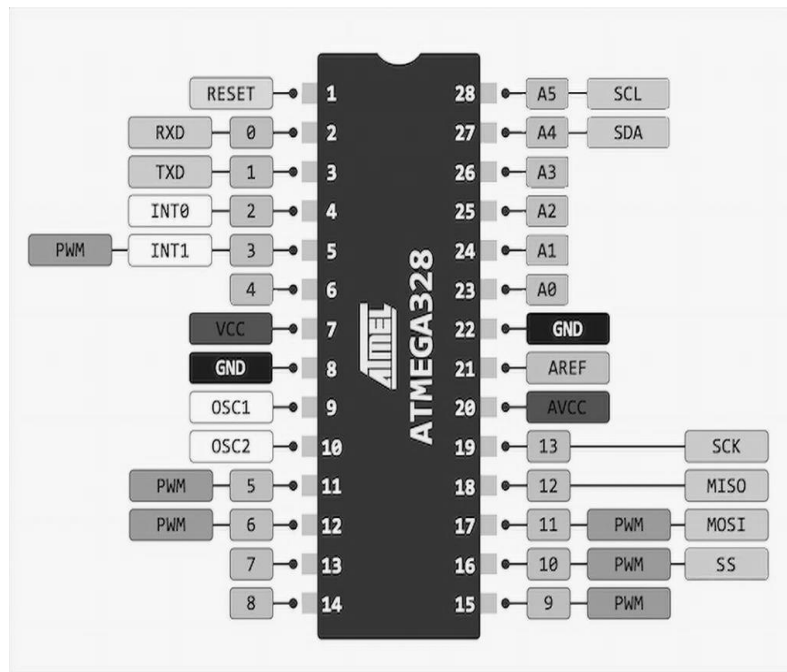

3) ESP8266 Wi-Fi Module
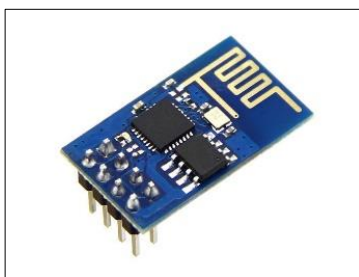
ESP8266 is a low-cost, standalone wireless transceiver Wi-Fi module that provides a number of IoT (Internet of Things) development-related features. It enables 2.4 GHz Wi-Fi connectivity (802.11 b/g/n) and WPA/WPA2 security protocols, enabling wireless internet communication between devices. 16 general-purpose input/output (GPIO) pins, the Inter-Integrated Circuit (IC) and Serial Peripheral Interface (SPI) communication protocols, pulse-width modulation (PWM) for controlling analog signals, and analog-to-digital convertor (ADC) for converting analog signals to digital data are additional features of the ESP8266. It is powered by a 32-bit RISC CPU with a clock speed of 80 MHz (which can be increased to 160 MHz) built on the Tensilica Xtensa L106 architecture. Additionally, it contains a 96 KB data RAM, a 64 KB instruction RAM, and a 64 KB boot ROM. External flash memory can be accessed through SPI.

ESP-8266 pin configuration...
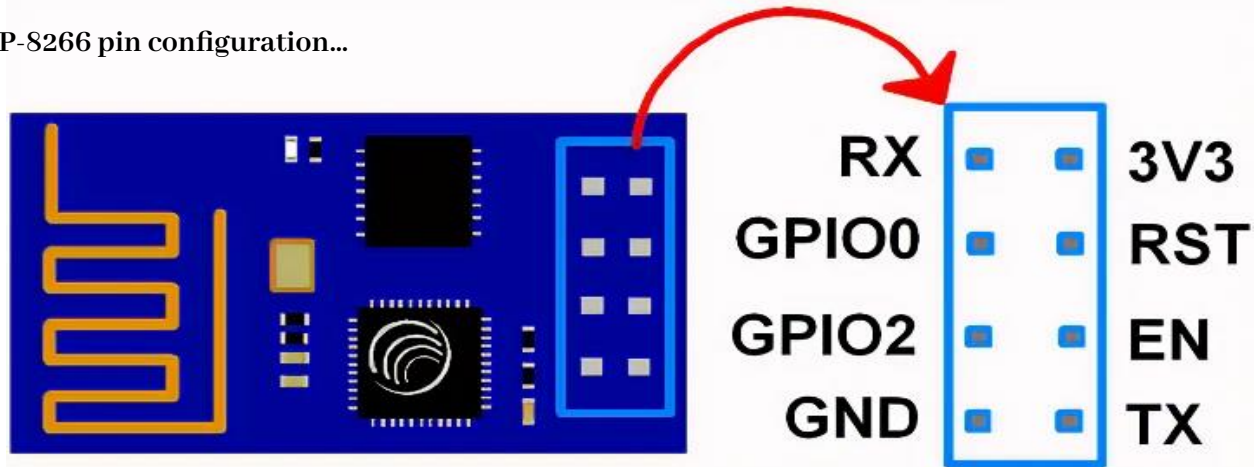
3V3: 3.3 V Power Pin.
GND: Ground Pin.
RST: Active Low Reset Pin.
EN: Active High Enable Pin.
TX: Serial Transmit Pin of UART.
RX: Serial Receive Pin of UART.

GPIO0 & GPIO2: General Purpose I/O Pins. These pins decide what mode (boot or normal) the module starts up in. It also decides whether the TX/RX pins are used for Programming the module or for serial I/O purpose.

4) **Temperature Sensor**

5) **Power Supply**

6) **Humidity Sensor**

7) **DC Motor**

8) **LED, LDR**

9) **Cables and connectors**

10) **Capacitors**

11) **Transistors**

Software requirements

- C++ Programing Language
- Arduino IDE

The Arduino IDE and a USB to serial converter, which transfers data signals between the computer's USB port and the microcontroller's serial connection, will be used to program the microcontroller. The Arduino IDE running on the PC may communicate with the microcontroller via this two-way communication channel, allowing for microcontroller programming and code transfer.

Performance requirements

The automatic retractable clothesline's major objective is to give people a quick and effective means to shield their clothes from inclement weather like rain and excessive humidity. When not in use, the retractable feature makes it simple for customers to store the clothesline, and the automatic operation makes sure that garments are kept dry in case of inclement weather. This saves the user time and effort and offers an environmentally friendly and energy-saving substitute. Overall, the automatic retractable clothesline should prioritize its capacity to offer a practical, weatherproof, and environmentally beneficial alternative for drying garments.

Technical Specifications

Specification	Value
Weight	4 kg
Dimensions	60 cm x 8 cm x 8 cm
Upper Temperature Ratings	-5°C to 40°C
Operating Voltage	9-16V DC or 120-240V AC
Material	High-quality stainless steel and durable plastic
Sensitivity	Adjustable sensitivity for rain detection
Water Resistant Rating	IPX4 (splash-proof and suitable for outdoor use)
Power Consumption	< 12W

Product Architecture

Block-Diagram
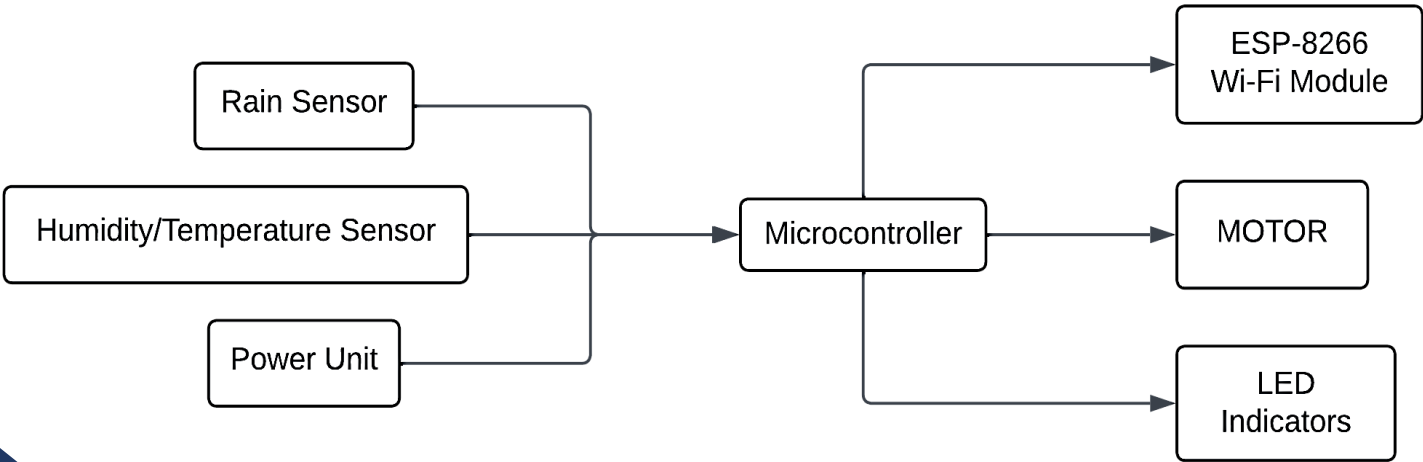
ALTERNATIVES AND WHY CHOOSE ABOVE COMPONENTS.

• ESP8266

We have chosen to use the ESP8266 for our clothesline system since it is a practical choice that satisfies our needs for fundamental Wi-Fi connectivity. Our main goal is to produce a low-cost solution, therefore the ESP8266's price is a significant benefit. Furthermore, the ESP8266 has Wi-Fi connectivity, which is all we want for our clothesline system, and sufficient computing power to handle routine duties. The ESP32 may offer more sophisticated features and capabilities, however those extra features are not required for our project and the ESP32 is more expensive. Overall, we think the ESP8266 is the greatest option for our clothesline system and are convinced that it will fulfill our needs and offer our customers a practical solution.

• DC Motor

The major reason for using a DC motor in our clothesline system is that DC motors are better suited since they have a larger starting torque and can maintain their torque at lower speeds, making them more suitable for applications where a high level of control and precision is required, such as in our clothesline system. This will guarantee that the clothesline operates effectively and smoothly and enable us to program it to stop at predetermined intervals.

Product Enclosure

- Enclosure Material: Sturdy ABS plastic
- Enclosure Color: Neutral gray
- Enclosure Dimensions: 25 cm x 15 cm x 10 cm (L x W x H)
- Mounting Options: Wall-mounted or ceiling-mounted
- Protection: UV-resistant coating for durability in outdoor environments
- Access Panel: Easy-access panel for maintenance and adjustments
- Weather Protection: Sealed enclosure to protect internal components from rain and dust.

PRODUCT SKETCHES

We'll use durable materials to construct the enclosure of electronics components and the clotheslines. They will be sleek and contemporary in style so it will go with any interior design. The enclosure will be waterproof, with enough room for the electronic parts and adequate airflow to prevent overheating. It will also have user-friendly elements like buttons that are simple to reach. Overall, it will give the clothesline system the most protection and convenience as much as possible, regardless of the weather.

Product Enclosure Sketch
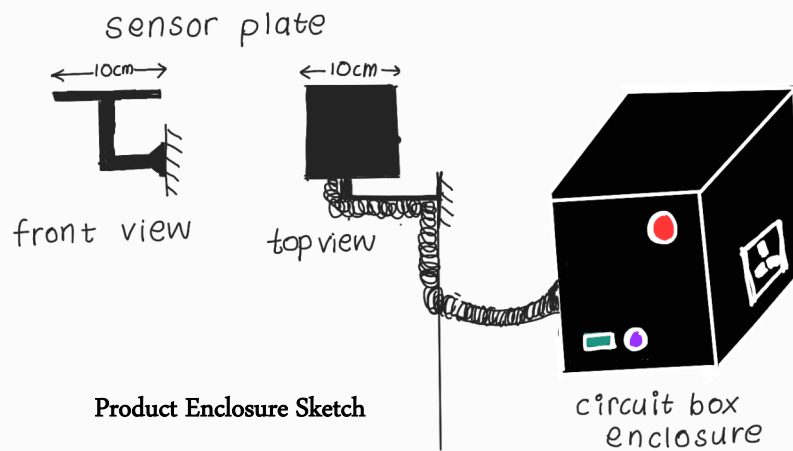
User Interface

The user interface of our clothesline system's IoT will be made with straightforward controls and a clear display that offers real-time information on weather conditions and drying status. Depending on their preferences, users can effortlessly choose between manual and automatic modes. To protect people and their clothing, the user interface of physical electronic components will include safety measures like an emergency stop button and manual retraction during strong winds or storms. Our clothesline system's both physical and virtual user interfaces will offer consumers a seamless and practical experience with its user-friendly design and safety features.

Product Budget

Components	Quantity	Price (Rs.)
Rain Sensor (YL-83-FC-37)	1	300.00
Humidity/Temperature Sensor	1	540.00
Atmel ATMEGA 328P-PU	1	1500.00
ESP8266	1	900.00
LDR	1	15.00
Crystal Oscillator	1	35.00
LED	2	20.00
Capacitors	4	50.00
Resistors	8	16.00
PCB Design	-	1200.00 (Approx.)
Enclosure	-	1200.00 (Approx.)
DC Step Motor	-	4600.00
Other	-	1500.00
Total Cost		**11876.00**

Marketing, Sales, and Rest of Product Life Cycle

We intend to first focus on homeowners and tenants who are searching for a more practical and sustainable way to dry their clothing after we introduce our clothesline system. We will use a variety of marketing platforms, such as social media, targeted internet ads, and partnerships with influencers in sustainable living, to reach our target audience.

We intend to sell the clothesline system through both traditional and internet retail channels. To promote brand accessibility and visibility, we will also collaborate with nearby sustainable living and home improvement retailers.

As our clothesline system becomes more well-known and well-liked, we'll keep getting input from users and tweak the system to better suit their wants and needs. We'll also look into ways to broaden our product range and provide more sustainable living options. In the end, we hope to contribute to a more sustainable future by establishing our clothesline system as a dependable and economical replacement for conventional clothes dryers.

Task Allocation

- PRABODHA K.P.K.A   210490L
  Circuit Design

- VIDMAL H.V.P   210668P
  Enclosure Design

- NAYANTHARA J.N.P   210418C
  PCB design

- SURENDRA S.A.J.E   210625H
  Procurement of components
  and Programming