RAIN SENSING MOTORIZED UMBRELLA

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Abstract:
An umbrella is much needed product in rainy season. The problems associated with umbrellas is that it needs to be carried separately along with your other stuff and it occupies one hand all the time. Also umbrellas are to be kept separately in buckets which leads to people forgetting about umbrella in many cases and loosing them.
Well we here design a smart solution to all umbrella related problems with a customized solution. Our proposed device is a bag pack that has an integrated umbrella with auto rain sensing. The umbrella does not need to be carried separately and both hands of the user are free even when the umbrella is open. Even opening the umbrella is an automatic operation with no manual efforts needed.

INTRODUCTION

An umbrella is much needed product in rainy season. The problems associated with umbrellas is that it needs to be carried separately along with your other stuff and it occupies one hand all the time. Also umbrellas are to be kept separately in buckets which leads to peopleforgetting about umbrella in many cases and losing them.
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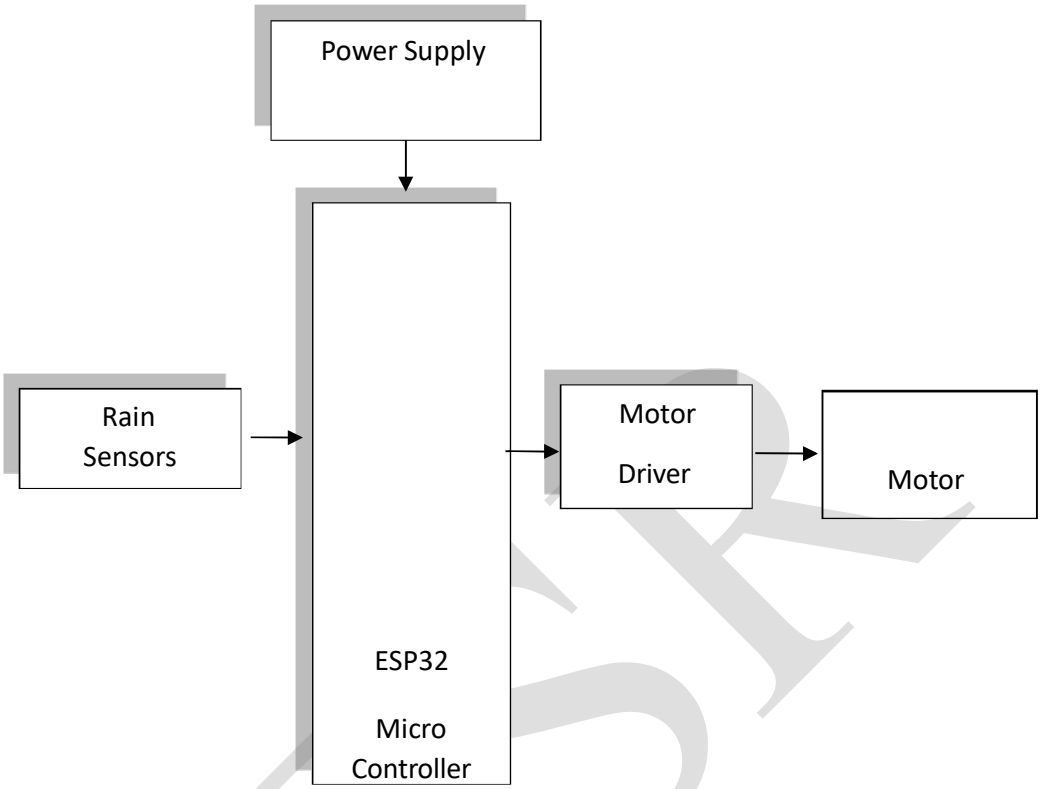
We know that the “Technology” develops day by day rapidly. The ultimate goal is to make human tasks easier. As the technology developing frequently, people come up with new equipment. People have interest to find more advanced concepts.

BLOCK DIAGRAM & EXPLANATION

Phase 1 – In the phase 1 out will be interfacing rain sensor with the microcontroller, whenever itrains the sensor gets triggered and this information is sent to esp32 which then displays the information on the LCD and triggers the motor
The whole operation is powered by power supply which provides 12v to run the motor andregulated to 5v for other electronics



HARDWARE SPECIFICATION

POWER SUPPLY

The power supply section is the section which provides +5V for the components towork. IC LM7805 is used for providing a constant power of +5V.

The ac voltage, typically 220V, is connected to a transformer, which steps down the ac voltagedown to the level of the desired dc output. A diode rectifier then provides a full-wave rectifiedvoltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.

A regulator circuit removes the ripples and also retains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulationis usually obtained using one of the popular voltage regulator IC units.

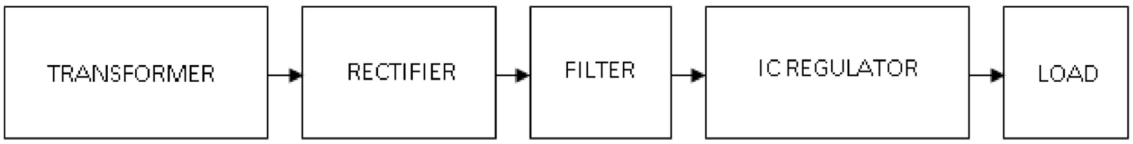


Figure 3.1 : Block Diagram of Power Supply

Transformer:

Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC.

Step-up transformers increase voltage, step-down transformers reduce voltage. Most power supplies use a step-down transformer to reduce the dangerously high mains voltage (230V in India) to a safer low voltage.

The input coil is called the primary and the output coil is called the secondary. There is no electrical connection between the two coils; instead they are linked by an alternating magnetic field created in the soft-iron core of the transformer. Transformers waste very little power so the power out is (almost) equal to the power in. Note that as voltage is stepped down current isstepped up.

The transformer will step down the power supply voltage (0-230V) to (0- 6V) level. Then the secondary of the potential transformer will be connected to the bridge rectifier, which is constructed with the help of PN junction diodes. The advantages of using a bridge rectifier areit will give peak voltage output as DC.

Rectifier:

There are several ways of connecting diodes to make a rectifier to convert AC to DC. The bridge rectifier is the most important and it produces full-wave varying DC. A full-wave rectifier can also be made from just two diodes if a centre-tap transformer is used, but this method is rarely used now that diodes are cheaper. A single diode can be used as a rectifier butit only uses the positive (+) parts of the AC wave to produce half-wave varying DC

Bridge Rectifier:

When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. Theinput to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners. Let us assume that the transformer is working properly and there is a positive potential at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and reverse bias D4.

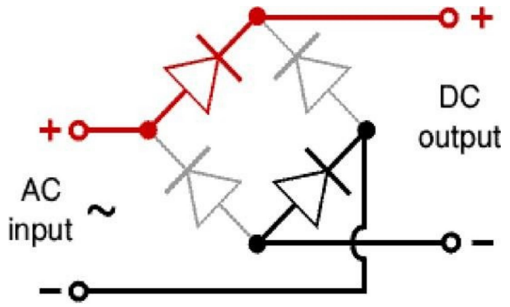


Figure 3.1 : Bridge Rectifier

The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow.

One advantage of a bridge rectifier over a conventional full-wave rectifier is that with a giventransformer the bridge rectifier produces a voltage output that is nearly twice that of the conventional full-wave circuit.

The main advantage of this bridge circuit is that it does not require a special centre tappedtransformer, thereby reducing its size and cost.

The single secondary winding is connected to one side of the diode bridge network and theload to the other side as shown below.

The result is still a pulsating direct current but with double the frequency.

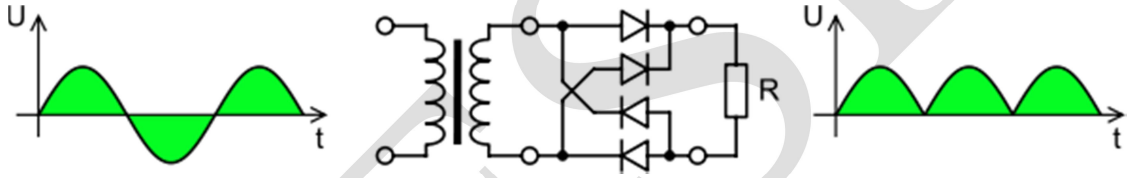


Figure 3.2 : Output Waveform of DC

Smoothing:

Smoothing is performed by a large value electrolytic capacitor connected across the DCsupply to act as a reservoir, supplying current to the output when the varying DC voltage fromthe rectifier is falling. The capacitor charges quickly near the peak of the varying DC, and thendischarges as it supplies current to the output.

Voltage Regulators:

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection allin a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustable set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts.

A fixed three-terminal voltage regulator has an unregulated dc input voltage, Vi, applied to one input terminal, a regulated dc output voltage, Vo, from a second terminal, withthe third terminal connected to ground.

The series 78 regulators provide fixed positive regulated voltages from 5 to 24 volts. Similarly, the series 79 regulators provide fixed negative regulated voltages from 5 to 24 volts. Voltage regulator ICs are available with fixed (typically 5, 12 and 15V) or variable output voltages. They are also rated by the maximum current they can pass. Negative voltage regulators are available, mainly for use in dual supplies. Most regulators include some automatic protection from excessive current ('overload protection') and overheating ('thermal protection').

Many of the fixed voltage regulator ICs have 3 leads and look like power transistors, such as the 7805 +5V 1Amp regulator. They include a hole for attaching a heat sink if necessary.

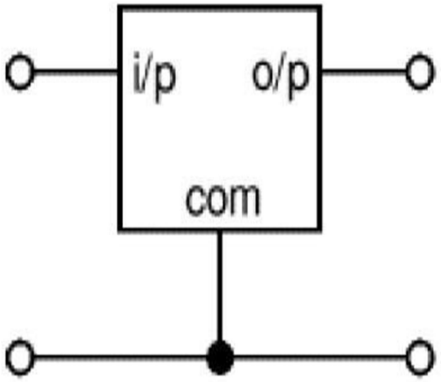


Figure 3.3 : Regulator

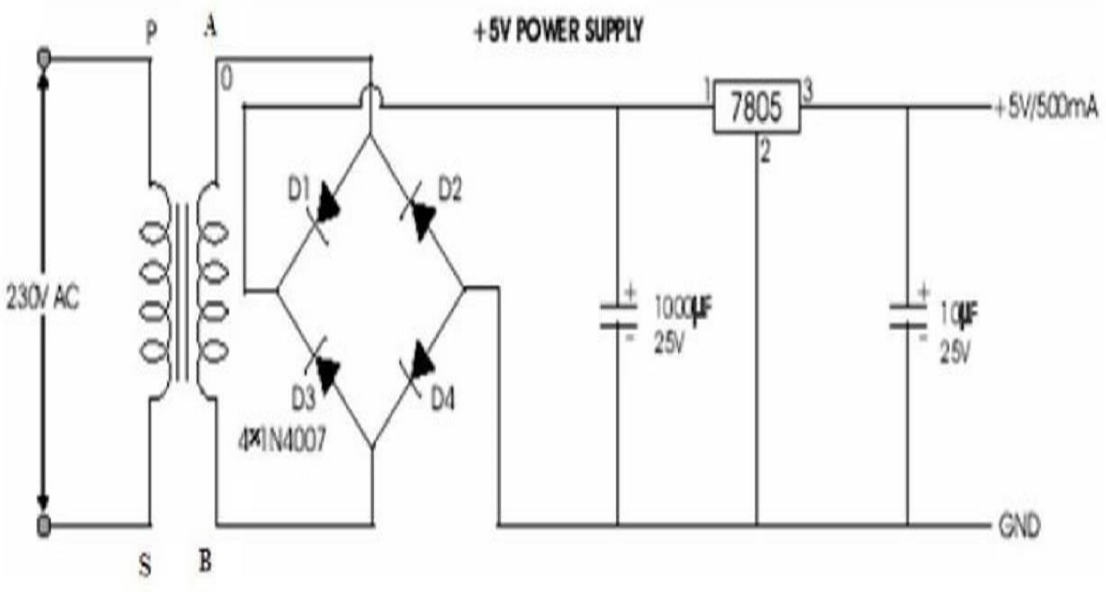


Figure 3.4 : Circuit Diagram of Power Supply

3.2 ESP8266:

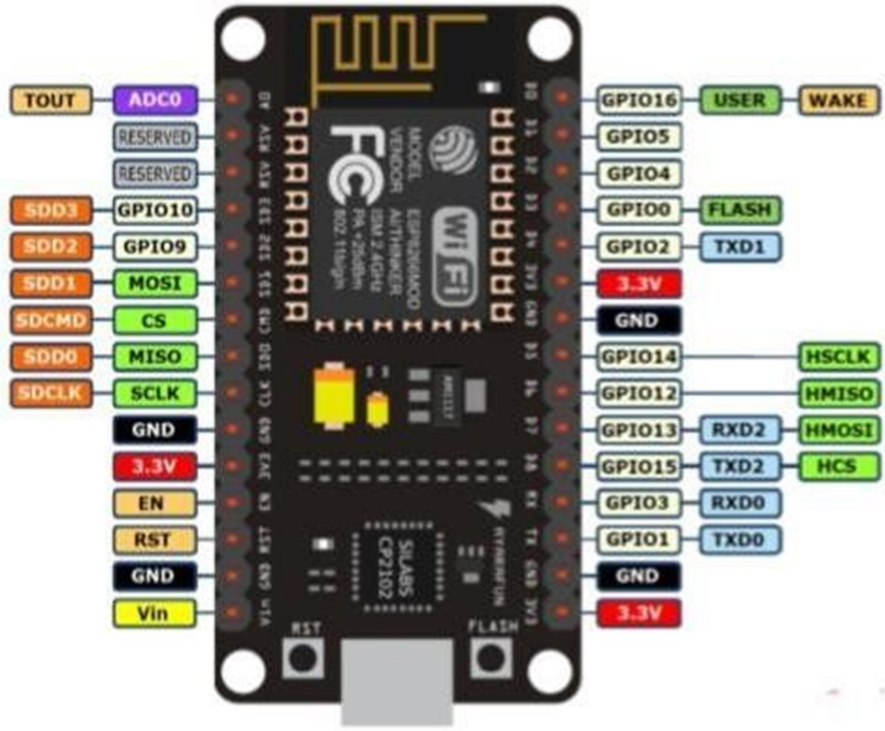


Figure 3.5 : A guide to setting up your ESP8266-12E NodeMCU ESP8266 ESP-12E WiFi Development Board

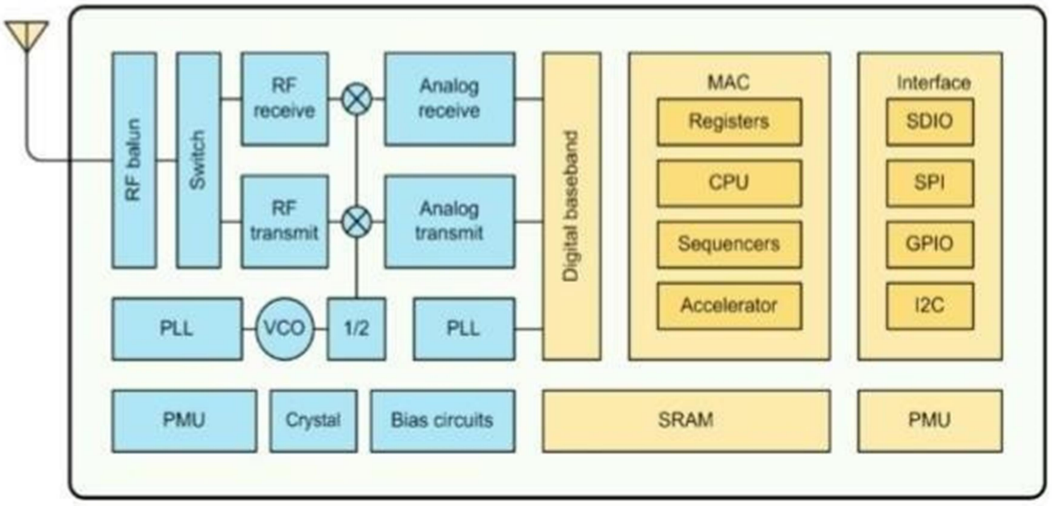
Features Version : DevKit v1.0 Breadboard Friendly Light Weight and small size. 3.3V operated, can be USB powered. Uses wireless protocol 802.11b/g/n. Built-in wireless connectivity capabilities. Built-in PCB antenna on the ESP-12E chip. Capable of PWM, I2C, SPI, UART, 1-wire, 1 analog pin. Uses CP2102 USB Serial Communication interface module. Arduino IDE compatible (extension board manager required). Supports Lua (alike node.js) and Arduino C programming language. PINOUT DIAGRAM Node MCU ESP8266 v1.0.

Node MCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term “NodeMCU” by default refers to the firmware rather than the DevKit.

The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua- cjson, and spiffs.

ESP-12E WiFi module is developed by Ai-thinker Team. core processor ESP8266 in smaller sizes of the module encapsulates Tensilica L106 integrates industry-leading ultra low power 32-bit MCU micro, with the 16-bit short mode, Clock speed support 80 MHz, 160 MHz, supports the RTOS, integrated Wi-Fi MAC/BB/RF/PA/LNA, on-board antenna. The module supports standard IEEE802.11 b/g/n agreement, complete TCP/IP protocol stack. Users can use the add modules to an existing device networking, or building a separate network controller. ESP8266 is high integration wireless SOCs, designed for space and power constrained mobile platform designers. It provides unsurpassed ability to embed Wi-Fi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement.

ESP8266EX offers a complete and self-contained Wi-Fi networking solution; it can be used to host the application or to offload Wi-Fi networking functions from another application processor. When



ESP8266EX hosts the application, it boots up directly from an external flash. In has integrated cache to improve the performance of the system in such applications. Alternately, serving as a Wi-Fi adapter, wireless internet access can be added to any micro controller based design with simple connectivity (SPI/SDIO or I2C/UART interface). ESP8266EX is among the most integrated WiFi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

L293D :

Introduction : L293D IC generally comes as a standard 16-pin DIP (dual-in line package). This motor driverIC can simultaneously control two small motors in either direction; forward and reverse with just 4 microcontroller pins (if you do not use enable pins).

Pin Diagram

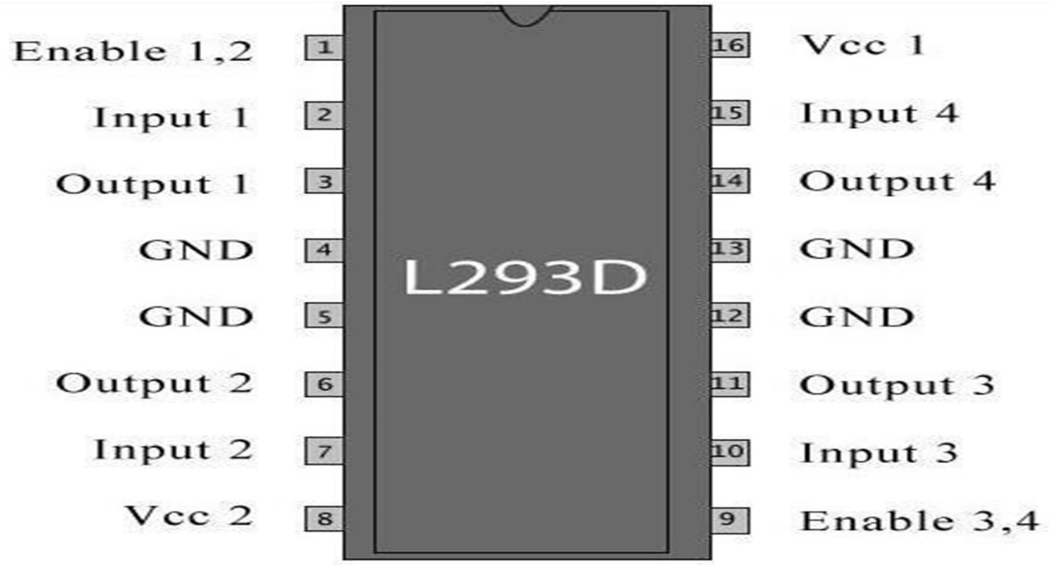
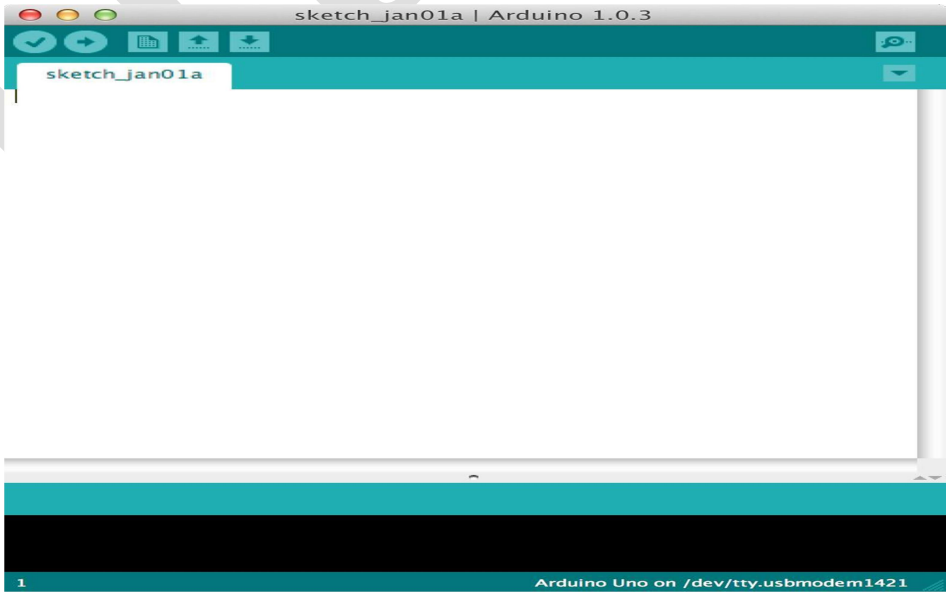


Fig 3.7 : showing pin diagram of L293D

SOFTWARE SPECIFICATION

IDLE Arduino Software :

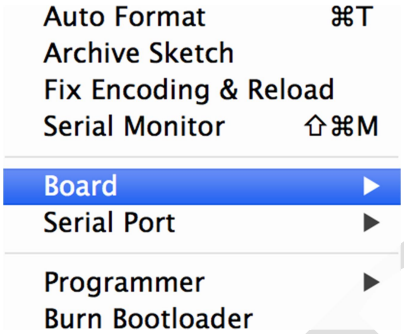
You'll need to download the Arduino Software package for your operating system. Whenyou've downloaded and opened the application you should see something like this:



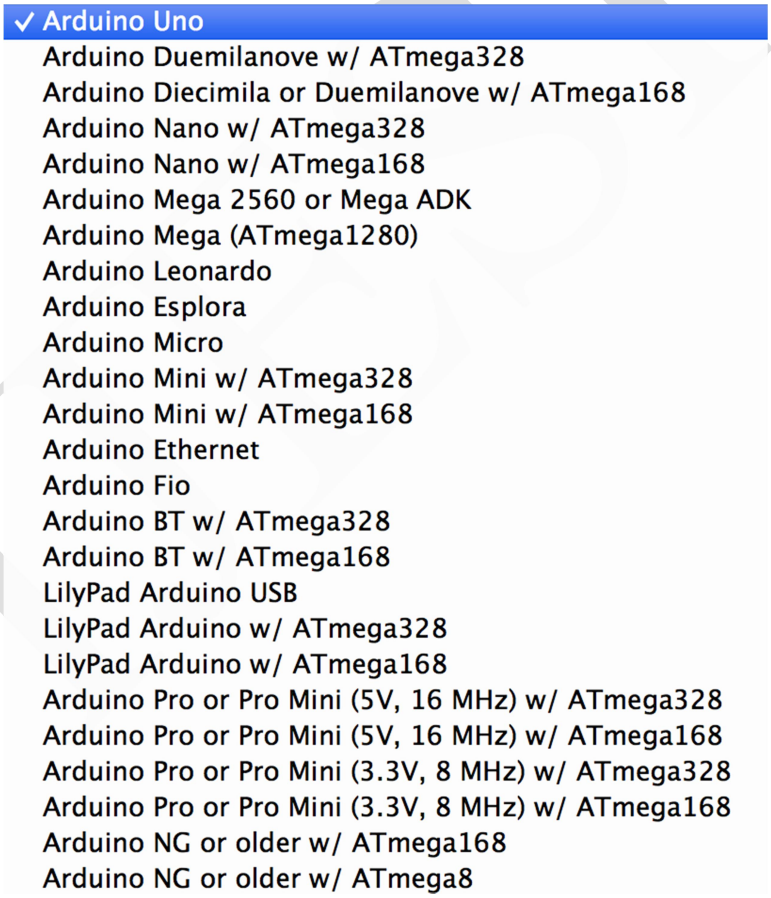
This is where you type the code you want to compile and send to the Arduino board.

The Initial Setup :

We need to setup the environment to **Tools** menu and select **Board**.



Then select the type of Arduino you want to program, in our case it's the **Arduino Uno**.



RESULTS AND DISCUSSION

Building a rain-sensing motorized umbrella using an ESP32 involves integrating the ESP32 microcontroller

with rain sensors, a motorized mechanism for opening and closing the umbrella, and programming to control these components based on rain detection. Below is a basic guide for the hardware setup and functionality:

Components Needed:

ESP32 Development BoardRain Sensor Module

Motorized Umbrella (with motor and control mechanism) Motor Driver (if not included in the motorized umbrella) Power Supply (battery or power bank)

Jumper Wires

Umbrella Frame and FabricCircuit Connection:

Connect Rain Sensor:

Connect the rain sensor to the ESP32's GPIO pin. Rain sensors usually have two pins (VCCand Signal).

Connect the VCC pin of the rain sensor to the 3.3V output on the ESP32. Connect the Signal pin of the rain sensor to a GPIO pin on the ESP32.

Connect Motorized Umbrella:

Connect the motorized umbrella's motor and control mechanism to the ESP32. If the motorized umbrella has a built-in motor driver, connect it to the ESP32. If not, use an external motor driver (e.g., L298N) to control the motor.

Power Supply:

Connect the power supply (battery or power bank) to the ESP32 and the motorizedmechanism.

Enclosure:

Place the ESP32 and rain sensor in a protective enclosure to shield them from rain.

Conclusion

Building a rain-sensing motorized umbrella using an ESP8266 involves integrating the ESP8266 microcontroller with rain sensors, a motorized mechanism for opening and closing the umbrella, and programming to control these components based on rain detection. Below is a basic guide for the hardware setup and functionality

Components Needed: ESP8266 Development Board Rain Sensor Module Motorized Umbrella (with motor and control mechanism) Motor Driver (if not included in the motorized umbrella) Power Supply (battery or power bank) Jumper Wires Umbrella Frame and Fabric Circuit Connection: Connect Rain Sensor: Connect the rain sensor to the ESP8266's GPIO pin. Rain sensors usually have two pins (VCC and Signal). Connect the VCC pin of the rain sensor to the 3.3V output on the ESP8266. Connect the Signal pin of the rain sensor to a GPIO pin on the ESP8266. Connect Motorized Umbrella: Connect the motorized umbrella's motor and control mechanism to the ESP8266. If the motorized umbrella has a built-in motor driver, connect it to the ESP8266. If not, use an external motor driver (e.g., L298N) to control the motor. Power Supply: Connect the power supply (battery or power bank) to the ESP8266 and the motorized mechanism. Enclosure: Place the E8266 and rain sensor in a protective enclosure to shield them from rain.

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