IOT BASED SMART RENEWABLE ENERGY GENERATION & IRRIGATION SYSTEM WITH MOISTURE DETECTION

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INTRODUCTION

The IoT-based Smart Renewable Energy Generation & Irrigation System with Moisture Detection is an innovative solution that integrates Internet of Things (IoT) technology to enhance agricultural practices. This system combines renewable energy sources, such as solar or wind power, with intelligent

irrigation management and moisture detection capabilities.

OBJECTIVES

- Develop an IoT-based system that combines renewable energy
  sources with intelligent irrigation management
- Implement sensors for real-time monitoring of soil moisture
  levels, allowing for data-driven irrigation
  decisions
- Integrate renewable energy sources such as solar and wind
  power to provide a sustainable and eco-friendly energy
  supply.
- Design a user-friendly interface for remote monitoring and
  control of the entire system

MOTIVATION
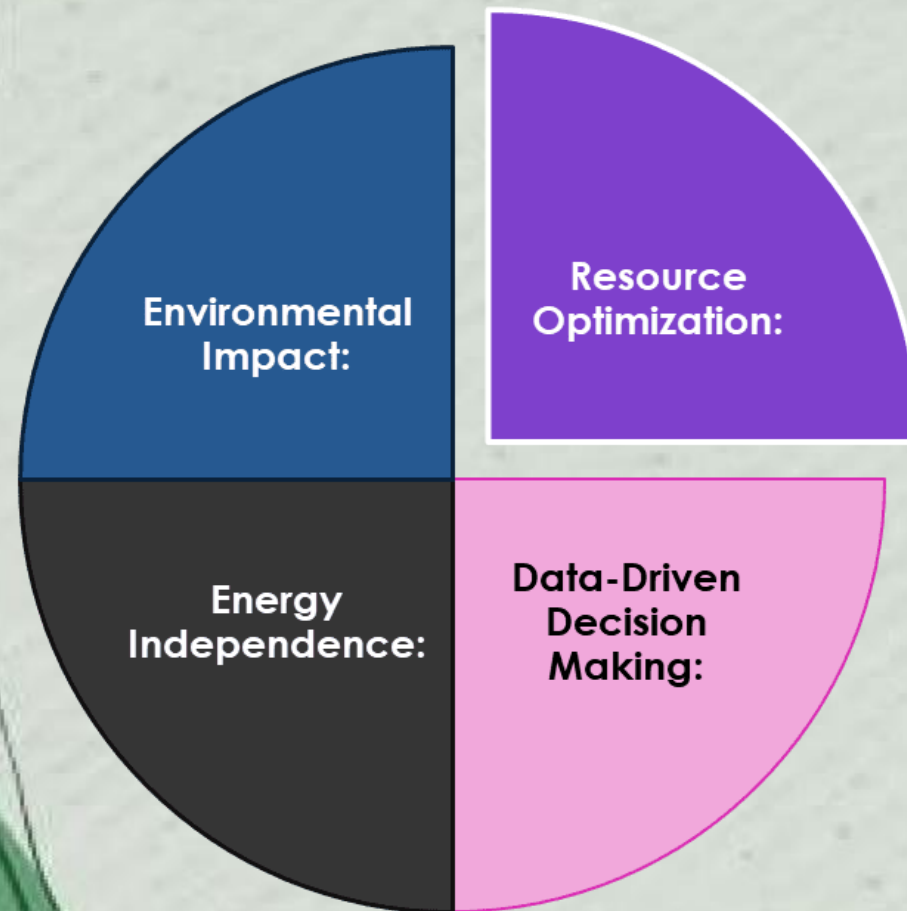
• **Resource Optimization:**
  - Optimize water usage for irrigation.
  - Maximize renewable energy generation for sustainability.

• **Data-Driven Decision Making:**
  - Use real-time data for informed irrigation decisions.
  - Analyze historical data to enhance future planning.

• **Energy Independence:**
  - Reduce dependence on conventional energy sources.
  - Harness renewable energy for self-sufficiency.

• **Environmental Impact:**
  - Minimize environmental footprint.
  - Promote eco-friendly agricultural practices.

LITERATURE SURVEY

Authors : Shweta B. Saraf, Dhanashri H. Gawali

Published by : IJRASET

DOP : 25-02-2022

Authors : Moinak Bose, Sourodip Ghosh

Published by : IRJET

DOP : 25-03-2020

PROJECT WORK DESCRIPTION

´The IoT-based

Smart Renewable Energy Generation & Irrigation System with Moisture Detection is a pioneering project that seamlessly integrates renewable energy

sources and advanced irrigation techniques. Utilizing Internet of Things (IoT)

technology, the system optimizes energy generation from renewable sources like

solar and wind, ensuring sustainable power for irrigation. Real-time moisture

detection enables efficient water management, ensuring precise irrigation based

on soil moisture levels. This smart system enhances agricultural productivity,

reduces energy dependency, and promotes environmental sustainability by harnessing clean energy and optimizing water usage through intelligent monitoring and control mechanisms.

# BLOCK DIAGRAM
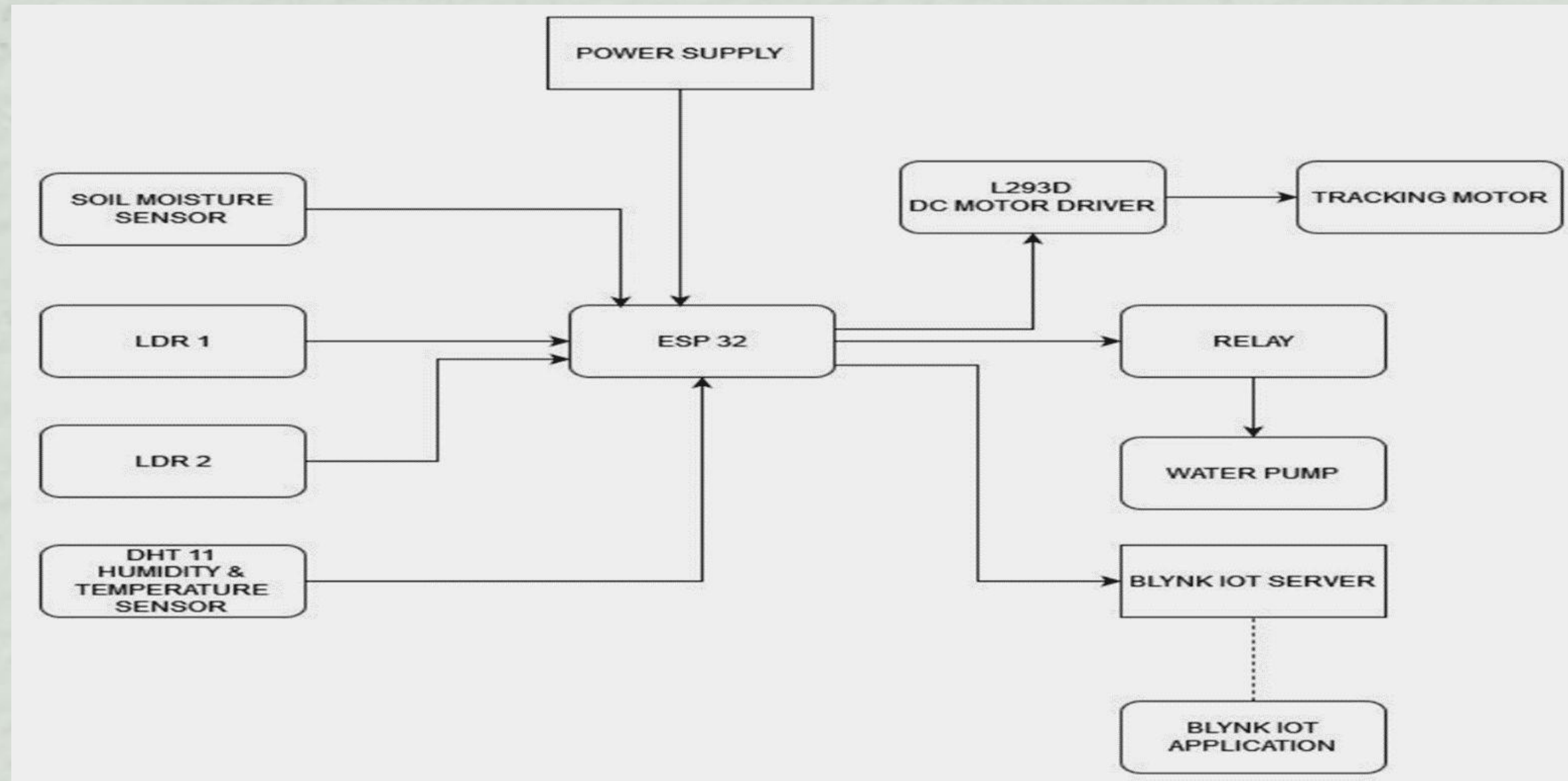
CIRCUIT DIAGRAM
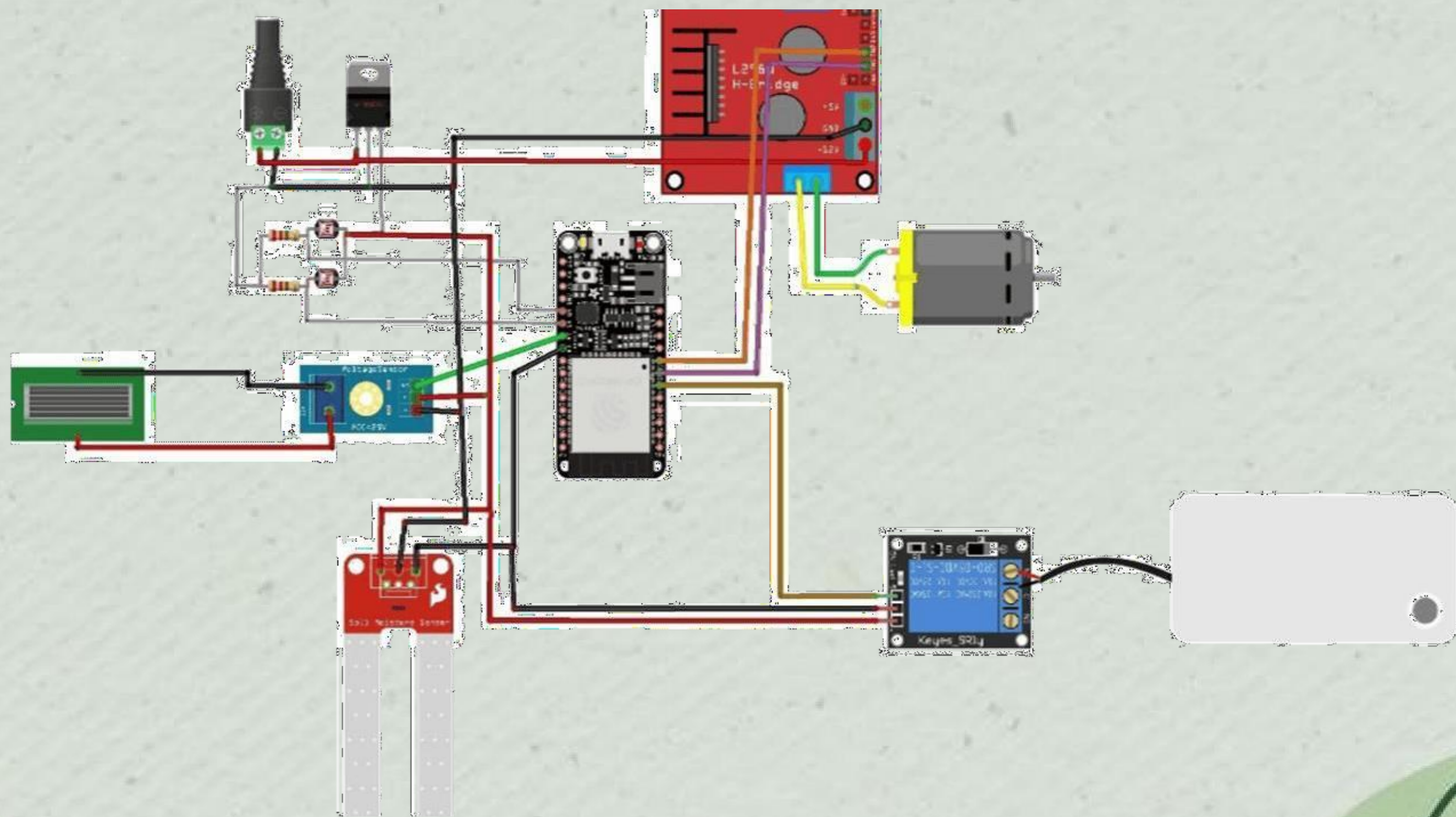
HARDWARE COMPONENTS

- ESP 32
- Solar Panel
- L293D
- LDR Sensor
- LDR Module
- Soil Moisture Sensor
- Soil Moisture Module
- ACS712 Current Sensor
- Voltage Sensor
- DHT 11
- Relay Module
- DC Motor
- Transistor
- Capacitor
- Resistor

ESP 32

SOLAR PANEL

• The ESP32 is a powerful, low-cost microcontroller developed by Espressif Systems.
• It
integrates Wi-Fi and Bluetooth capabilities, making it suitable for IoT
(Internet of Things) applications.
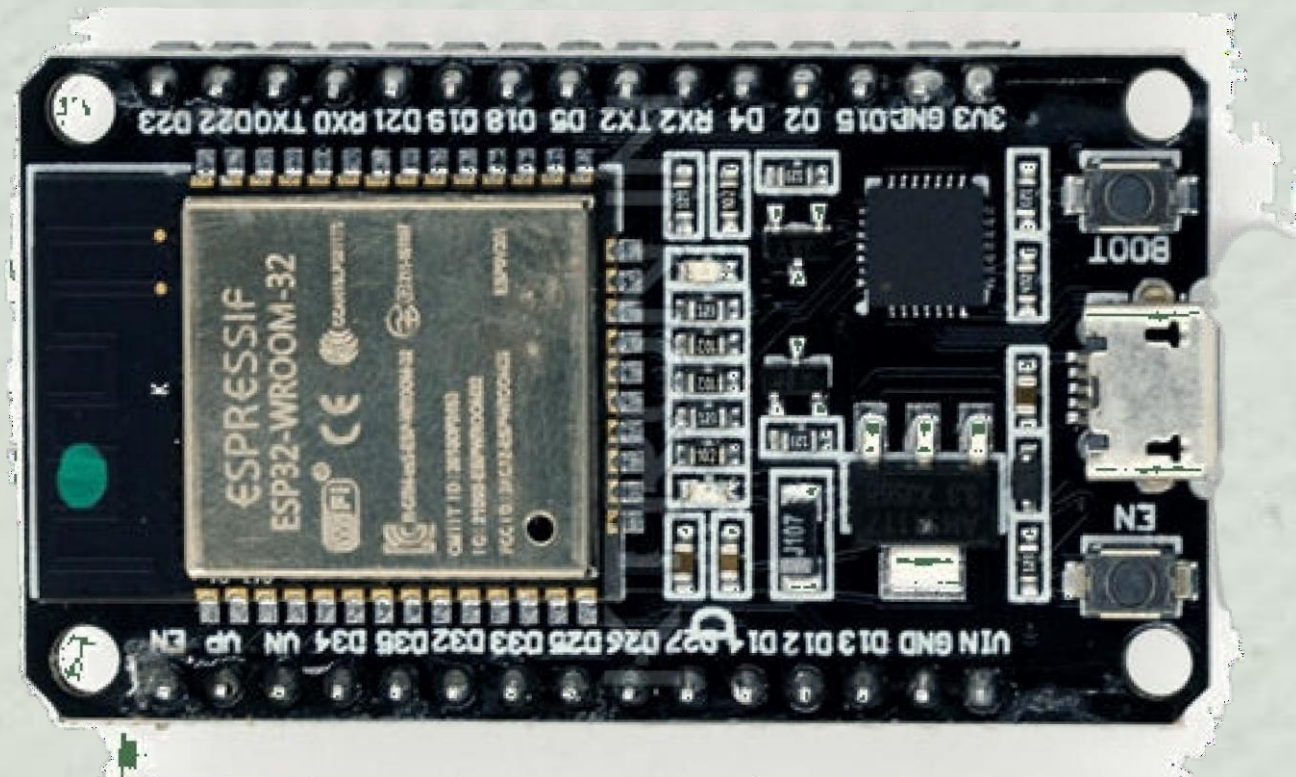
Solar panels, also known as photovoltaic (PV) panels, are devices that convert sunlight into electricity.

L293D

LDR

The
L293D is a dual H-bridge motor driver IC that facilitates bidirectional control
of DC motors. It enables seamless interfacing with sensors and
microcontrollers, making it a versatile choice for various robotic and
electronic applications. The IC's built-in protection ensures reliability in
motor control circuits.
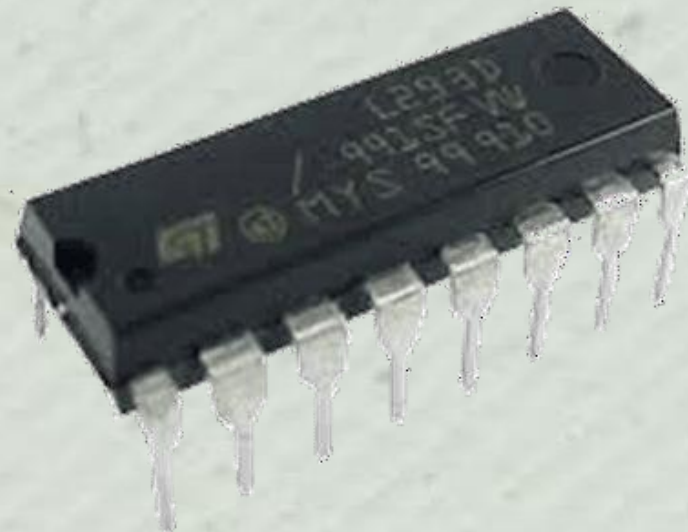
The
Light Dependent Resistor (LDR) is a passive electronic component that exhibits
a change in resistance based on the intensity of light it is exposed to. Widely
used in light-sensing applications, LDRs find applications in automatic
lighting systems, cameras, and other devices requiring light-level detection
for control or measurement.

LDR MODULE

The
LDR (Light Dependent Resistor) module is a
photoresistor-based sensor sensitive
to ambient light levels. As light intensity
changes, the module's resistance
varies, providing a voltage output. Widely used
in electronic projects, it's
instrumental for applications such as automatic
lighting control, sun tracking
systems, and daylight-sensitive circuits.
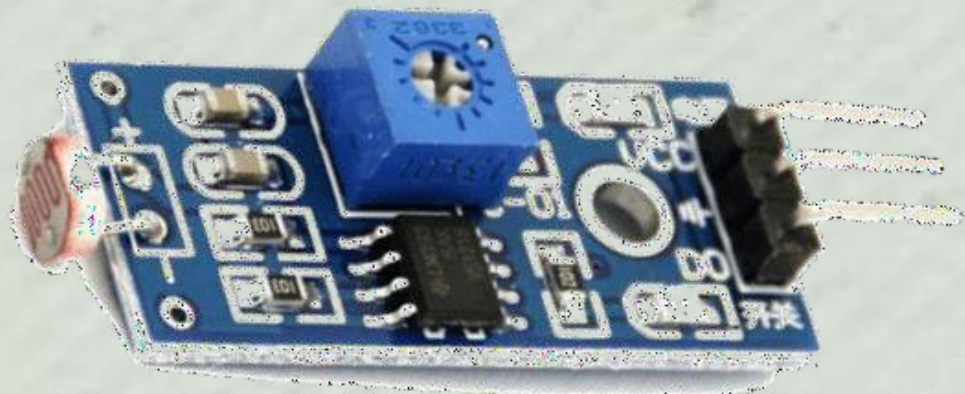
SOIL MOISTURE SENSOR

The
soil moisture sensor is a device that measures
the water content in soil. It
provides crucial data for e cient irrigation in
agriculture. The sensor's
analog or digital output is directly proportional
to the soil moisture level,
aiding in optimal water management and
promoting sustainable agricultural
practices.

SOIL MOISTURE MODULE

ACS712 CURRENT SENSOR
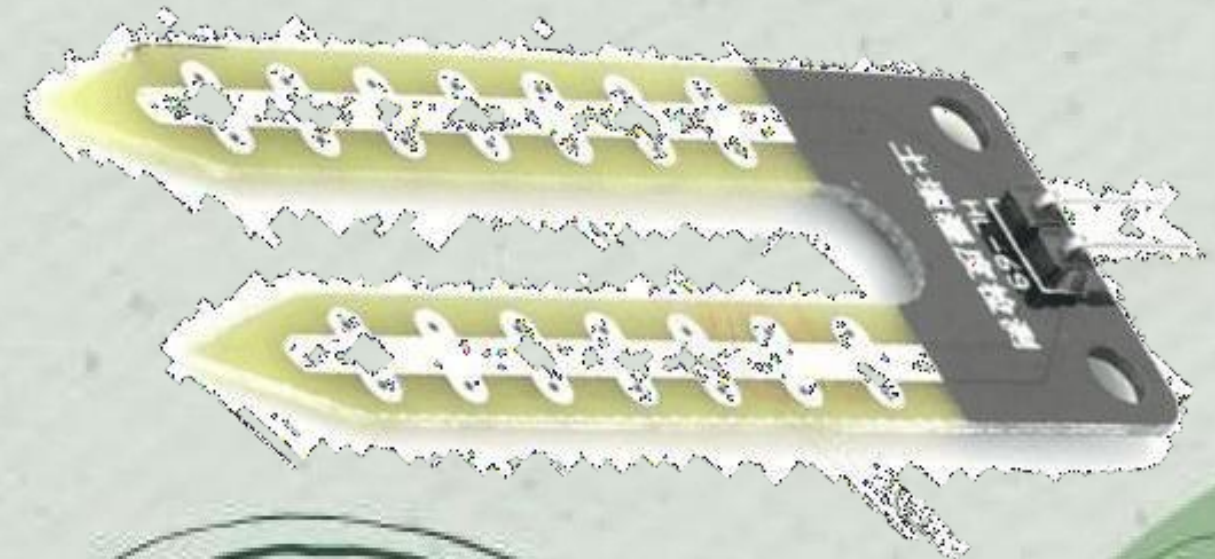
The
Soil Moisture Module is a sensor used to measure the moisture content in soil.
It typically employs conductive probes to assess the soil's water level,
providing crucial data for e cient irrigation in agriculture and gardening.
The module aids in preventing overwatering and promoting optimal plant health.
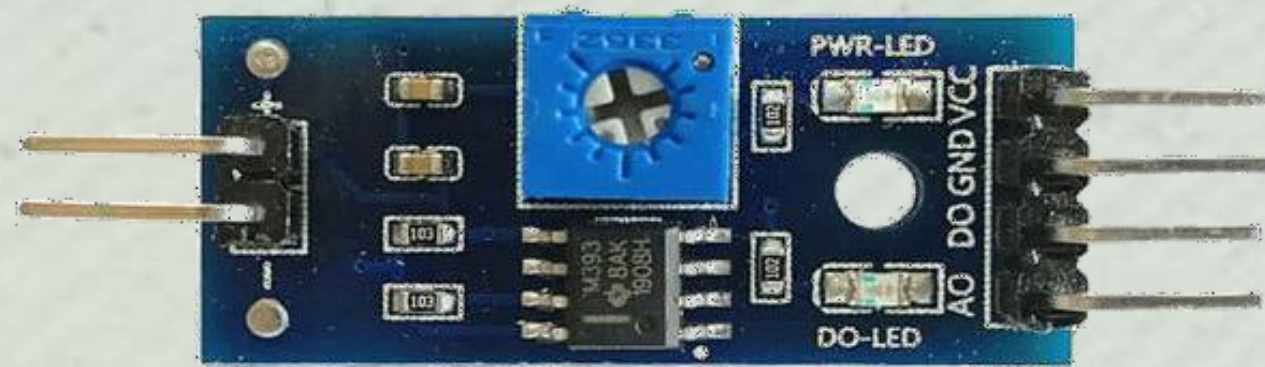
The
ACS712 is a Hall-e ect based current sensor, providing a precise and
non-intrusive method for measuring DC or AC currents. With its linear output
proportional to the sensed current, the ACS712 is commonly used in electronic
projects, power monitoring systems, and renewable energy applications for
accurate current measurement.

VOLTAGE SENSOR

DHT 11
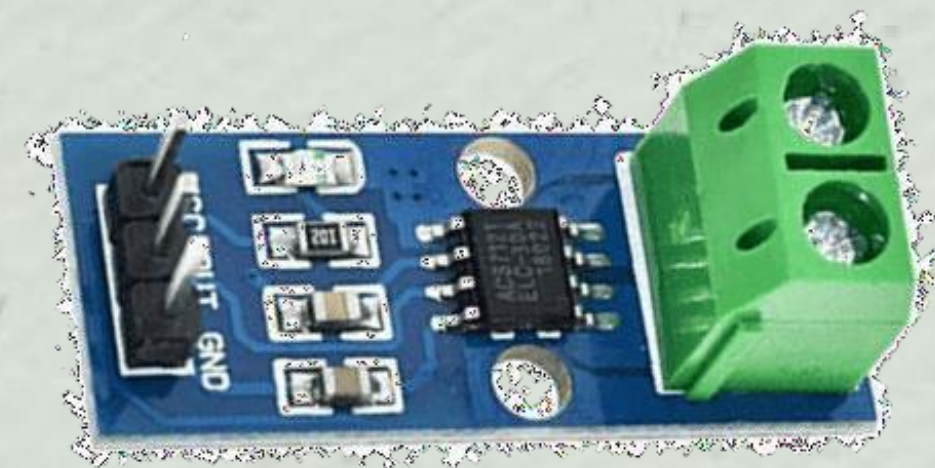
A
voltage sensor is a device that measures
electrical potential di erence
between two points in a circuit. It provides a
proportional output voltage
corresponding to the measured voltage, aiding
in monitoring and control
applications. Voltage sensors are crucial for
assessing electrical systems'
health and ensuring optimal performance in
various electronic devices.
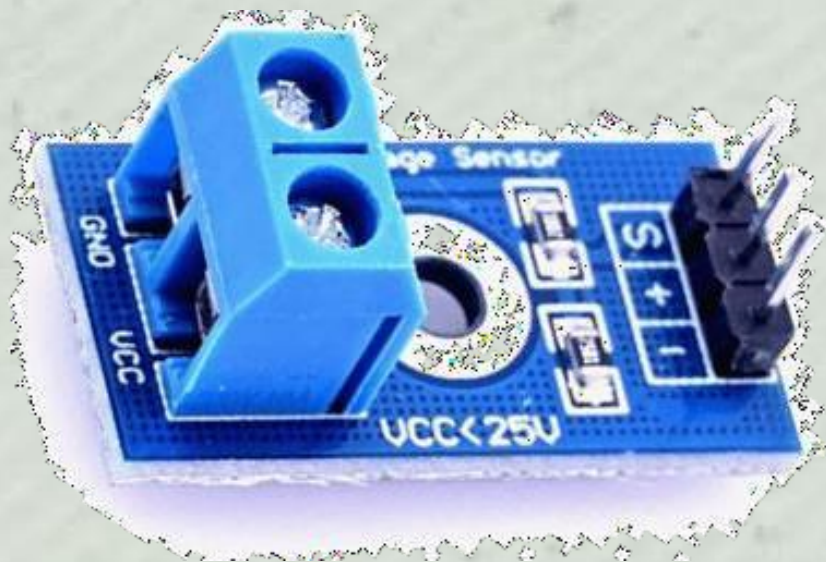
The
DHT11 is a basic, low-cost digital temperature
and humidity sensor Widely used
in hobbyist projects, it provides reliable and
real-time data. With a simple
3-pin interface, it is easy to integrate with
microcontrollers, making it
popular for weather monitoring and indoor
climate control applications.

RELAY MODULE

DC MOTOR
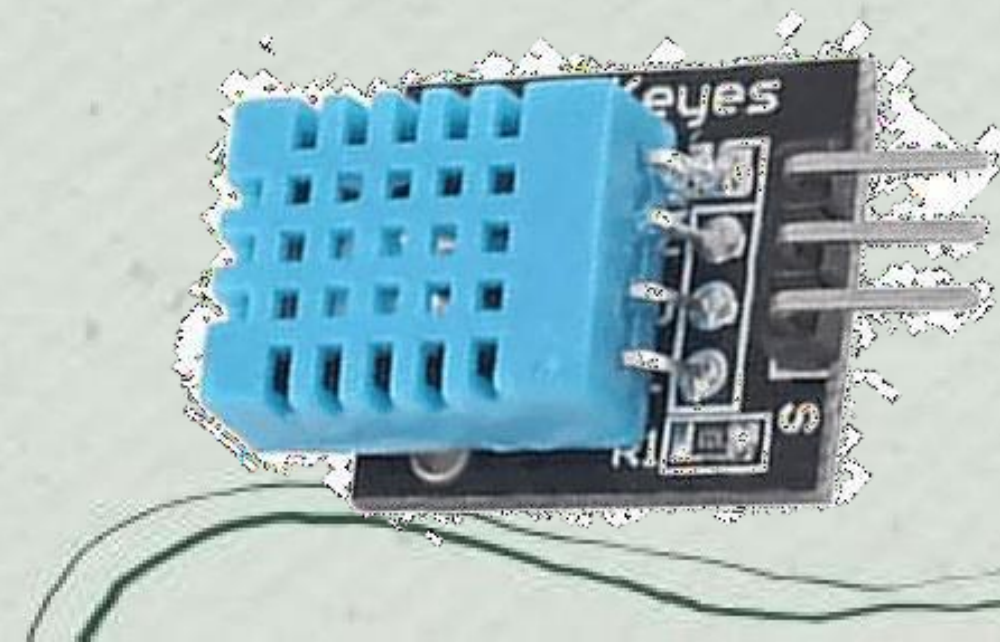
A
relay module is an electronic device containing
one or more relays that enable
the control of high-power electrical devices
using low-power microcontrollers
or digital circuits. It acts as a switch, allowing
the isolation and control of
circuits, making it essential in automation,
robotics, and home electronics
projects.

A
DC (Direct Current) motor is an
electromechanical device that converts
electrical energy into mechanical motion. It
operates on the principle of
electromagnetic induction, using a direct current
to create a magnetic field
that drives the rotation of the motor's shaft. DC
motors are widely employed in
various applications, including robotics,
electronics, and automotive systems.
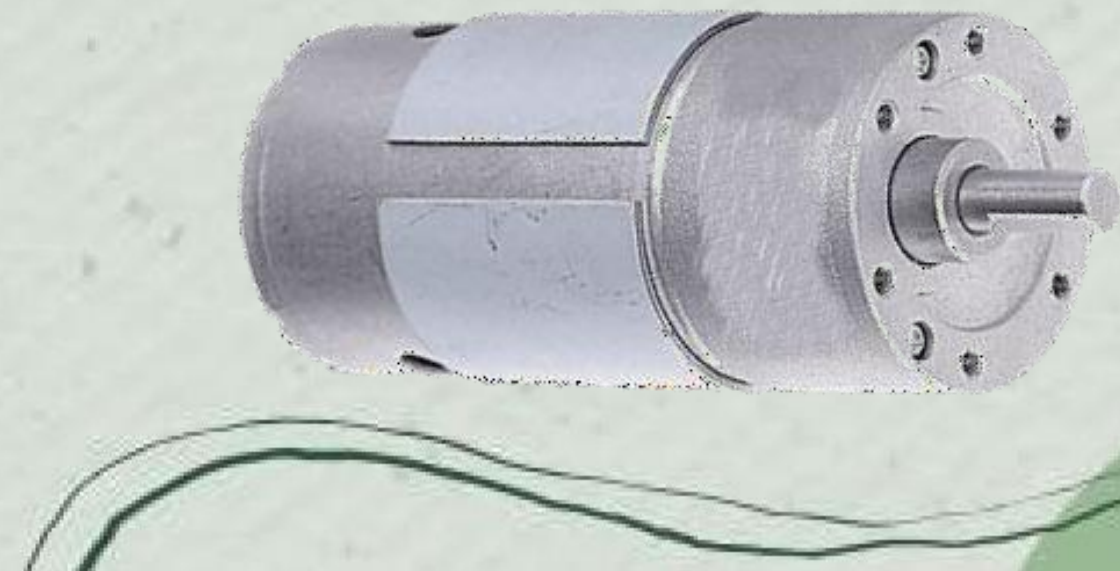
TRANSISTOR

CAPACITOR

A
transistor is a semiconductor device that
amplifies or switches electronic
signals. It has three layers of semiconductor
material: the emitter, base, and
collector. By applying a small current to the
base, a much larger current can
flow between the collector and emitter, allowing
precise control in electronic
circuits.
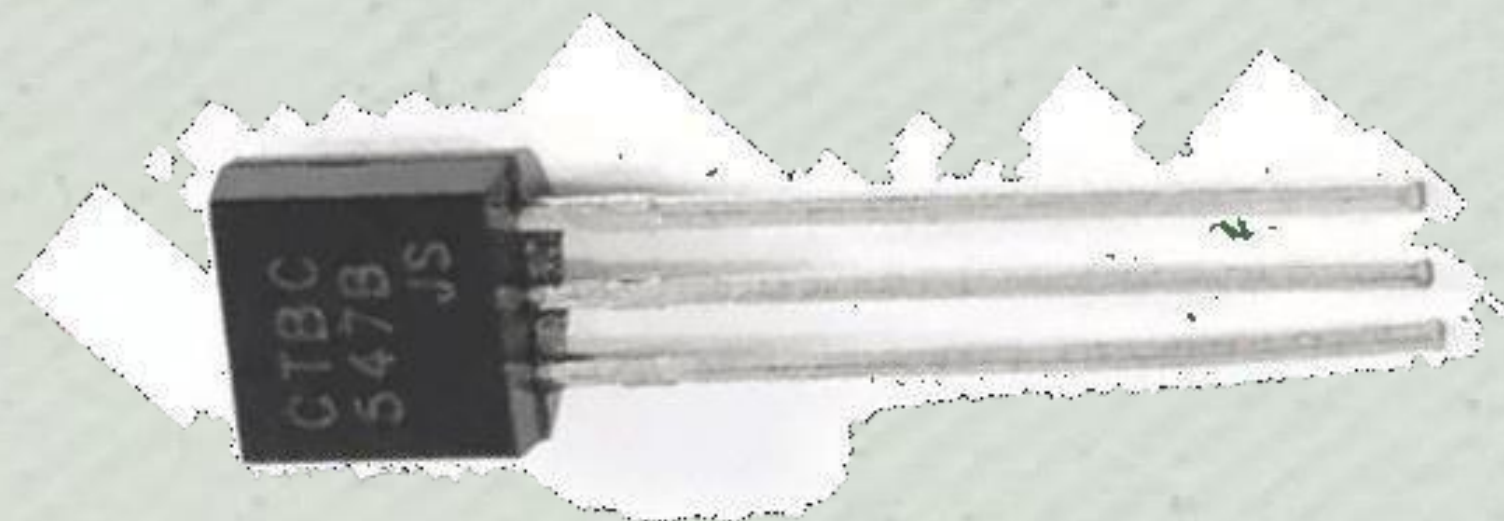
The
1000 μF capacitor is an electrolytic capacitor
with a capacitance of 1000
microfarads. It is commonly used in electronic
circuits to stabilize voltage,
filter out low-frequency noise, and store
electrical charge. Its high
capacitance makes it e ective for smoothing
power supplies and supporting
applications where substantial charge storage is
required.

RESISTOR

1K resistors are electronic components that are used to reduce the flow of electric current in a circuit. They are passive components that are designed to resist the flow of current, and they are often used to limit the current in a circuit to protect other components from damage.
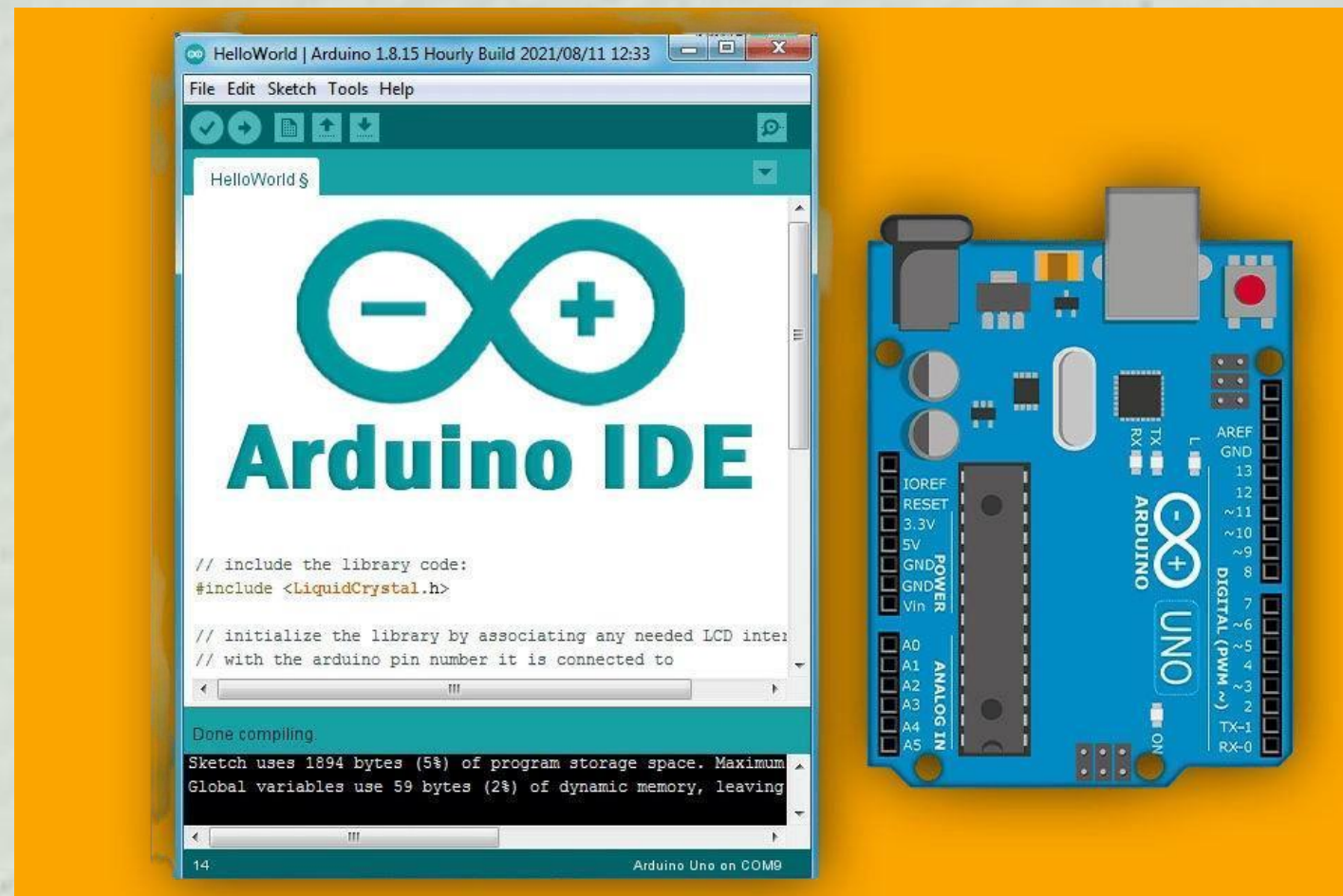
SOFTWARE USED
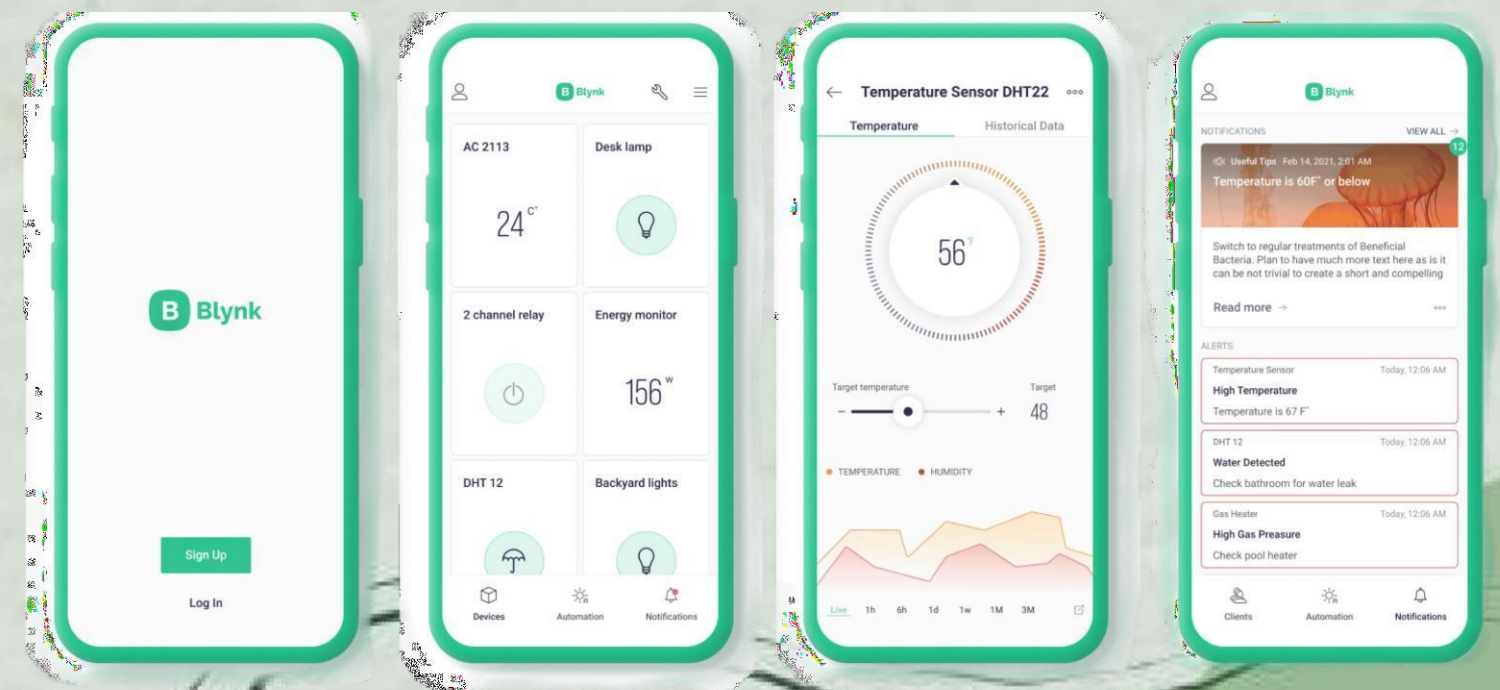
- Arduino IDE
- Blynk IOT App

ARDUINO IDE

The Arduino IDE (Integrated Development Environment) is used to write the computer code and upload this code to the physical board. The Arduino IDE is very simple and this simplicity is probably one of the main reason Arduino became so popular
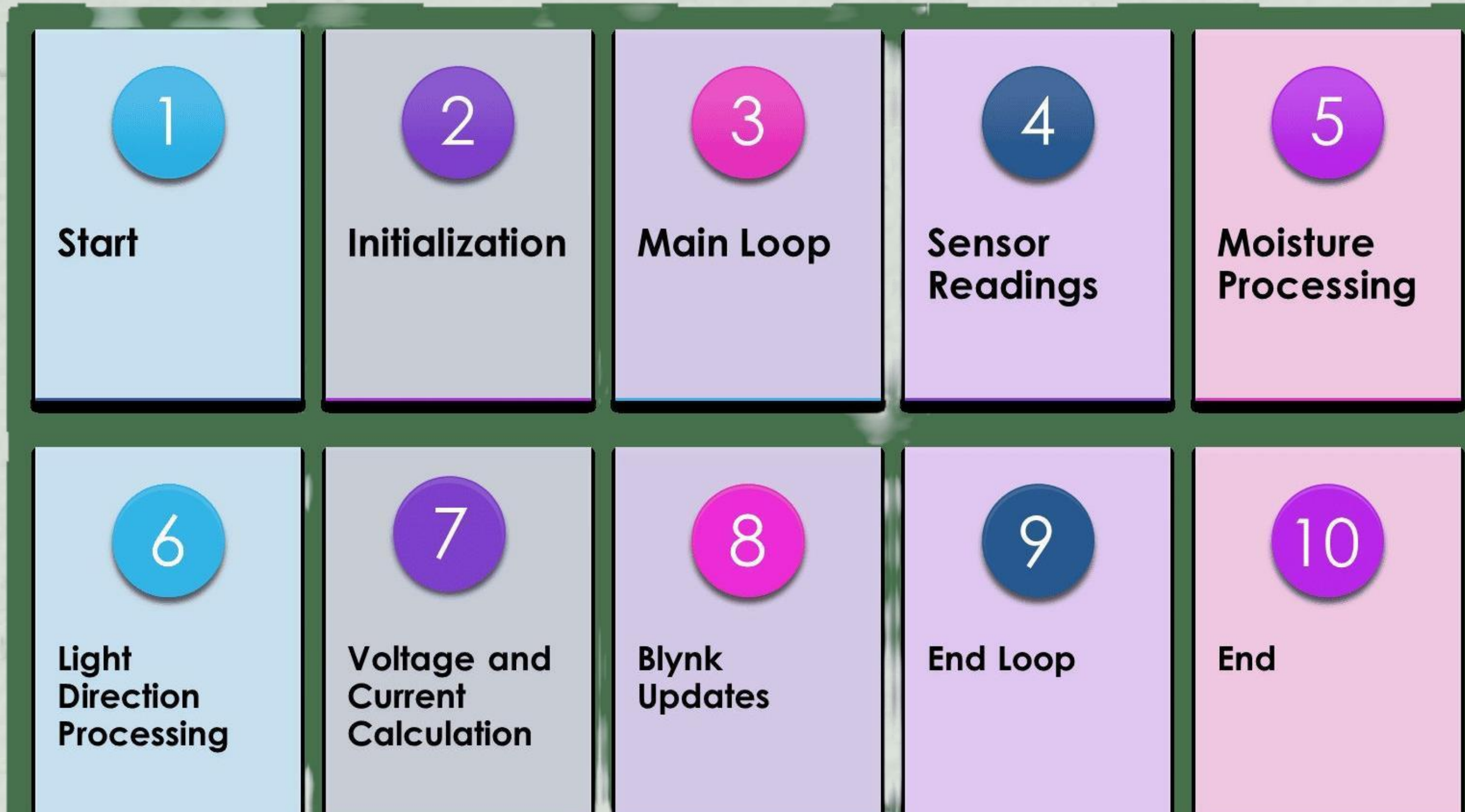

BLYNK IOT APP

Blynk is an IoT (Internet of Things) platform that provides a mobile app to control and monitor connected devices. It enables users to create custom dashboards with buttons, sliders, and displays, allowing remote interaction with their IoT projects.
Blynk simplifies the development of IoT applications by providing a user-friendly interface for building mobile apps that communicate with microcontrollers or other hardware.

FLOWCHART

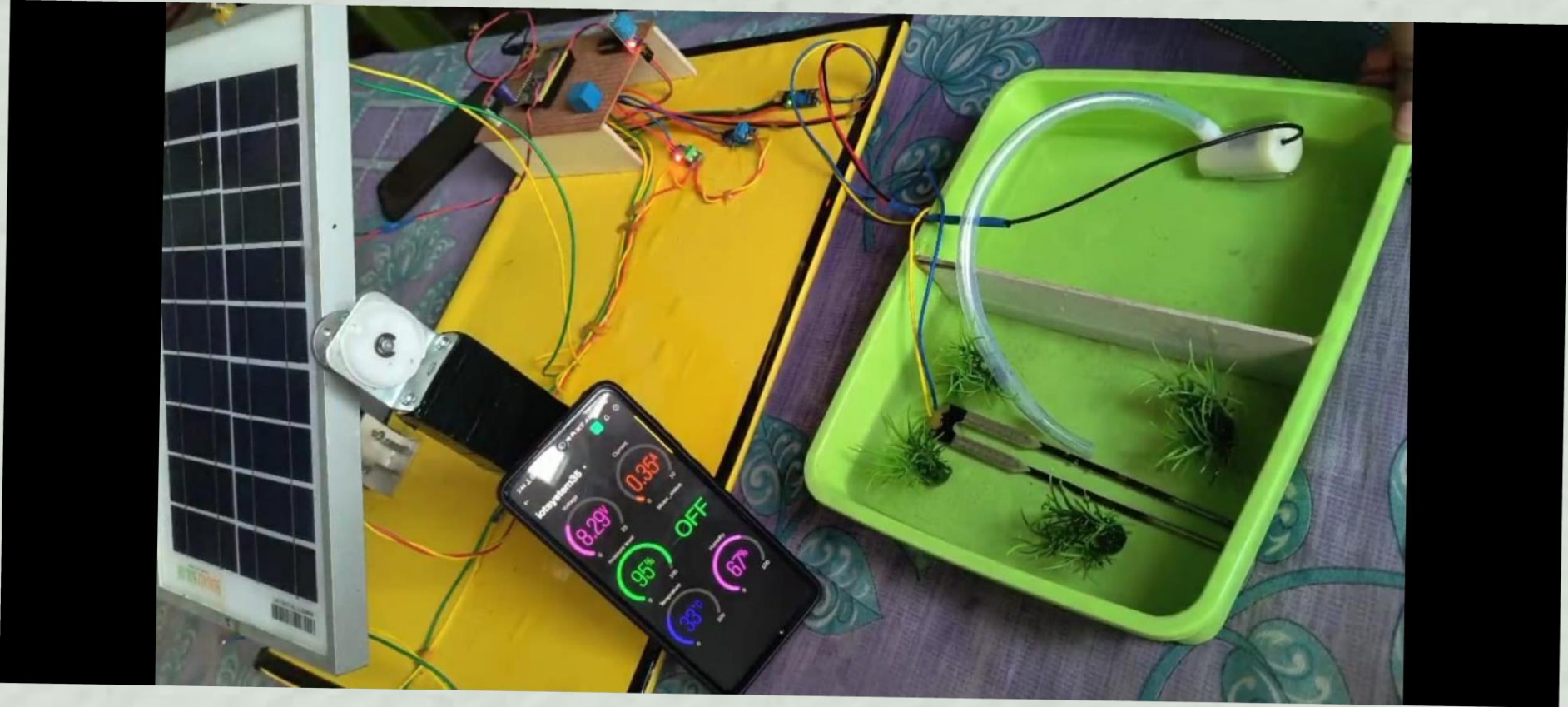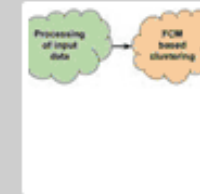|	
1 Start	
2 Initialization	
3 Main Loop	
4 Sensor Readings	
5 Moisture Processing	
6 Light Direction Processing	
7 Voltage and Current Calculation	
8 Blynk Updates	
9 End Loop	
10 End	

RESULTS

FUTURE SCOPE

Advanced Sensor Technologies:

Data Analytics and Machine Learning:.

Remote Monitoring and Control:

Integration with Weather Forecasting:.

Distributed Energy Storage:

Precision Agriculture Techniques:

CONCLUSION

• In conclusion,
the IoT-based Smart Renewable Energy Generation &
Irrigation System with
Moisture Detection presents a pioneering solution for
sustainable agriculture.
By seamlessly integrating renewable energy sources
and IoT technology, the
system optimizes energy efficiency and ensures
precise irrigation based on
real-time moisture detection. This innovative
approach not only enhances crop
yield but also promotes environmental conservation.
The system's adaptability,
cost-effectiveness, and minimal environmental impact
underscore its potential
for widespread adoption in modern agriculture,
marking a significant stride
towards efficient resource management and
sustainable farming practices.

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