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SMART IRRIGATION SYSTEM

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Abstract: India has a population of over 1.2 billion, and the population is steadily increasing. In the next 25-30 years, there could be a serious food shortage issue if agriculture is not developed. Currently, farmers are facing challenges due to a lack of rain and water scarcity. This paper aims to introduce an automated irrigation system to assist farmers in saving time, money, and energy. Traditional irrigation methods rely on manual labor, but with automated technology, human involvement can be reduced. The system consists of soil moisture, humidity, and temperature sensors placed at the root zone of plants, all connected to an Arduino microcontroller. The microcontroller processes the sensor data and ensures efficient irrigation.

Keywords **– IoT, Sensors, Automatic Valves.**

I. INTRODUCTION

As India is an agriculture-dominated country, it has a huge impact on the economy of India. The income source of 70%population in India is based on an agriculture system. Nowadays, huge technologies are being developed. The government of India also declared various schemes in this sector due to which lots of farmers can benefit from this scheme. Water consumption is the main problem in the farming sector. Crops do not get the required water supply. In agricultural innovation, the automatic regulation of valves through artificial intelligence (AI) has emerged as a groundbreaking solution within irrigation systems. This cutting-edge technology targets the intricacies of soil moisture management in the root zones of crops, specifically within the context of piped and micro-irrigation networks. By seamlessly integrating AI algorithms, this system offers a dynamic and responsive approach to water distribution, responding in real time to the ever-changing moisture levels detected in the crop's root zone. At its core, this AI-driven irrigation system seeks to optimize water usage efficiency by precisely tailoring the release of water through automated valve adjustments. The technology serves as a proactive measure, mitigating the challenges posed by water scarcity in agriculture and promoting sustainable resource management. Its adaptability allows for a fine-tuned response to diverse environmental conditions, ensuring that water delivery aligns with the specific needs of each crop. Furthermore, the integration of AI introduces a layer of intelligence to agricultural practices, fostering precision farming techniques. This not only enhances overall crop health and yields but also minimizes environmental impact through judicious water utilization. The system's automation extends beyond mere water regulation; it enables remote monitoring and control of the irrigation network, streamlining operational processes and reducing the burden on farmers In essence, the automatic regulation of valves based on AI insights signifies a paradigm shift in modern agricultural irrigation. This transformative technology holds the promise of revolutionizing how water is distributed within the intricate root systems of crops, offering a sustainable, efficient, and intelligent approach to contemporary farming practices. As we navigate the challenges of a changing climate and increasing global demand for food, this innovation stands at the forefront, shaping the future of agriculture through the fusion of artificial intelligence and irrigation management**.**

II. LITERATURE REVIEW

Md. Rezwan Hossain Naeem, Shadman Gawhar, Md. Belawal Hoque Adib, Sanjid Ahmed Sakib, Abir Ahmed, and Nafiz Ahmed Chisty (2021) Developed a system to deliver a smart and cost-effective irrigation system by integrating a real-time monitoring system, remote controlling and cloud computation of acquired data and they didn't Focus on Cost-Effectiveness and User-Friendly Systems.[1]

Angelin Blessy and Anveesh Kumar (2021) Developed a smart irrigation system using artificial intelligence and IoT to reduce water wastage in agriculture reducing energy, saving money, and increasing yields is an important task in the smart irrigation system.[2]

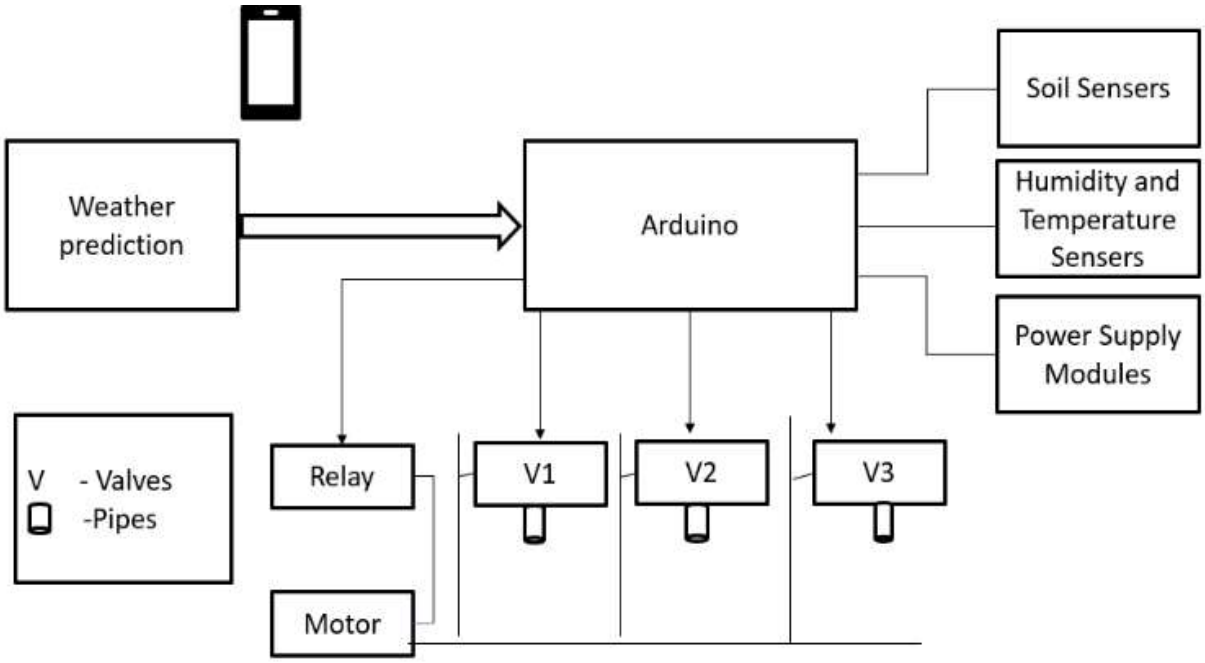
Revanth Kondaveti, Akash Reddy Supreet, and Palabtla (2019) Developed an automatic irrigation system using IOT and Machin learning that predicts rainfall. the drawback of this project is the lack of Data Accuracy.[3]

Development of Smart Drip Irrigation System Using IoT (2019) Developed a System to irrigate the plants using the smart drip irrigation system on a small scale using an open-source platform used as a central controller of the system. and sensors drawback of this project is they didn't focus on Environmental Impact.[4]

III. PROPOSED SYSTEM

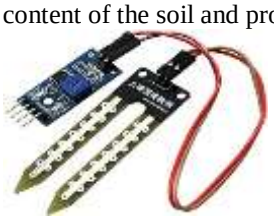
The new system for automatically controlling valves in irrigation systems, using artificial intelligence (AI) to monitor soil moisture in crop root zones in piped and micro irrigation networks, is a groundbreaking solution that blends technology and agriculture. This system is designed to transform conventional irrigation methods by incorporating a more flexible and intelligent approach to water management.

BLOCK DIAGRAM



Soil Sensors:

Deploy soil moisture sensors at strategic locations within the root zone of the crops. These sensors measure the moisture content of the soil and provide data to the central control system.



Temperature and Humidity Sensor:

Temperature and humidity sensors work by measuring the capacitance or resistance of air samples. Most of these sensors utilize capacitive measurement to determine the amount of dampness in the air. This sort of measurement relies on two electrical conductors with a non-conductive polymer film lying between them to form an electrical field between them.

Motor:

The water pump will supply water to the plants. It will be connected to the relay switch which will control water flow as per the direction in the mobile app.

Arduino UNO:

An Arduino Uno can be used in a smart irrigation system to water plants. Here's how it works:

- Connect the water pump:
  Use a relay module to connect the water pump to the Arduino board.
- Use a soil moisture sensor:
  Place a soil moisture sensor in the root zone of the plant. The sensor sends data to the Arduino about the soil's moisture content.
- Compare soil values:
  The Arduino compares different soil values.
- Command the relay:
  The Arduino commands the relay to turn on or off the motor, and start watering the plants.
- Send information:

The Arduino sends all information to an Android application via an Esp8266 Wi-Fi Module

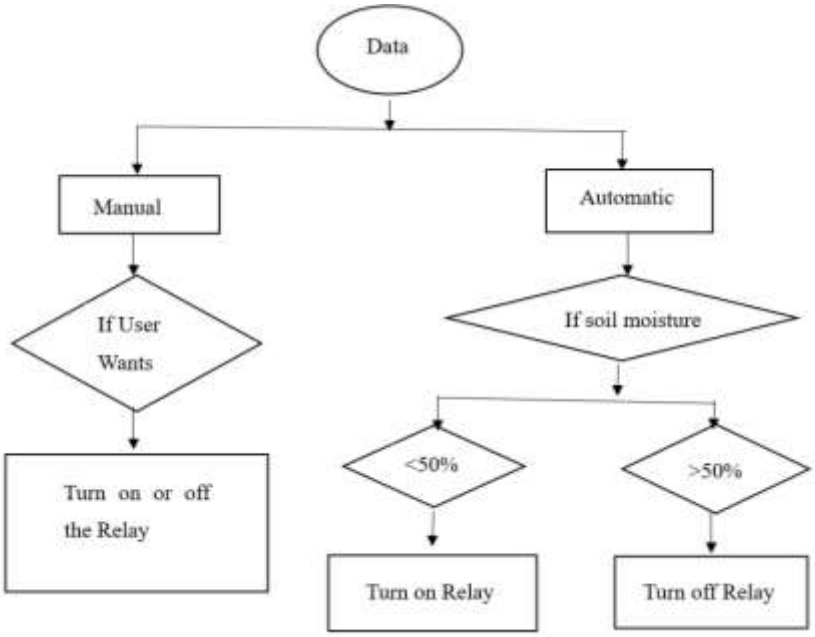
Valves:

A solenoid valve is a shut-off valve that regulates the flow of water in an automatic irrigation system. It's an electrically controlled valve that's also called an electromagnetic valve, water valve, electric valve, or electro-valve

Relay:

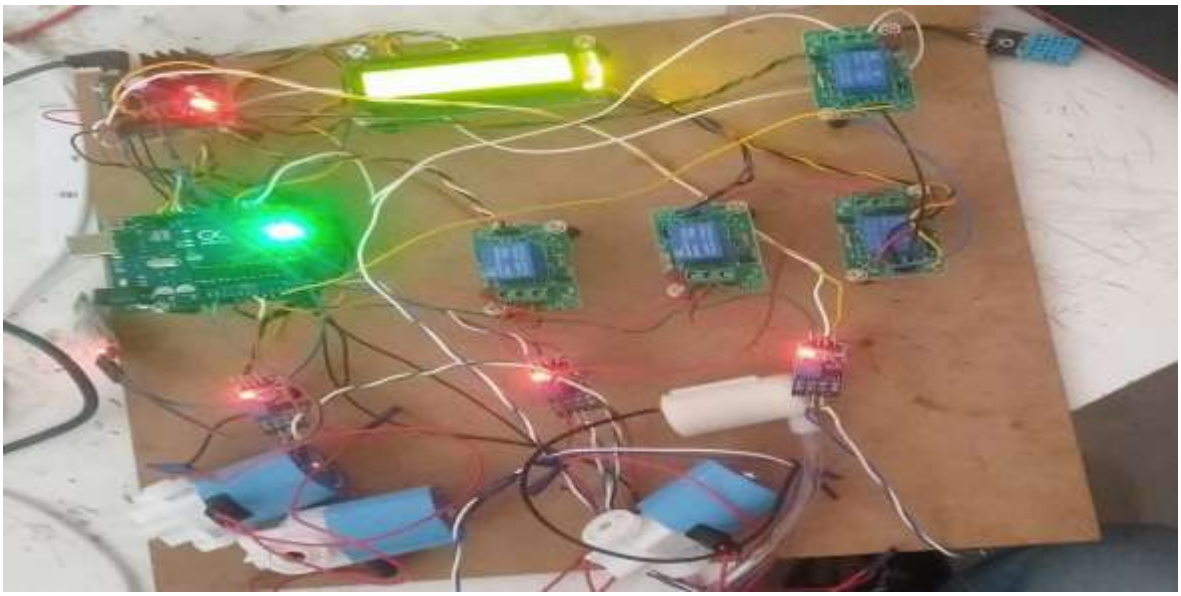
A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a microcontroller. When activated, the electromagnet pulls to either open or close an electrical circuit.

IV. WORKING FLOW



Working flow of Smart Irrigation System

V. RESULT



Working of Smart Irrigation System

Smart Irrigation System Collects the data using sensors i.e. temperature and humidity sensors based on the data collected, Arduino Uno decides which valve to turn on or off.

VI. CONCLUSION

Ultimately, implementing an automatic valve regulation system for irrigation can address the limitations of manual valve adjustments in traditional agricultural methods. This technology has the potential to transform the industry by optimizing water usage, increasing crop yields, and preserving natural resources. Its ability to adapt to varying conditions, scalability for extensive agricultural systems, and user-friendly design make it a valuable tool for sustainable farming practices. The expected benefits, such as reduced labor costs and precise irrigation tailored to specific crops, highlight the wide-reaching impact of this innovation. By incorporating artificial intelligence, this solution not only tackles existing challenges but also drives the industry forward toward a more efficient future.

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