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A Concise Survey Paper on Automated Plant Irrigation System

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Abstract: ***In the present day world Scarcity of meals and water mainly takes place due to the increase in population in order to keep away from this there's a need to sell the agriculture zone. Agriculture is one of India's most important industries, accounting for 18% of the country's GDP. The best yield is determined by the irrigation device utilised, which has an impact on the sector. The traditional irrigation arrangements employed in the major components do not deliver the best yield for the plants. The venture's main goal is to develop an Automated Irrigation System that may be used to supplement traditional irrigation methods. The job isn't necessarily restricted to the agriculture sector; it may also be done at our homes or businesses with lawns and plants. There are a whole lot of wastage water and other sources within the crop discipline. In order to prevent this difficulty, we're using an Arduino-based automatic plant irrigating device. This instrument measures the moisture content of the soil and provides sufficient water in accordance with the need .So while the soil is dry the pump will robotic-ally water the fields and whilst the soil is wet the pump robotic-ally stops, there by eradicate the want of manpower and preserve the time.***
Keywords: Arduino, Irrigation, Agriculture.

I. INTRODUCTION

All manually irrigated farms are frequently watered by this technology, which considerably reduces the requirement for personnel by employing a high-quality price. This device may be able to work even if the owner is away for a short length of time, ensuring proper watering even in the absence of humans. Also, no water will be wasted during the traverse.

Farmers have recently begun employing irrigation techniques including manual manipulation, in which the farmers irrigate the field on a daily basis by turning the water pump on and off as needed. This method consumes more water from time to time, and the water delivery to the land is frequently delayed, causing the plants to dry up. Plant development is harmed by a lack of water before wilting becomes visible. Water deficit results in lesser weight fruit, in addition to the delayed increase charge. This problem may be completely solved if we utilize an Automated Irrigation System, in which irrigation occurs only when there is a high need for water, as indicated by soil moisture.

II. LITERATURE SURVEY

A. Design And Implementation Of Irrigation System

According to the research in Automated Irrigation System Using a Wireless Sensor Network and GPRS Module, irrigation will take place using wireless sensor devices in a computerised irrigation system. It measures temperature and moisture using a sensor and is controlled by a microcontroller. The use of DTMF code said about the use of automated irrigation system for correct yield and handled remotely for farmer safety in Wireless Sensor Network based fully Remote Irrigation Control System and Automation. To control water flow for hectored, sprinkler, or drip segment irrigation, a wireless sensor network with an embedded DTMF (Dual Tone Multiple Frequency) signalling mechanism is used.

The usage of a totally autonomous drip irrigation device that is controlled and monitored using an ARM9 processor was mentioned in Smart drip irrigation equipment for sustainable agriculture. DEHAR, a set of routing principles, has been developed to extend the energy of conventional batteries. Because of the delay experienced due to synchronized sleep scheduling, the suggested technique is green, with a modest number of sensor nodes. A tiny band belt that is used to connect sensor nodes to the wind. The current irrigation system, which uses a photovoltaic solar panel to power the machine because it is powered by electricity, may be prohibitively expensive. For water conservation, a set of rules was established with temperature and soil moisture threshold values encoded directly into a microcontroller gateway. The machine features a complete duplex communication link based on an internet cellular interface utilizing GPRS to visually display and also save cell records in a database server.

B. The Way Sensors Works And Used In Field

The AtMega328 microcontroller which sends the facts inclusive of the repute of the pump to the farmer via GSM Module. Then GSM based embedded machine for irrigation. The sensors continually check the soil's condition, and the flow of water is controlled by sending a message from a cell phone. It includes an contain Bluetooth for faraway monitoring which in turn reduces rage problem of GSM network and SMS fee is also saved. MAX232 is used to connect the GSM and the microcontroller. When the soil moisture level falls below a certain level, the moisture sensor can detect it and sends a signal to the controller, which further sends the signals to the cell, which activates the buzzer.

Wireless sensor networks with embedded DTMF (Dual Tone Multiple Frequency) signalling to manage water glide for sectored, sprinkler, or drip segment irrigation, according to the Indian market. SMS-managed devices now available on the market use circuit switching rather than packet switching.

C. The Need To Research About Irrigation System

The traditional definition of an irrigation work has shifted in recent years. It has evolved from a simple physical shape for water storage, transit, and distribution to a more intricate device that incorporates farmer participation. This entails better control at all levels, from reservoir operation to agricultural operation, and therefore a shift from simple "operation and renovation" to "operation, upkeep, and management."

To meet this new challenge, existing efforts must be updated. One of these projects is the Sorraia Irrigation Project. In this work, major issues are identified, and it is demonstrated how research (especially modelling) may be directed toward better management of the conveyance and distribution systems, as well as on-farm management.

Finally, it will become clear that, in addition to the technical challenges to be resolved, farmers' involvement and participation in all levels of management must be increased. As a result, there is also a need to adopt schooling, education, and extension applications.

D. Research Area And Discussion

Farmers in agricultural subjects were unable to deploy the costly and sophisticated irrigation facilities of their fields. As a result, it's critical to increase the low-cost, less-complicated irrigation system for the enhancement of farmers' lifestyles. In the works mentioned above, the writers check the characteristics such as temperature, humidity, and moisture of soil just in a specific region to manage the flow of water.

This information is insufficient to accurately anticipate the state of a field. As a result, it advocates for the installation of a wide range of such sensors to continually display the soil status. Wireless Sensor Network may be used to determine the soil condition. Expensive Wi-Fi equipment, such as GSM and GPS, should be avoided, and low-cost ZigBee-based devices should be utilized to minimize the overall cost of the system.

The emerging device may also run on battery backup in remote areas such as agriculture. Less energy-consuming micro controllers, sensors, and wireless working devices will be installed to extend battery life. It is also vital for a battery-powered equipment to remain in the power-down mode in extreme circumstances. Climate conditions can also be addressed for improved water management in order to reduce agricultural water demand.

III. TECHNIQUES AND TYPES

According to the author's study, there are current methods for irrigating fields such as drip irrigation, sprinkler irrigation, and so on. Researchers employed a variety of sensor-based devices in their automated watering system.

A. Modern Techniques Of Irrigation

1) *Sprinkler System:* Water droplets are sprayed or scattered across the landscape like raindrops using spinning nozzles linked to pipes. The pipes are connected perpendicular to a field-installed vital pipeline. Sprinkler irrigation allows you to water regions that will be too irregular to irrigate using previous methods. The subsequent are a number of the system's advantages.

a) It's top notch for sandy soil and hard terrain.
b) Plants/plants are included from harsh colds or temperatures.
c) A system is also wont to use fertilizer and insecticides.
d) It aids with conservation.

2) *Drip System:* Water flows through slim pipelines buried within the ground and drips through small holes (emitters) near plant roots. The plant is nourished by means of the water absorbed via the roots. With this approach, there's no water waste because less water is misplaced to evaporation, runoff, and wind. Some advantages of this gadget are:

a) Water is conserved through optimizing soil moisture.
b) For plant health, direct watering of plant roots is critical.
c) Weed improvement is inhibited because water is provided immediately to plants as hostile being allotted for the duration of the sector.
d) Bacterial growth is minimized on account that the space round the plants is dry.

3) *Surface Irrigation System:* It is one among the foremost widely used irrigation methods. Gravity is employed to use water to the land here. Floor irrigation is typically called flood irrigation since the distribution of water is unregulated.

This irrigation gadget is further classified into three kinds of modern irrigation technologies. These are the following:

a) *Furrow:* within the case of furrow irrigation, water is forced to flow via shallow channels that are arbitrarily spaced and on a slope to the land. Water is supplied to those shallow channels by a spread of methods, including a syphon, a vital ditch, a gated pipe, and so on. The velocity of the water is set by the inflow price, soil infiltration, furrow slope and form, and surface roughness. It requires far less capital investment, yet it's one in all the foremost labour-intensive irrigation systems.
b) *Basin and Border Irrigation:* Both of those methods depend on water flowing through the soil. In basin irrigation, however, water is provided to an issue, which can end in pounding for a period of your time. Water, on the opposite hand, is forced to flow through ditches while walking over the ground with a drainage mechanism at the top.

B. Importance of Irrigation

1) Making Up for while there's not Any Rain- When there's not enough rain or there's no manner of knowing whilst it's visiting rain, irrigation is activated. Without rain or irrigation as another, crops suffer, possibly leading to a meals deficit or crop/plant failure.
2) Increasing the number of Land which will be Cultivated or Used for Agriculture- Some regions of the earth are certainly dry. The key to turning these plains into cultivable ones became irrigation. Irrigated cropland now money owed for more or less 18% of all cropland on this planet. Irrigation is likewise accountable for making the most of fallow areas, which are left idle after harvest until the subsequent farming season.
3) Productivity Improvements- When rainfall is insufficient, irrigation is employed by default and in many cases. It can, however, be used at any time, despite the fact that there is also enough rain to boom agricultural productiveness.

C. Types Of Sensors

1) *Climate-Based Controllers:* Climatic-based controllers, also known as evapotranspiration (ET) controllers, change irrigation schedules depending on local climate facts. The combination of evaporation from the soil surface and transpiration via plant components is known as evapotranspiration. These climate-based controllers collect local weather data and modify irrigation run-time accordingly, ensuring that the landscape only receives the proper amount of water.

There are three basic types of ET controllers:

a) Signal-based controllers utilise publicly available weather statistics to determine the ET cost for a grass floor on the site. A wireless link is used to send the ET records to the controller.
b) Historic ET controllers employ a pre-programmed water consumption curve that is entirely based on historical water usage in certain places. Temperature and solar radiation can be included into the curve.
c) On-website online climate size controllers generate continuous ET measurements and water as a consequence of climate data gathered on-website online.

2) *Soil Moisture Sensors:* Soil moisture sensors might be connected to an existing irrigation controller. If the soil moisture content in the root area is over a pre-set threshold, the sensor monitors it before a planned watering event and skips the cycle. Different types of soil moisture sensors are available, and customers must ensure device compatibility before purchasing a sensor. Some soil moisture monitors feature a soil freeze sensor, which allows the irrigation cycle to be interrupted if temperatures drop below 32 degrees Fahrenheit. Soil moisture sensors are available in both wired and wireless versions.

3) *Rain and Freeze Sensors:* Rain and freeze sensors halt the irrigation cycle throughout a rain or freeze event when watering is not necessary, despite the fact that they are not considered sophisticated technology. Watering during the rainy season wastes water, money, and generates unnecessary runoff. There are three distinct types of rain sensors available, each with its own set of features.

a) The only type of rain sensor still in use today uses a tiny cup or basin to collect water; once a certain quantity has been accumulated, the cup's burden pauses the irrigation cycle. Debris in the cup can also disrupt the watering cycle, therefore it should be examined and removed of muck on a regular basis.

b) A dish with two electrodes spaced at a certain distance from the bottom of the cup is used in the second type of rain sensor. Particles, like the first type of rain sensor, can affect accuracy by displacing water in the cup, and the distance can be changed to accommodate for minor rain events. The irrigation cycle is terminated when water reaches the electrodes.

c) The 33% type of rain sensor no longer has a rain capture cup, making it simple maintenance and dependable. Instead, the sensor employs a slew of discs. The transfer is caused by the enlarged discs, which interrupts the cycle. The machine will resume the scheduled cycles once the discs dry out. The discs must be examined at least once a year to see if they need to be changed. All of the devices must be placed in an open area where they may be rained on.

D. General Features Of Irrigation System

The smart irrigation gadget is self-explanatory and person pleasant plant watering device. In this current gadget software program is mainly compatible to operate the hardware module. For the monitoring and controlling the water pump and sprinkles, the multiple sensors and activator are used. This gadget is used for monitoring and controlling water pump and sprinkler with the help of software program applications. Battery smart sensor gateway for sensor connectivity is supplied. USB, ZigBee, and Wi-Fi connectivity for computer interface are needed.

In this machine, buzzer, enter and output switches are provided for testing. Wi-Fi connectivity and android app are supplied for subject testing. This smart gadget has software program to view a sensor's actual time graph evaluation on PC and cellular.

E. Process Of Irrigation System

Irrigation is the process of artificially applying water to crops in order to meet their water requirements. Irrigation may also be used to deliver nutrients to crops. Water for irrigation can be obtained via wells, ponds, lakes, canals, tube-wells, and even dams. Unlike traditional irrigation controllers, which operate on a pre-programmed time table and timers, intelligent irrigation controllers monitor climate, soil conditions, evaporation, and plant water usage to mechanically modify the watering time table to real site circumstances. Smart irrigation structures employ sensors to collect real-time or historical data to advise watering exercises and change watering schedules to increase efficiency. An automated irrigation system refers to the operation of the equipment with no or very little operator intervention aside from monitoring. Almost any device (drip, sprinkler, surface) may be made to work automatically with the use of timers, sensors, computers, or mechanical home equipment.

F. Drawbacks Of Existing System

1) Poor design or inefficient installation.

2) Expensive and also highly maintenance.

3) Way more complicated irrigation methods.

IV. CONCLUSION

Agriculture is one of the critical industries where new technology is being utilised to relieve farmer burden. We conducted a survey of smart irrigation devices. This paper analyses and discusses widely available and occasional fee-based irrigation automation for sprinkler, drip, and floor watering. The potential for future research effort in the irrigation process is mentioned in order to build a better computerized irrigation device with low cost and considerably less circuit complexity for the benefit of farmers.

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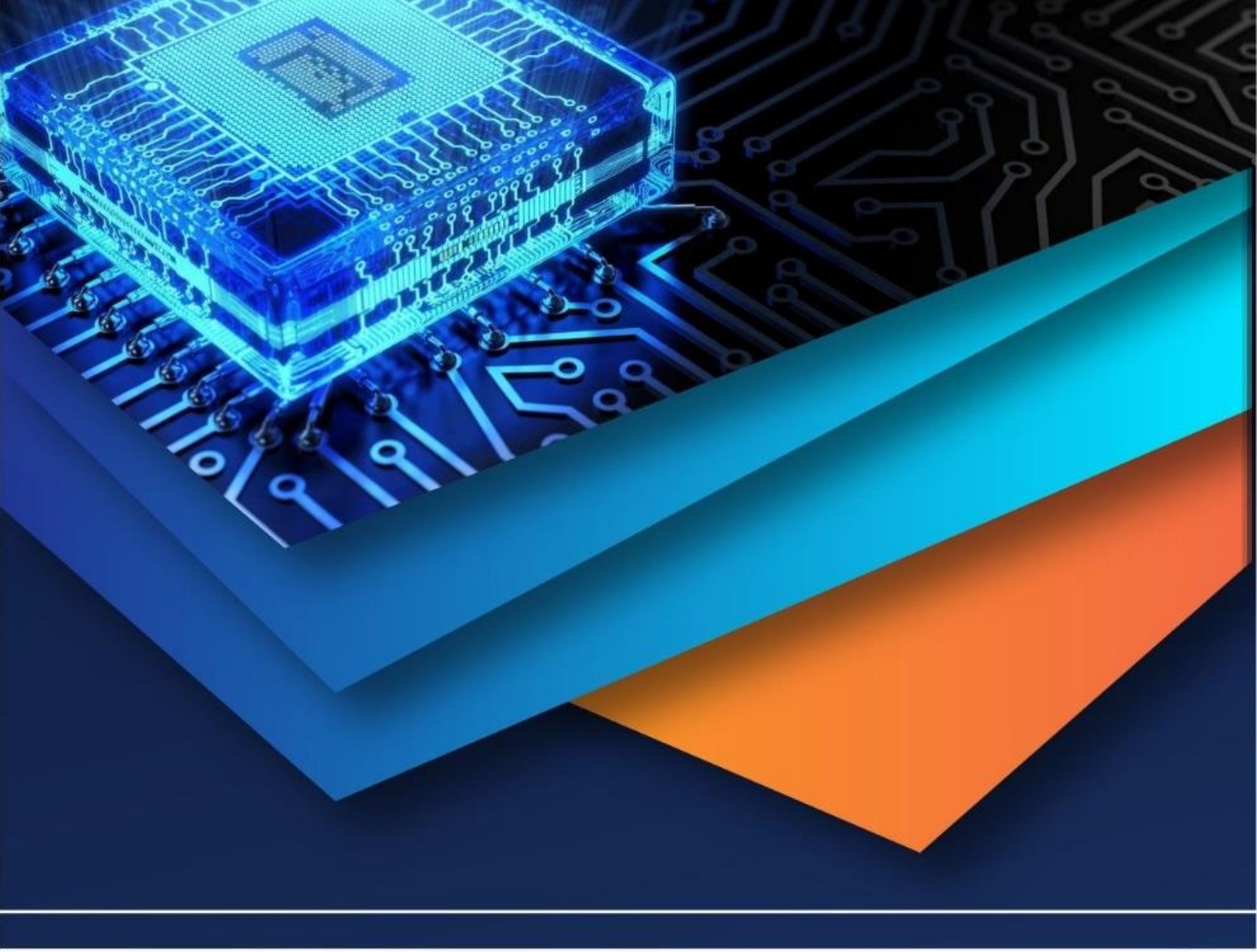

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