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A Survey on DTMF based Irrigation Water Pump Control System

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ABSTRACT

Technology advancements made it possible for humans to simplify their work while still doing it with less labour- intensive methods. Better outcomes in less time. This project involves look forward to employing telephonic signalling Dual-tone, multi-frequency control method different electrical loads, including irrigation water pumps located in difficult-to-reach places. The current study is based on the idea that a Dual Tone Multi-Frequency (DTMF) signal can be used to turn on and off specified electrical loads. In the fields where we grow crops spaced out from one another, the tube wells operating them becomes. A person is forced to run from one location to another run the loads. Similar events occur in our homes as well. While keeping this in mind, a system developed to make the farmer's life easier as in addition to saving time by using DTMF technology remotely control the loads.

Keywords: DTMF, Controller, Load, Motor, GSM.

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I. INTRODUCTION

Introducing the DTMF Based Irrigation Water Pump Control System: a smart solution to manage irrigation using just your mobile phone! This system utilizes Dual-Tone Multi-Frequency (DTMF) technology, the same tones you hear when pressing keys on your phone, to control the water pump. With this setup, farmers can conveniently operate their irrigation systems remotely, without needing to be physically present at the site.

Here's how it works: By dialing a specific phone number and pressing certain keys on their phone, farmers can activate or deactivate the water pump. Each key press sends a unique DTMF tone, which is decoded by a receiver connected to the pump control system. This system offers flexibility and ease of use, allowing farmers to efficiently manage water distribution to their fields from anywhere, simply using their mobile phones.

By integrating technology with agriculture, this system aims to streamline irrigation processes, conserve water, and improve overall crop yield, empowering farmers with greater control and convenience in Managing their fields

The basic idea behind this project is to control the functioning of the agricultural load using wireless technology. In this project we will have two cell phones; one will be handed to the farmer which can send the digital signal to other mobile phone which is normally held in automatic answering mode at the load ends. At the receiving ends cell phone codes are inputs to the microcontroller, which pre-programmed to identify the command signal coming from the users ends, which is interfaced through relays & relay drivers according to the desired commands from users end. The cell phones at load site are usually DTMF decoded. DTMF will decode the keywords coming from user's site into digital codes of corresponding frequency which finally fed as input to the microcontroller. This gives farmers an ability to press the keypad of the cellphone and can switch on or off the water pumps installed at different positions of the land as per the desired of the farmers. A DTMF decoder & controlling circuit receives the input commands and control the on–off mode of the connected electrical motor pump. This circuit designed is easily available using the various electrical and electronics circuit components. This act as a sign of relief for the areas which comes under draught region, where there is scarcity of rain water such as in Rajasthan. In such areas, a farmer can make better use of limited water and

controlling based on weather conditions, environmental conditions. This also helps in water harvesting as water is utilized and not wasted. 3

To turn basic the idea of automatic irrigation water pump into realistic state hardware circuit along with software programming is required. The major hardware components used. Here we control irrigation water pump using mobile phone through DTMF technology. DTMF have provision with audio jack. Mobile phone connected to DTMF audio jack. Any key pressed in dial pad then it converts into DTMF tone. DTMF tones converts into 4 bit number format. By pressing keys in dial pad pump motor will be ON and OFF. Motor status will display on 16X2 LCD display.

II. NEED OF SYSTEM

The need for a DTMF-based irrigation water pump control system arises from the necessity to enhance agricultural efficiency.

This technology empowers farmers to remotely control water pumps using simple phone commands, reducing the need for physical presence, optimizing water resource utilization, and enabling timely irrigation, ultimately leading to improved crop yields while conserving resources and labour.

It collects real time monitoring and alerts, allowing farmers to detect issues such as pump failure or low water levels in the source, helping in timely maintenance.

III. PROBLEM STATEMENT

In traditional agricultural practices, manual control of irrigation water pumps poses significant challenges, leading to inefficient resource utilization, labour-intensive operations, and suboptimal crop outcomes. The absence of a streamlined and remote-controlled solution results in a lack of flexibility in irrigation scheduling, hindering the adoption of efficient water management practices. Moreover, in areas with limited infrastructure and remote agricultural setups, the absence of reliable and accessible pump control exacerbates these challenges. Therefore, there is a pressing need to develop and implement a DTMF-based irrigation water pump control system that offers efficient, remote, and precise control over water distribution, promoting sustainable agricultural practices and enhancing crop.

To address these challenges, the proposed solution is the development and implementation of a DTMF-based irrigation water pump control system. This system would enable farmers to remotely control pump operations, customize irrigation schedules, and receive real-time updates on pump performance. By harnessing DTMF signalling, the technology ensures reliable and accessible communication even in areas with limited connectivity. This solution aims to optimize water usage, enhance crop yield, and facilitate sustainable agricultural practices, thereby contributing to improved food security and resource management.

In summary, the problem statement emphasizes the need for a DTMF-based irrigation water pump control system to overcome the limitations of traditional manual pump control methods. The proposed solution seeks to revolutionize irrigation practices by providing efficient remote control capabilities, promoting water-efficient agriculture, and addressing the challenges faced by farmers in both developed and remote agricultural settings.

IV. LITERATURE SURVEY

In recent years, there has been growing interest and research attention directed towards harnessing the potential of the Internet of Things (IoT) to enhance various aspects of agriculture. Among these, one significant focus area has been the application of IOT in achieving precise irrigation and effective water management in agricultural practices. In the study presented by the authors in reference [3], a novel approach to precision farming was introduced. This approach involved the integration of IoT technologies to monitor and control critical environmental factors, such as temperature, humidity, sprinkler water flow, and soil moisture levels. By deploying IoT enabled sensors and devices, the system aimed to provide real time data and insights, enabling farmers to make informed decisions regarding irrigation schedules and water application strategies.

The use of IoT in precision irrigation has the potential to optimize water usage, reduce wastage, and improve overall crop productivity by tailoring irrigation practices to the specific needs of each crop and its growth stage. This advancement in agricultural technology holds promise for enhancing water efficiency and sustainability, while simultaneously contributing to improved crop yields and resource conservation in the context of modern agriculture. The researchers in [4] proposed a design methodology that allows for the remote control of multiple water pumps distributed across a specific agricultural site. In their work, they specifically considered a scenario involving four pumps. The paper provides a comprehensive electronic design and simulation results at different stages of the system's development. The electronic design is based on discrete passive and active electronic components, ensuring practical implementation. The researchers utilized the Multism program for system testing and simulation, which allowed for a thorough evaluation of the proposed design's performance. The simulation results demonstrated the system's capability to effectively control the switching state of the motors. The DTMF commands employed in the study enabled the precise switching ON/OFF of specific motor pumps or all of the four motors, providing a flexible and efficient means of remote pump control. Overall, the

presented research highlights the successful application of the DTMF technique in the context of agricultural pump control, offering a viable and practical solution for remotely managing multiple water pumps. The integration of artificial intelligence (AI) techniques for monitoring and decision support, in conjunction with the Internet of Things (IoT) and communication systems, has paved the way for the development of sophisticated smart agriculture assistance systems [5-6]. Researchers have proactively developed mobile applications to establish seamless communication channels for transmitting sensor data collected from the agricultural field [7]. In the domain of plant disease prediction, a multitude of machine learning algorithms have been employed, exhibiting promising results in accurately forecasting and diagnosing various plant diseases. Additionally, the synergy between IoT and AI has led to the creation of robust surveillance systems that leverage AI-driven techniques for real-time monitoring and early detection of potential issues in agricultural settings [8].

V. BLOCK DIAGRAM

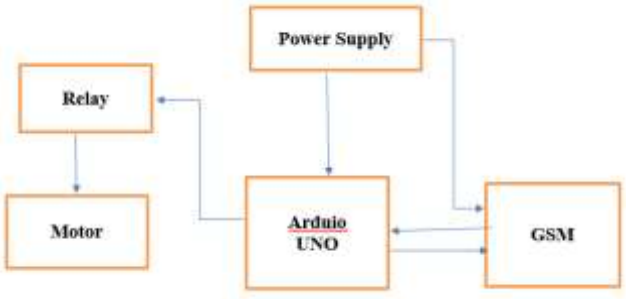

Fig 1. Block Diagram

A DTMF (Dual Tone Multi-Frequency) based irrigation water pump control system utilizes the tones generated by a telephone keypad to remotely operate the water pump. This system typically consists of two main components: the control unit and the DTMF decoder. The control unit is connected to both the water pump and a telephone line. When a user dials the designated phone number associated with the irrigation system and inputs the appropriate DTMF tones using their phone's keypad, these tones are transmitted through the telephone line to the control unit. The DTMF decoder within the control unit then interprets these tones and triggers the corresponding actions, such as turning the water pump on or off, based on the predefined instructions.

This technology offers a convenient and efficient way to manage irrigation systems remotely, allowing farmers or operators to control water pumps from a distance, reducing the need for manual intervention. Additionally, by leveraging existing telephone infrastructure, DTMF-based irrigation water pump control systems can be implemented in areas with limited internet connectivity, making them accessible to a broader range of users. However, it's essential to ensure the security and reliability of the system to prevent unauthorized access or interference with the irrigation process.

Here we control irrigation water pump using mobile phone through DTMF technology. DTMF have provision with audio jack. Mobile phone connected to DTMF audio jack. Any key pressed in dial pad then it converts into DTMF tone. DTMF tones converts into 4 bit number format. By pressing keys in dial pad pump motor will be ON and OFF.

VI. CONCLUSION

The DTMF-based irrigation water pump control system offers a solution to the challenges of manual pump control in farming. By enabling remote operation and scheduling, it improves efficiency and resource management. This technology promotes water-efficient agriculture and addresses the needs of farmers in both developed and remote areas. Overall, it revolutionizes irrigation practices, leading to better crop yields and sustainable farming. In conclusion, the DTMF-based irrigation water pump control system offers a solution to the challenges of manual pump control in farming. By allowing remote operation and scheduling, it improves efficiency and crop yields. This technology is especially valuable in remote areas with limited infrastructure, where it can revolutionize agricultural practices and promote sustainable water management, ultimately enhancing food security and farmer livelihoods.

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