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Smart Irrigation System using IoT

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Abstract: ***In developing nations like India, despite of technological advancement we've been less attentive towards our agriculture. Present condition of agriculture isn't so satisfactory to supply maximum crop yield due to lack of technology awareness among farmers. Because the literacy rates of farmers those involved in agricultural field is significantly low, applying and dealing with new technology could be a major concern. If farmers can embrace new technologies properly, agriculture sector are often a significant sector for generating employment in addition as increasing GDP in developing countries like India. As of 2012, this sector contributes about 18% of the full G.D.P. of India but around 50% people are involved during this. IoT will help us to extend the productivity of this huge you look after people involved during this sector. Utilization of IoT ecosystem can get renaissance agrarian field. IoT will aid in predicting crop yield, crop price, soil temperature, and real time data about air quality, water level and proper timing of crop to be delivered to plug, which is able to help to extend productivity. Study says we are going to have 9.6 billion people on Earth by 2050 which is able to increase demand for food and IoT in agriculture should be a very important driver to satisfy this requirement. Therefore we want to develop such system which is able to enhance farming procedure. Objective of this paper is to present a plan how IoT ecosystem can enhance the general farming output in addition as increase GDP.***

I. INTRODUCTION

Farmers need agricultural information and pertinent knowledge to create knowledgeable decisions and to satisfy informational needs. In agriculture domain through the event of a knowledge management system, enquiries of farmers will be answered with the assistance of multimedia which is well accessible. The applying of knowledge and Communication Technology (ICT) has proven for widening the opportunities to market agriculture on several aspects and domains in developing countries. Technology has crossed difficulties by using wireless technology, networking, mobile etc. to beat the employment of energy, power and price consuming equipments which was helpful within the agricultural development. The event of ICT in various domains has driven substantial interest in rising investments by private sectors towards the expansion of ICT in Agricultural research. At present, the key issue within the current domain is utilization of resources like man-power and water which is scarce in many parts of the country. There haven't been any significant technological advancements being made in agricultural sector as compared to other sectors. Agricultural system must be monitored on a daily basis. the employment of the developed framework is to scale back wastage by automating the complete agricultural system. Agriculture, with all its allied sectors, is undoubtedly the most important livelihood provider in India. it's said that, agricultural sector is that the backbone of Indian economy. Around 45% of the geographical areas are occupied by agricultural fields. Most of the Indians are either directly or indirectly depends on agricultural crops. The rising agricultural surplus tends to boost financial aid especially in rural areas. Researchers say that the demand for food are going to be doubled by the tip of 2050 because of enormous increase in population. because of receding water level, as a results of changes in climatic condition, it'd be a challenging task address the population demand. As soil moisture content is a vital consider increasing the productivity in agriculture, if the moisture content is optimum for plant growth, the plants can readily absorb soil water. So, one solution to all or any the issues requires real time agricultural monitoring system furthermore as crop growth. Thus, the employment of recent techniques in agricultural fields must be equipped with sufficient usage of resources. This approach relies on the mix of LoRa, Arduino uno, several sensors, and blynk platform. Technology and cloud interface as they evidently help in ending the important time requirement within the field. it's believed that the usage of those wireless technologies not only increases the crop productivity but also helps in saving the resources required.

II. HARDWARE DESCRIPTION

A. Arduino Uno

Arduino is an open-source electronics platform supported easy-to-use hardware and software. Arduino boards are ready to read inputs - light on a sensor, a finger on a button, or a Twitter message - and switch it into an output, switching on a motor, switching on an LED, publishing something online. You'll tell your board what to try and do by sending a collection of instructions to the microcontroller on the board. to try and do so you employ the Arduino programing language (based on Wiring), and therefore the Arduino Software (IDE), supported Processing.

Over the years Arduino has been the brain of many thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of students, hobbyists, programmers, and professionals has adapted to this open-source platform, their work and offerings have added up to an out of this world amount of accessible knowledge and expertise that may be of great help to novices and experts alike.

B. Software Used (Arduino IDE)

The Arduino Integrated Development Environment (IDE) can be called a cross-platform application that's written in functions from C and C++. It is accustomed write and upload programs to Arduino compatible boards, but also, with the assistance of 3rd party cores, other vendor development boards. The ASCII text file for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ with unique rules of code structuring. The Arduino IDE offers a software library from the Wiring project, which provides many common input and output procedures. User written program only requires two basic functions, for starting the code and therefore the main program loop, that are compiled and linked with a program stub main() into an executable algorithm with the GNU tool chain, also included with the IDE distribution. The Arduino IDE utilizes the program avrdude to convert the executable code into hexadecimal encoded file that's loaded into the Arduino board by a loader program within the board's firmware. By default, avrdude is employed because the uploading tool to flash the user code onto official Arduino boards.

C. Soil Moisture Sensor

Precision soil moisture has chosen shown in figure which consists two probes that are inserted in to soil. When the current pass through the probes, the soil contains low moisture offer a less resistance and passes high current. That is variable resistance is the parameter to identify the level of soil moisture

D. Temperature Sensor (DHT11)

The DHT11 sensor series are precision integrated circuit temperature and humidity sensors as shown in figure, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature

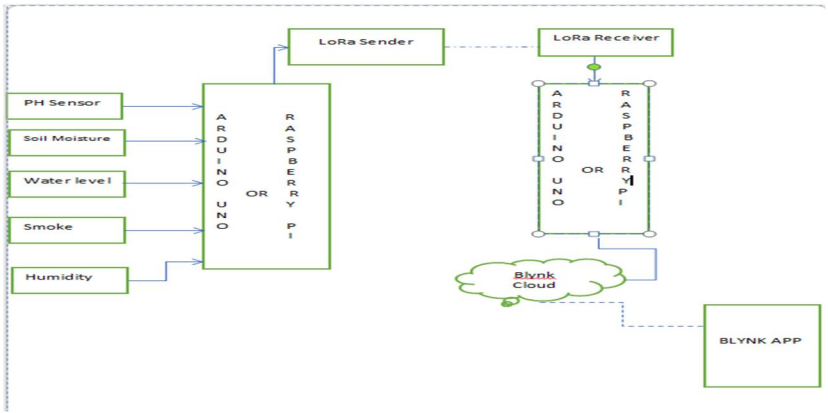
E. Relay

A relay is employed to manage the A.C motors from the controlled DC signal. It can isolate one operated circuit to a different. The principle behind the electromagnet operates the close and opens the circuit. Relays find their usage in wide area electronics circuits like industrial control circuits a high power amplifiers, telephone exchanges etc. Advanced rating relay is employed during this work as shown in figure

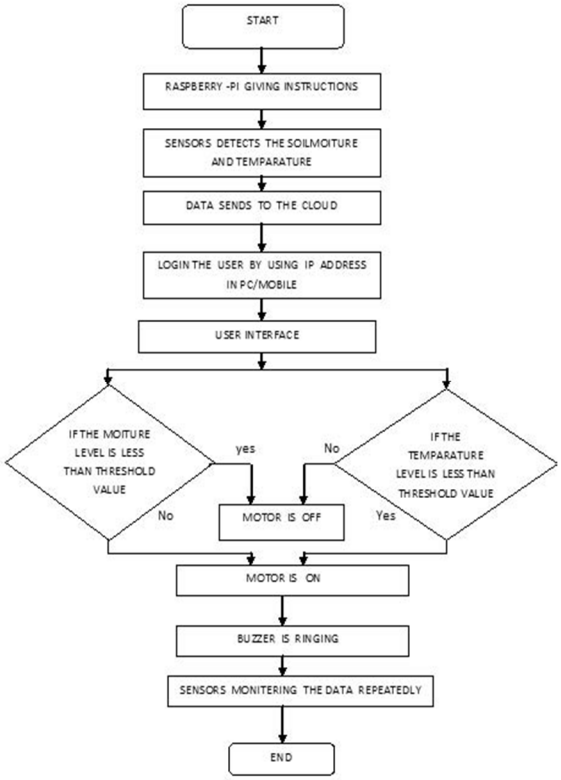
III. BLOCK DIAGRAM DESCRIPTION

Any number of sensors can be placed in the environment to detect the physical values of the surrounding. All these sensor values will be converted to digital values in the Arduino uno and then transferred to the receiver node through LoRa module. A LoRa module on the receiver end receives and loads it to another Arduino module which is connected to internet service and uploads the data to the cloud. The consumer can access the data on any number of android devices from anywhere on the globe.

A. Block Diagram



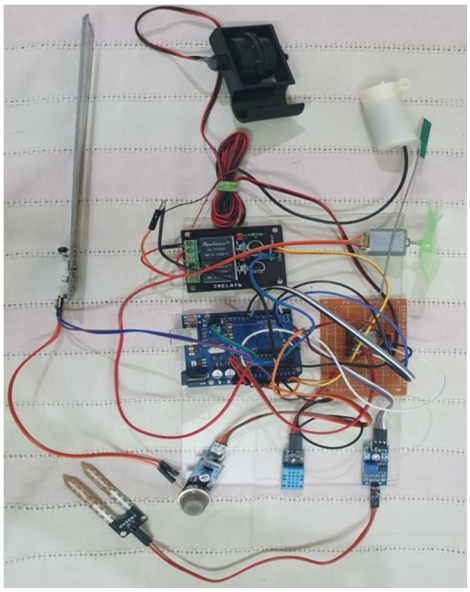
B. Data Processing and Decision Making



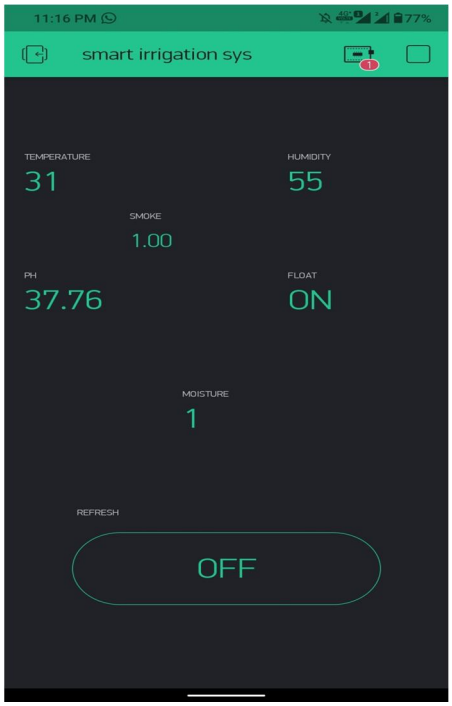
IV. RESULTS AND DISCUSSIONS

The designed model is shown in the figure, and the real time results (values) are also shown in figure. This system requires an internet connection in the receiver end to send the data to the cloud. The farmer (consumer) can view the data on any number of android devices. The real time environmental data reaches the farmer and then the farmer can decide on the strategy to go about his business. The microcontroller on the Arduino uno can also check for threshold value, which when reached the relay gets triggered and switches on/off the pump or buzzer (according to farmers convenience).

A. Hardware Kit



B. Android Application



V. CONCLUSIONS

Farmers need help during different stages of crop growth and therefore the guidance should tend at the proper time. Farmers are suffering a lot economically, socially and politically. Various challenges in agricultural domain are identified and architecture was framed meeting the above mentioned challenges. Knowledge base is structured with various crop details which discuss knowledge acquisition, flow, various input like market availability, geospatial data and weather prediction. Monitoring contains components like remainder, monitoring the growth of plant in various stages, irrigation scheduler, crop profit calculator, and calamity checker and problem identifier. Evapotranspiration method is used to calculate the water need of a plant per day with devised algorithm's help. A comparative study was made between various applications available with current developed system taking various aspects into account like knowledge base, monitoring modules, efficiency and reliability.

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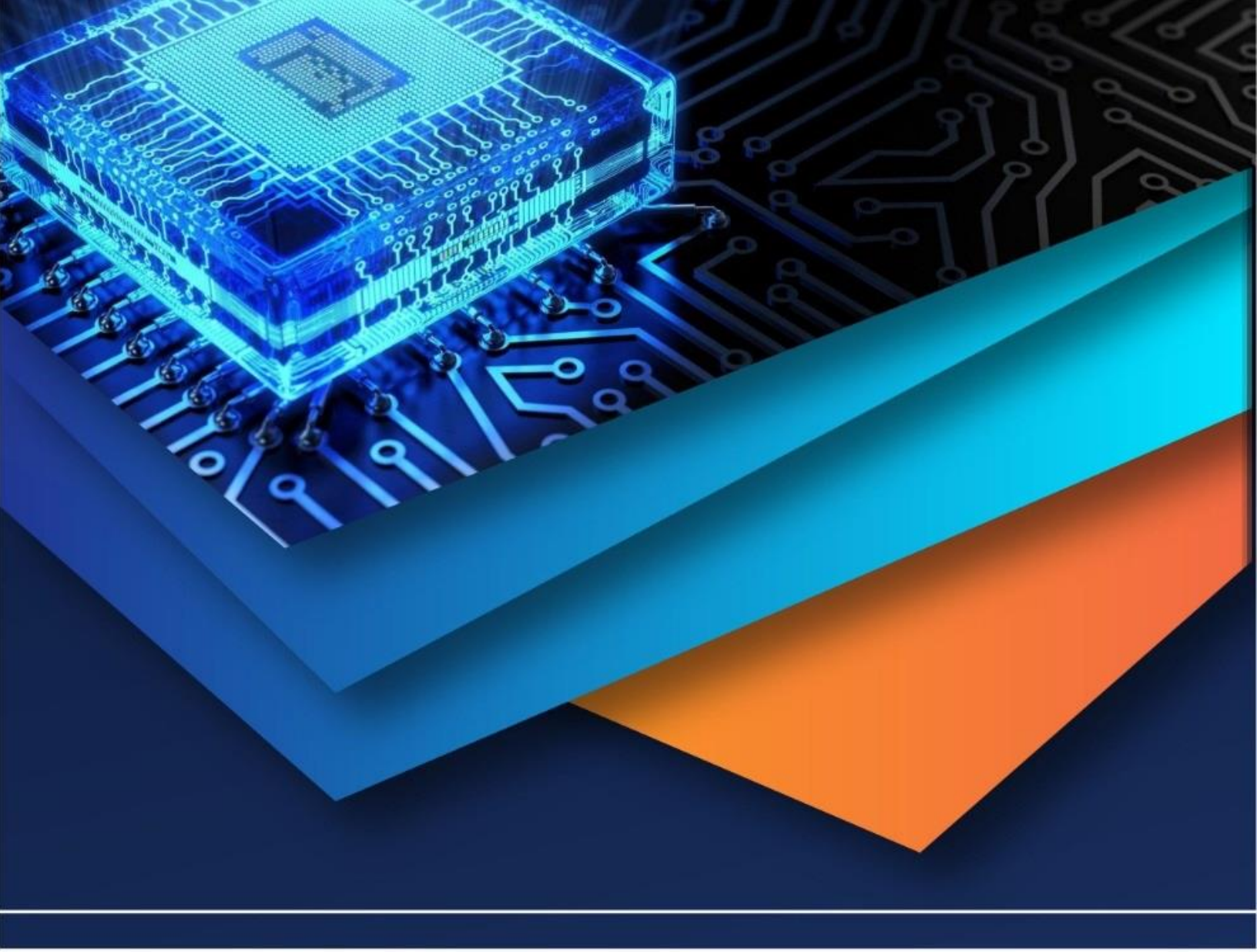

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