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IOT ENABLED SMART GARDEN MONITORING

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ABSTRACT

Population in urban areas are around 54%, this puts lot of pressure in maintaining greenery and air quality. It is vitally important that people in urban areas take charge of carrying out green activities around them. A lot of high rise towers or buildings in the horizon of the cities are seen, which means space can be utilized on top, in the terrace areas using urban gardening concept. Urban gardens are turned into brilliant, individualistic and fruitful spaces. Basic elementary task is detecting the soil moisture, temperature, humidity, nutrient etc. and further steps to maintain the garden has to be performed. Opportunity in evolution of IoT for urban farming application is providing with the help of new technology and services. We propose this project on urban gardening which will be able to automatically monitor and control the gardens. Moisten the grounds depending on different type of plants available that is it performs zone wise watering. A person can control the process through mobile phone application. This proposed system manages to reduce cost, minimize water wastage, and reduce physical human interface.

KEYWORDS

Internet of Things (IoT); zone wise gardening; MIT App inventor; three modes of operation; easily monitored; low cost.

1. INTRODUCTION

The cities are crowded with the people, very less space for people to stay and do green activities or any agriculture activities in the urban scenarios. This matter has to be taken into cognizance and put to use of the available land holdings for the useful activities. It is possible in cases of the terrace or roof top gardening.

Device that is designed using IoT conception connects to mobile phone directly. Ability to transfer data over the network is through IoT, as it provides an unique identification to all the users. Smart garden technologies help people precisely programme lawns and crops that need to be dampen. Using IoT/M2M sensors, users are able to monitor soil moisture levels, weather conditions and can use water more methodical and effectual. Hardware is embedded with electronics, sensors, software for connectivity and enables to achieve maximum values and obtain services by data exchange between connected devices and operator. So, this idea helps is systematical operation and is useful in many ways.

This paper presents a brilliant managerial controlled platform based on Internet of Things (IoT) for soil moisture content detection and irrigation purpose by using solar panels for power supply.

We propose two zones design, one involves collecting soil moisture values and switch on appropriate pump as required. The decision for watering is based on data that are collected and compared with pre-configured thresholds values. Further, three modes such as auto mode, manual mode and timer mode is designed, it is selected using mobile application helps user to control watering of plants. The results show that by using this device it reduces manpower, can

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mechanically control and monitor the operation, low cost and efficient system.

2. RELATED WORK

The development of a system for the measuring, monitoring and automatically irrigating in urban gardens using Internet of Things (IoT), it has sensors of CO2, humidity, luminosity, temperature, detection of plants and a hybrid application for its remote monitoring connected to a local area network. Also, the communication process used here is tested in order to provide a great connection service between the proposed system and the network and also to encourage agricultural production in urban sectors.

Sensors are used for data acquisition and IoT devices are used for data exchange through a web server. The explosive growth of IoT is changing our world and the rapid drop in price for typical IoT components is allowing people to innovate new designs and products at home.

The below shown devices is controlled using Arduino Microcontroller. In this device irrigation is automatic. Humidity, temperature, moisture values are wirelessly transmitted to the database, based on the codes written irrigation work is automatically carried out.

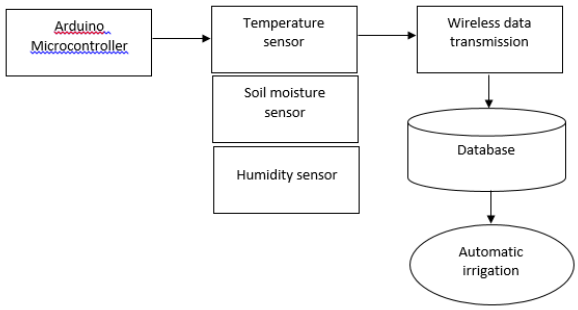

Fig 2.1: Sample existing system schematic

Irrigating the farm with automated irrigation system based on soil temperature, moisture and pH. Sensors are used to find the soil moisture content level and based on this microcontroller drives servo motor and pump. Irrigation status is updated to the database using PC. Depending upon the type of soil and crop, the fertilizers are suggested by applying Naïve Bayes algorithm on the database. The estimated amount of rain is predicted using weather forecasting using Web scraper and the crops are watered accordingly.

3. PROPOSED METHOD

Agriculture or Gardening can be improvised using technology. Irrigation depends on various aspects such as soil, climatic conditions, methods of irrigation, type of fertilizers and so on. The key to avoide over watering of garden is to understand the precipitation rates of our sprinklers, and to water the garden accordingly. Switch off the irrigation system if the ground is wet.

Precise knowledge about these factors are less known and can be overcome by developing devices on this regard. This also provides ease of work. The following model analyses the home gardening, collecting data through sensors & respected outputs are obtained. This model is also automated using IoT model & controlled through a mobile app.

Main objectives of the proposed system are as following: design and development of a microcontroller based sensor interfacing to read the various parameters to monitor the field, parameters on humidity, temperature, soil moisture. Interfacing between LCD and microcontroller is built to show the sensor readings sensed from respective sensors. ADC port in the microcontroller is used in order to convert the sensor values, since the operation is based on the threshold values as set in the program written for the execution. Using mobile serial port, Bluetooth or Wi-Fi module and UART port of the microcontroller, the read values are transferred. Android mobile application is developed for controlling the device with various modes of operation. Also displays the connection status. Cloud server connection is established in order to store all the soil test results as records over the server, by

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uploading it to the cloud. On timely basis when respective mode of operation is chosen. This can be viewed on Things on Cloud software. Cloud stores all the related information and connects to a mobile phone. Android mobile app is used to control and monitor the garden.

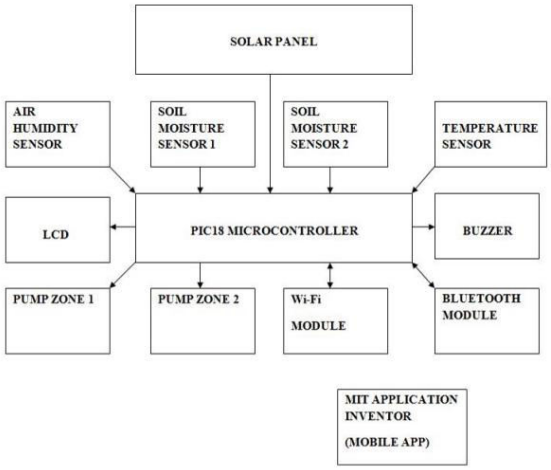

Fig 3.1: Proposed block diagram

All the sensors such as air humidity, soil moisture, environmental temperature sensor are placed in a garden and are connected to the microcontroller which acts as input and its values are read and will be displayed on LCD. We considered two zones depending on different type of plants and depending on the sensor's values in individual zones, motors will get activated. Here mainly we are using solar panel for power supply which is a energy efficient method. Buzzer will be on when the water level is less in the tank. The functioning of the system will be controlled by a mobile application created using MIT app inventor. This app works in three modes i.e. auto, manual and timer is designed. In auto mode system takes a value from microcontroller based on predefined threshold values in the program. These values are compared, based on the limits set, the motors are turned on automatically. In manual mode we have to manually control the system. There are two zones equipped with two motors, two or more motors based on number of zones can be installed. The required motor is turned on respectively, whenever necessary. In timer mode it is necessary to choose time intervals and the turn on/off time of a motor. This design can be controlled easily using mobile phone from any location. This device can be adapted in agriculture fields. It can help in improvising the air quality. This promotes the fast development of a modernization. For case studies, research particular plants. It can be used by any people who are passionate about gardening.

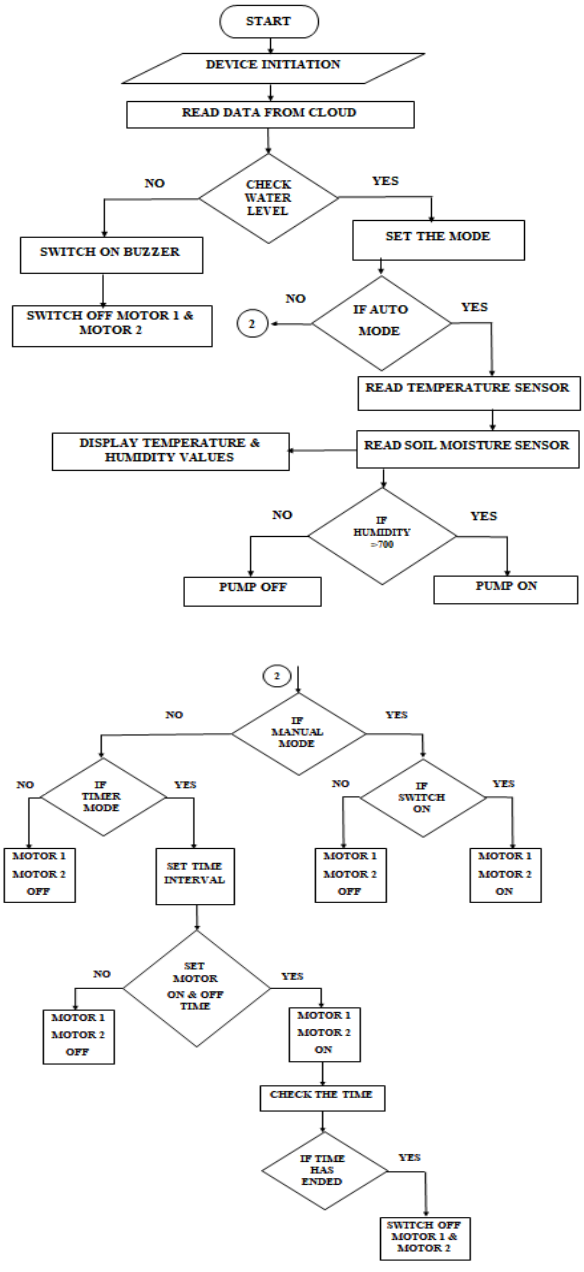

Fig 3.2: Mobile application flowchart

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4. RESULT

The experimental setup of a mini garden like field is arranged with two different blocks containing two different plants for purely experimental purposes. To access to the garden like setup in an easy manner, an user friendly application is created using MIT app inventor. The results are observed for invocating alarm to the user when required. Monitored real time sensed data is stored on the cloud server for decision making.

According to the threshold level set up in the code, when the soil moisture value reduces below or goes above the threshold level, it notifies the user in the form of texts indicating the condition of the garden. The system here is operated in three modes manual mode, auto mode and timer mode which is designed in the application as shown in figure.

Fig 4.1: Result of Mobile application, start page

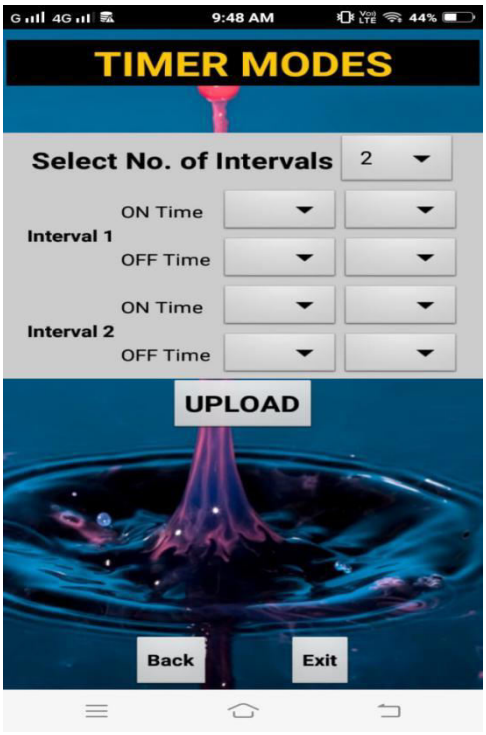

Fig 4.2: Result of Mobile application, timer mode

5. CONCLUSION

IOT Enabled Smart Garden Monitoring has been successfully developed with PIC18 Microcontroller. We have focused on using (microchip) PIC Microcontroller, which has the advantage of low power consumption.

The design and implementation of this system monitors climatic variables and supply of water in the urban garden. This system constitutes of three divisions of subsystems: 1. Mechanical subsystem (physical & motor), 2. Electronic subsystem (sensors), 3. Communication (mobile/web application). Sensors are used for measuring humidity, temperature, soil moisture content, in real time allows web interface so that users will be able to monitor the garden based on their convenience. Operation is carried out by comparing the sensor parameters with pre-defined threshold values.

The proposed model provides a depletion in human involvement, when the user is at remote places and also during night hours. Implementing the soil moisture based

automated watering system reduced the consumption of water.

Design of the system is self-sustaining, energy consumption is minimized also the usage of water resources. Proposed system improves plant quality and contributes to environmental sustainability. The future works of this system involves evaluating these models and their end users. In building commercialization, provide solid solutions for pollution control. Various ways to implement IoT framework applications in manufacturing purpose. More advancement of devices through studies, by adapting in education.

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