Provisional Agrology with Dam Actuation

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Abstract— The IOT has been denoted as the new wave of Information and Communication Technology (ICT) advancements. Agriculture happens to be the key source of livelihood for more or less every occupant in developing country including India. In order to satisfy ever-increasing demands for agricultural products, the agricultural productivity has to be doubled. The proposed framework for precision agriculture employs low cost environmental sensors, an Arduino Uno prototyping board along with Autonomous dam and sub canal system, which does not require manual operation. In this paper, an automatic dam gate system has been proposed to automatically control dam gate without human effort. An actuated dam gate system has been developed which can be used to protect the low-lying area from the tidal water as well as it can also be used in an irrigation canal, power plant, factories etc. DC motors are used to control the movement of dam gates. Wi-Fi module is being used in order to transfer the real time data from the sensors and operate accordingly.

Key words: Prominent Agriculture; Sensors; Arduino Uno; Motor Driver Controller; Wi-Fi

I. INTRODUCTION

Looking at the current state of agriculture, it is a well-known study that by 2050 we need to double the agricultural yield of the world. Key question is, how do you get these, given that the amount of arable land, the amount of land that you could use for agriculture is not growing, the water levels are not reducing, so how can you actually achieve that goal in a sustainable way. That is one of the fundamental question in agriculture that we are out to answer. It is as the way Green Evolution previously helped actually improved the agricultural yield. Using various methods but still investigating on those methods, we may not be able to achieve another break through to get us e double agricultural unit by 2050.

Organic agriculture in particular has experienced tremendous growth in last two decades. Increasing consumers want to know how and where the product is grown which means a good thing for small farmers. Now there is a pressure of how you start growing all that much at a faster rate. Agriculture is the oldest industry and technologically it is one of the most backwards. Technical community is looking at various ways in order to improvise this industry technically.

Water management system is currently an issue of growing concern. Reasonably limited water supplies, preservation and durability policies along with the infrastructure complexity for achieving consumer and irrigation requirements with quality levels help to make water management a challenging regulation problem. Diverse authorities typically operate water supply, treatment, transportation, and distribution separately. Faced with the rising demand in case of saving water, hydraulic engineers employ automatic control techniques to acquire a better performance in the real-time functioning of open-channel systems.

We need a disruption how do we get there; we are looking at this technique, which was developed around couple of decades ago called precision farming. Idea is that instead of farmer thinking of entire farm as a homogeneous piece, he could treat it as deep farm differently, different parts of farm are different, they absorb moisture differently, have different levels of fertility. You can plant seed closer together rather than applying irrigation throughout the farm in uniform manner. Applying only where it is needed and how much it is needed. Even though precision agriculture has been developed couple of decades ago it has not really take off. The data that farmer gets from the farm is very expensive.

Even though the sensors exist, deploying these sensors are non-trivial especially when you do not know what the result is going to be and how much benefit you are going to get. Even though the technology could help the farmer improve the yield, the cost of this technology is still prohibited.

Even if the humankind experienced agriculture, advancement there is still an issue of diminishing resources that must be advocated. The goal is to provide the useful insights to the farmer, and allow them to view the farm in terms of textual data from the sensors at varying intervals of time.

To operate the dam, an autonomous dam gate system has been proposed and developed in the study that will be able to open and close gates automatically when it is necessary and subsequently reduce water wastage. After taking into consideration all limitations, An Arduino based autonomous dam gate technique has been designed using a low-cost sensor, which offered better water level detection as well as consequently will be utilized to protect lowland areas from tidal water or excessive water during the flood as well as proper drainage issue.

II. LITERATURE REVIEW

A. Embedded Dam Gate Control System using C & Visual Basics 6.0

(Mukesh Iyer, Shrikant Pai, Sneha Badti, and Shubhangi Kharche 2013): Now a day's water scarcity is the major problem in India, factors responsible for this is improper supply of water, improper water saving system, improper opening and closing of dam etc. Till date, the dam gates were manually operated using PLC. This use of PLC may lead to many bugs and errors. To reduce this problem Mechatronic control system is proposed in this paper. Here we use Simple Input Multiple Output (SIMO), Sensor, DC Moto, Microcontroller, and Visual Basics 6.0. The software has C program and Visual Basics 6.0. We use BASCOM-8051 software as the integrated development environment for writing microcontroller code in C. Visual Basics 6.0 software

based controller provide the operator to control the system during manual operation of the dam.

B. A Review Paper of Automated Canal Gate Control of 3

ø induction motor with PLC and VFD powered by solar system and Monitoring by SCADA.(Mahesh Nandaniya-2013): This paper intended the canal automation. This purpose is to introduce a concise manner practical application of canal focus on gate control of canal. With respect to canal modeling, detailed procedure of data driven linear irrigation canal model is successfully developed. In this, we use PLC, which uses commands to open and close the dam gates. The speed of the motor (rpm) is controlled by Variable Frequency Drive (VFD). The system include sensors, radio communication, radio technology, remote terminal units, and SCADA package. SCADA operator implements the gate movement through the SCADA interface.

C. Designing Flood Control System

Using WSN. (Inyiama H.C, Obota M.E-2013): Recent advancements in information and communication technology and WSN have made new trends to emerge in flood control practice. This paper present automated flood control system based on Supervisory Control, wired and wireless communication efficiency. Control system is a device that maintains the operation of process. It mainly consists of Process being controlled, sensing systems, and controller. This can be open loop or closed loop. Open loop systems uses known relationship between the process input and output to dmadji must the controller parameters. Closed loop systems measure the output of process and adjust the controller parameters to minimize error signal. Here we use components such as WSN node, Sensor Probe, Pump, Water channels, Software Component, Supervisory Component (SCADA).

D. Design for Irrigation & Monitoring System

Actuated dam. (S.M. Talha, S. Sheroz Mohani-2012): This paper presents design and implementation of control system by means of microcontroller and data transmission network. To verify principle of operation of controlling design to be presented a miniature automated dam model is experimentally tested using PC based system. Enhancing features of PC is fully automated including PC interface. The design of model included two reservoirs upper and lower reservoir, both embedded with different water levels, which are monitored electronically by sensors. Here water can be discarded by any usual medium.

III. REQUIREMENTS

A. Arduino Uno

It is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world.

B. ESP8266 Wi-Fi Module

The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller

C. Relay Switch

A relay is an electrically operated switch. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal.

D. Push Buttons

A push-button (also spelled pushbutton) or simply button is a simple switch mechanism for controlling some aspect of a machine or a process.

E. Water Pump

Mini Water Pump operates in 6V DC

F. Servo Motor

It is a servo arm that can make turn in 180 degrees. Using the Arduino, we can command a servo to turn or operate in any desired angle rotation.

G. Soil Moisture Sensor

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content

1) Resistors (10KΩ) – For resisting the current flow.
2) Capacitors (10µF and 100nF) – For storing the charge

H. Circuit Board (Breadboard / PCB)

A printed circuit board (PCB) mechanically supports and electrically connects electronic components or electrical components using conductive tracks, pads and other features etched from one or more sheet layers of copper laminated onto and/or between sheet layers of a non-conductive substrate. Components are generally soldered onto the PCB to both electrically connect and mechanically fasten them to it.

PC with minimum 3GB RAM and 20GB HDD

I. Software Requirements

1) Arduino IDE

The Arduino Software (IDE) allows you to write programs and upload them to your board.

2) Java Development Kit 8

The JDK includes tools useful for developing and testing programs written in the Java programming language and running on the Java platform.

3) Android Studio

Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on Jet Brains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, Mac OS and Linux based operating systems.

IV. METHODOLOGY

The goal of this project is to develop an intelligent dam gate control system and the main purpose of this paper is to develop a system to control the dam gate and sub canals

automatically so that it can control the water flow from the dam to make an effective use of water in the irrigation system as well as to control floods caused due to leakage. Figure 1 shows the overall working process of our system where water level sensor is used to detect the level of water in the dam and provide a signal to the Arduino UNO board. A servomotor is incorporated to ensure the gate position; it is either open or close. Arduino UNO is used here as the main processor, which analyzes the data provided from the water level sensor, and after completing the analysis process a signal is sent to the servo motor to open or close the dam gate. The opening and closing of gates can also be monitored though the dam authority with the help of an app, which provides the information about the soil moisture of the surrounding areas and the water, level in the dam.

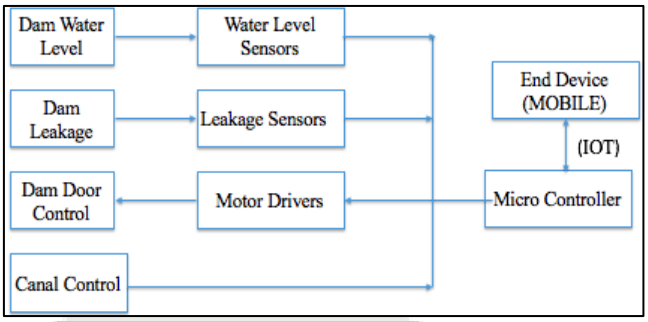

Fig. 1: Block Diagram of Methodology of the System

V. Design & Development

A. Architectural Design

System architecture is a conceptual model that defines the structure and behaviour of the system. It comprises of the system components and the relationships describing how they work together to implement the overall system. Figure 2 shows the architecture of the system.

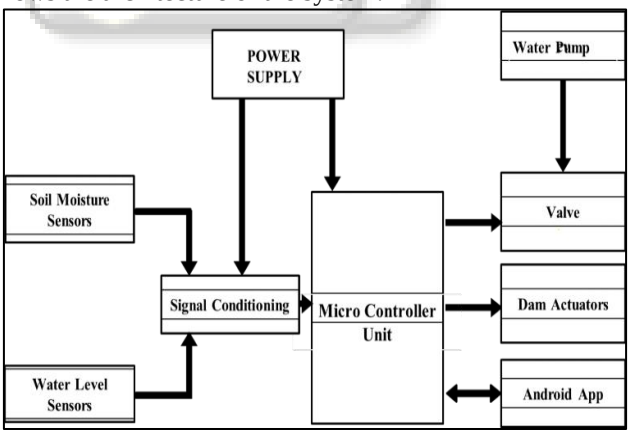

Fig. 2: Architecture Diagram

VI. Conclusion

With this proposed framework, we were able to develop provisional precision faming along with autonomous dam gate. The prototype was able to provide automaton for irrigation, low resources (water) utilization an also requires low Labour involvement. The proposed system has the potential of sensing water level and at the same time taking decision for movement of dam gates. This system also can initiate a water pump to draw out the excess water from the drain and use it in the irrigation process. This system can be used to protect lowland areas from tidal water. It can also be utilized in an irrigation canal, power plant, industries etc. However, some others addition and modification of the system can be available for the further improvements. Nevertheless, Arduino based dam gate monitoring system has made our system more reliable and feasible due to low cost and at the same time great effectiveness of Arduino over microcontroller or PLC. As an extension to our study, we would like to include few more sensors to collect information about soil and field plants.

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