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A Fuzzy Logic for Irrigation Controller and Data Mining System for Information Flow and Smart Decisions for Farmers

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Abstract: *All farmers are poor averagely. They can't afford the automation systems which are very expensive. All farmers need cheap and simple unit for their farm automation. We are trying to provide a generalized irrigation controller and web portal for information flow and smart decisions for farmers. We put a system model which will handle farm irrigation automation with 'n' number of sensor inputs and user interfaces. We also put a system model which sends the 'ON FARM ACTIONS' data to the central receiver. This server provides a web portal for 'n' number of farmers to access their data which is related. It will help to take smart decisions depending upon the collective data and virtual farming algorithms.*

Keywords: *Farmer, Agriculture, Automation, Generalized Irrigation, Microcontroller, Data Processing*

I. Introduction

The design systems are used to control the irrigation activities depending upon the sensor inputs of various kinds. The structure cloud based processing system for data which is acquired from the 'on farm actions'[1][2].

II. Literature Survey

We studied the systems which are used by the farmers resulting from the utilization of water, energy etc. Some farmers are using the automation systems. We studied all those devices and equipments etc. While doing this we met some farmers and asked some questions to them. While doing this we came to know about some unique requirements of the farmers [2][4]. We studied the market statistics too in order to know about the equipments which are available in the market which are the technologies used by the various industries and farmers for automation of their field. We found that various sensors are available in the market for soil, water purity checking, humidity checking, temperature checking etc [3][5]. In order to have a unique collaboration among all these available sensor and equipments, we searched and studied a lot about these all. Jain Irrigation Company is one of the top most companies in India which work in the agriculture field and specifically in the domain of irrigation. They are collaborating with us for this task. Also the Irrigation Research Division, Pune (Government of Maharashtra) is providing their dedicated help for this task [4][5][6].

III. Research Methodology To Be Employed

The major system modules which constitute the proposed system model are described as below:
[1] Sensor Interface
[2] Key Control Unit
[3] Microcontroller Unit
[4] Valve Controller
[5] GPRS Modem
[6] Application Server
[7] User

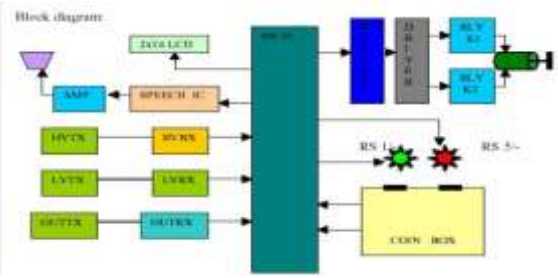

Figure 1 Block Diagram of the Proposed System Model

The description of the above block diagram is explained as below:

[1] Sensor Interface

The Sensor Interface is the module which is responsible for accepting the input from the sensors in 24 Volts AC form and converts it to 5Volts DC [1][3][5].

[2] Key Control Unit

The Key Control Unit is responsible for generating an appropriate bit patterns for user input [3][4][5].

[3] Microcontroller Unit

The Microcontroller Unit is responsible for accepting the sensor and the user inputs over different ports. Then run the defined algorithm in current system environment. Then generate the appropriate Valve Control Voltages and AT Commands for Valve Controller and GPRS Modem respectively [4][5][6].

[4] Valve Controller

The Valve Controller takes the input from the microcontroller and then switches the appropriate irrigation valve with the required voltage for example 12 Volts AC [5][6][9].

[5] GPRS Modem

The GPRS Modem does all the encoding of AT commands which are received from the microcontroller and then transmits all of them for predefined server IP address over the predefined port address by using FTP or HTTP protocol [6][7][9].

[6] Application Server

The Application Server accepts all the data from the GPRS Modem over a socket which is already defined. Then it stores it into a database. It also provides the user web portal for 'n' number of users. It gives access to their data of 'ON FARM ACTIONS'. It also provides SMART answers and decisions for farmer queries regarding irrigation [6][7][8].

IV. Results

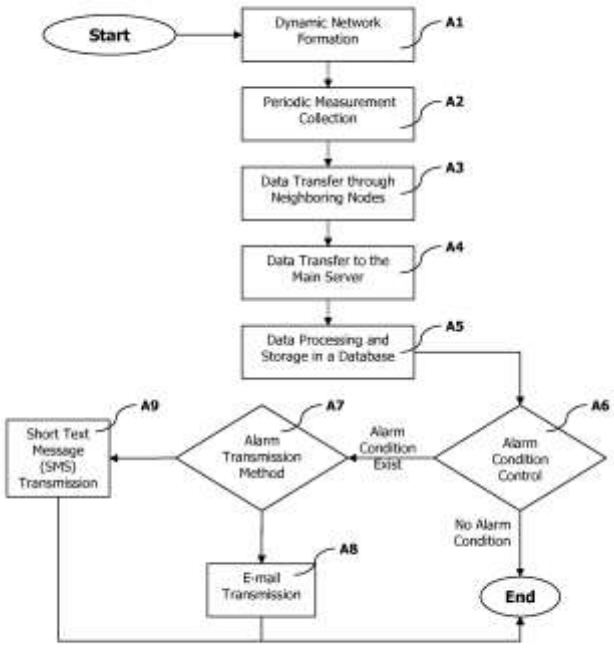

Figure 3

Figure 2 Work Flow Diagram of the Proposed System Model

The work flow of the proposed system model is described as below:

[1] The sensors are all active entities. They provide their input to the microcontroller [4][5][7].

[2] At the same time the user can provide manual settings via key control interface [5][6][8].

[3] Then the microcontroller accepts these patterns on its input ports. Then it executes its prewritten algorithms. Then it generates the valve control voltages and AT Commands [1][3][6].

[4] The Valve Controllers then evaluate the pattern and switch between appropriate irrigation valves for turning ON/OFF [4][6].

[5] At the same time the GPRS Modem converts AT Commands to packets and sends those over network for predefined IP address and port address [8][9][11].
[6] The Application Server then processes these received data on it sockets and stores it back to the database [7][9][10].
[7] It also provides user interface via web portal for users/farmers in order to access their data of 'ON FARM ACTIONS' [9][11].

V. Usability

The usability of the proposed system model is described as below:
[1] Irrigation Automation will be done as the system runs on sensor feedback [10][11].
[2] Simple Interfacing is provided to reduce the need of individual sensor controllers [9][10].
[3] Huge systems of irrigation can be built by using this model as it supports 'n' number of inputs and outputs [10][11].
[4] Cost Reduction is possible since the system is modular and uses simple and cheap subsystems [2][8][9].
[5] Central data processing is done on the application server which provides the digitization of data for farmers [7][9][10][11].
[6] Smart Decisions and Answer Systems are built up as the data is stored centrally and is available in bulk to apply the complex and virtual farming algorithms [7][8].
[7] Complete Irrigation Package will be available in cheap cost for farmers which will in turn give cost reduction, energy reduction, water utilization, smart decisions etc [6][7][9].

VI. Conclusion and Future Scope

It will result in conservation of water and labour since the systems are automatic, they do not require operator. System and operational flexibility is increased as the desired any valve can be controlled along with the pump and the increased efficiency of water and fertilizer use. Systems can be operated at night also. It results in cost effective irrigation system as it generalizes the system for 'n' number of sensors and irrigation valves. It provides centralized storage for farm data which uses the concept of data mining and support MART decision making. The savings in the energy cost, system cost and water. More farmers can afford this system as it is cheap. More Generalization will be assigned to the system model in future support more number of variety of on field/off field sensors and irrigation valves. More cost reduction will be tried in order to achieve as trying different combinations of cheap material which is available in the future. Cloud computing for data processing will be used to support a large number of active and claimed users and SMART decisions and answers for their questions. Solar charging for On Farm System will be the part of focus as being used to. Application server optimization is also possible with the help of this proposed system.

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