



Multiple Valve Control in Farming Using PLC

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during the
starting years
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ABSTRACT

Agriculture is very important in the overall economic development of a nation and in which irrigation plays an important role in agriculture development. Here, It is proposed a methodology for multiple valve control in smart farming by using PLC and smart irrigation system through Global System for Mobile (GSM). This proposed system will focus on automatic turn on and turn off of multiple solenoid valve and switch on and off of motor that plays major role in farming activities. Based on the environmental condition, In both day and noon, the valve can be controlled by smart phone through message to GSM module connected with PLC. This modeling and control techniques of a smart irrigation and smart farming are demonstrated here.

Keywords

PLC, GSM, Solenoid valve, Irrigation, smart phone

INTRODUCTION

Agriculture is the vital aspect of Indian economy and it continues to remain for long time. Annual GDP growth rate has been elevated from below 6 percent

than 7 percent. This is because of rapid growth in non-agriculture zone. Degradation of land and climatic condition results in Ground water aggravation. Irrigation water has become scarce. Indian agriculture is classified into agro-ecological diversity in soil, temperature, rainfall and cropping system. Land grooming, reaping, threshing and irrigation are the operations, which utilize more energy in farming. In which utilization of water is importance. In the above operations irrigation plays the role in yield capabilities. Irrigation is defined as Artificially supplying & systematically dividing of water in order to obtain high or qualitative agricultural production. Successful farmers have used various methods to supply water to their crops. Irrigation is an artificial usage of water to overcome deficiency in rainfall for growing crops. Irrigation is a basic need to increase yield.

In the next few couple of years, world population will increase. so it is needed to increase the food product production to meet the demands of increased population.

If the rainfall decreases, Agriculture becomes impossible without irrigation. Nowadays irrigation farming is limited. It protects crops from drought and It increases yield of crop. Irrigation will help to cultivate master crops with the water supply as per need of the crops and it is implemented by using solenoid valve. Ultimately it helps in economic development. In addition, irrigation improves water content of plant fibers, dissolves nutrients and makes

them available to plants. So it is suggested to move to smart farming with modern technologies to improve irrigation and to reduce usage of enormous amount of water

RELATED WORKS

The recent works in implementation of smart farming using PLC have been studied. In this, A detail literature survey on the published work in this field have been done.

In [1], the novel approach of smart farming employing a method which links a smart sensing system and smart irrigator system by communicating with the help of wireless network. it also emphasizes on key measurement of physical parameters.

In [2], Autonomous or unmanned aerial vehicles have been put forward for farming. The development of unmanned aerial vehicles such as drone had an impact on calculating biomass development and fertilization status of crops by using lightweight and powerful hyper spectral snapshot cameras

In [3], The project emphasizes on agriculture which is automated and also makes farming easy using advanced technologies. PLC and SCADA gives the system full control over the elements put forward and forms the front end for a user friendly interface.

In [4], The novel deals with the monitoring and management of water storage and distribution with the help of automation system such as PLC and SCADA. It can be made possible of controlling irrigation, water storage and monitoring which avoids wastage of supply water.

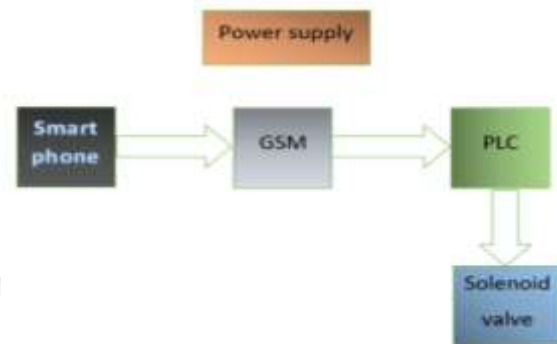
In [5], The paper focuses on the smart irrigation and prevents water wastage in uncontrolled irrigation. New irrigation electrical control improves irrigation efficiency, promoting water conservation and reducing environmental impacts. The key feature is to avoid wastage of water by using PLC based sprinkler irrigation system with different level of sensors and GSM controller.

From the above survey, It is found a novel approach using a smart system that tracks of external environmental factors and develops communication with the irrigation system to perform necessary tasks that are needed for farming. In this system, a problem faced by the farmers have been solved.. The main problem faced by them are distance operation of

communication to the irrigation system is not possible using zig bee and other communication devices. So it is introduced GSM, solenoid valve and PLC for solving the problem

PROPOSED MODEL

In the proposed idea of the system is to automate the irrigation system of the farming activities by the principles communication and electronics. It is accomplished the idea by using GSM, PLC, Solenoid valve, mobile phone.



EXPERIMENTAL WORKING

The main component used for implementation is PLC, which is a controller used for controlling the application. PLC can be programmed using WPL software and the program is compiled and debugging is done. For analysis, the programming can be reworked and recompiled. The output of the system can be produced and checked on the WPL software itself. Here GSM is used for communication purposes. It is used as a communicating interface between smart phone and PLC. By using smart phone message can be sent to GSM module, through transmitter and receiver the message send via smart phone to GSM is transferred to PLC and in PLC, the message is processed. For different messages corresponding various set of codes is dumped in PLC. So based upon the message sent, the PLC response will vary and output of the system also varies. The PLC will respond by generating electrical signals on its output ports. From the PLC, the output will be sent as electrical signals. There are different applications connected to different port pins of the PLC. Based on the electrical signal created on the port pins, the corresponding application will respond for the created electrical signal. The electrical signal is of two types signal low and signal high. If the signal is low, then turn off process will be done. If the signal is high, then turn on process will be done

For instance, if message sent as “motor on” then motor will be switched on or if message sent as ” motor off” then motor will be switched off or if message sent as “valve1 on” then corresponding valve1 will be switched on or if message sent as “valve1 off” then corresponding valve1 will be switched off or if message sent as “valve2 on” then corresponding valve2 will be switched on or if message sent as “valve2 off” then corresponding valve2 will be switched off.

PLC

The vital part of the system is PLC Module which means Programmable Logic Controller. The PLC is an electronic device which is mainly used in industrial automation purpose. Also it is a most sophisticated device available currently in the market for the industrial automation. The PLC has the capability to automate very particular process, machine function also entire manufacturing process. The companies like Delta, Motorola, Mitsubishi are manufacturing the PLC. It has two different kinds of ports available for the operation which is Input and Output ports. There are also different kinds of PLCs with different number of input and output ports available in it. Based on the application it is selected the appropriate PLC. The PLC module is configured by using the programming. For the programming, There is a software called WPL Software. By using this software, it is possible to simulate the program before transferring the it into the PLC module thereby the error correction is easy. In programming section, There are two different programming methods. They are Textual language and Graphical form. The textual language programming is considered more complex whereas the graphical programming is considered simple than Textual programming. So therein its simplicity in programming Graphical form is mostly preferred over Textual form. In the graphical form, there are different kinds of programming methods. They are Ladder Diagram, Function block diagram, Sequential function chart. Ladder logic, it is considered to be easiest way of PLC programming and it is also called as Relay Logic. Here horizontal lines are denoted as Rungs and vertical lines are denoted as Rails. There is electrical connectivity in Rung between positive rail and negative rail.



GSM

The another vital part of proposed system is GSM Module. The GSM by abbreviation means Global System for Mobile Communication. The GSM is mainly used for Mobile Communication across worldwide. It is widely used for transmitting Voice and Mobile data at different frequency range. For transmission purpose, there are different frequency ranges like 850 MHz, 900 MHz, 1800 MHz and 1900 MHz. GSM module is based on the technique called TDMA which means Time Division Multiple Access. The GSM Module digitalize the information also contract the size of the data and send it by the channel with different streams of client data which has its own time slot. It has the ability to transfer data at 64 kbps to 120 Mbps. They are different kinds cell size in GSM system. They are macro, micro, Pico and umbrella. The GSM network consist of a Mobile Station. Some of the advantages of the GSM Module is, it has good spectrum efficiency over others and international roaming facility. Indeed, it has short message service is compatible in it. For working it is integrated to MC through the level shifter IC Max232. It uses serial communication to send data.



SOLENOID VALVE

The another component in the system is Solenoid Valve. It is a Valve which is operated electromechanically, that is controlled by electric

signal to control the flow. The characteristics of solenoid valve is depending upon the electric current are using in it. Many number solenoid valves can have placed together on a manifold. It is mostly used in fluidics. There are many kinds of solenoid valves. They are ordinary valve, 2-way valve, 3-way valve. The solenoid Valve's advantage is that it is safer and also it faster operation. Indeed, it has high reliability and low control power consumption. Solenoid Valve is made by using the following components. They are Core tube, Bonnet, Solenoid subassembly, Hanger Spring, Backup washer, Disk, Valve body. Solenoid is mainly manufactured by using Brass, Aluminum, Stainless Steel etc. It is mainly used to hydraulic system, automatic irrigation system.

WPL

It involves the control and analyze the functionality of programmable logic controllers by monitoring their work with the sophisticated utility. Its related to development tools. It also reads the set values of the software components and checks temporary values in timer (T), counter (C), and register (D). This software can be run on Windows XP, Windows vista, windows 7, Windows 8 or Windows 10.

SMART PHONE

The another component in the system is Smart phone. At Present there are different kinds smart phone available in market with a lot of stunning features. Indeed, it also have different kinds of operating system. For instance, operating systems like IOS, Android, Linux etc. Any smart phone has been chosen which has the Messaging facility. The Smart Phone is integrated with PLC Module for automation purpose with the help of GSM Module. The precise operation of smart phone is to send command through message to the GSM Module which is processed for further action of automation.

CONCLUSION

Thus the key reason for the development of this project is to reduce the manpower and to increase the yield of crop. The proposed user friendly farming is used for distance operation of valve automation. This in-turn create a good future for farmers

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