

Automatic Controller of Even Supply of Water in Dams during Excess Flow using PIC Microcontroller

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Abstract— This paper mainly deals with the automation system that is done to overcome the difficulties faced by the overflow of water inside the water storage canals, dams, reservoirs, lakes, etc. In this paper, we present the concept of a hierarchical predictive controller used for irrigation canals. In response to such a control problem, we propose a hierarchical controller: the lower control layer is formed by decentralized proportional integral (PI) controllers and the higher control layer is constituted by a centralized predictive controller. For example, if the overflow of water in dams is more than its withholding capacity then there occurs damage. In order to avoid such kind of effects, an automation system is introduced. This is done with the help of a PIC Microcontroller, float switch, flow switch and a Zigbee module.

Key Words— PIC Microcontroller, Float switch, Flow switch, Zigbee Module.

I. INTRODUCTION

An irrigation canal is a waterway, often man-made or enhanced, built for the purpose of carrying water from a source such as a lake, river, or stream, to soil used for farming or landscaping. An essential element of farming found in archaeological digs dating as far back as 4,000 BC, irrigation canals have often meant the difference between sustenance and starvation. An irrigation canal, at its most elemental, is a trench filled with water. It can be dug into the ground and then filled with water, or an existing stream can be widened in a process called

"canalization," and diverted as appropriate to provide maximum efficiency. Another way to create a canal is to build up the walls first, using the dry ground as the bed, and connect it to a water source only when completely built.

Many irrigation canal regulation methods have been developed in the world. These methods differ from a country or region to another. They range from the simplest methods, developed more than 2000 years ago, to the most sophisticated ones developed recently, or under development.

In order to overcome the effects of flood, we introduce an automatic system where we control and monitor the excess flow of water in dams, reservoirs, etc. This can be done with the help of PIC microcontroller, float switch, flow switch and Zigbee module.

II. EXISTING SYSTEM

In existing system they used a model predictive controller approach. In that system a human operator will be travelling between the gates as ordered by a remote centralized controller.

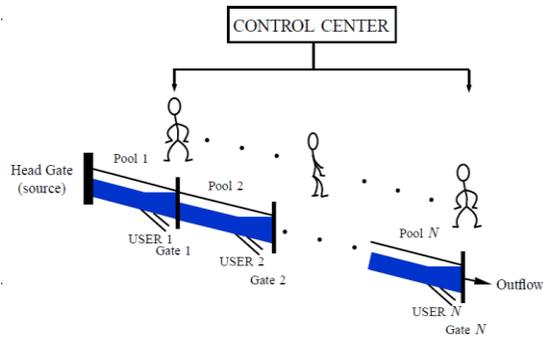
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Fig(1): mobile mpc configuration for an irrigation canal

The operator provides the controller with up to date measurement from the location visited and act as the actuator as required by the remote controller. It is a point to point communication between one person to another person. If the water is filled in one gate then it is informed through a controller to an operator via mobile device who is at the subsequent gate. In this system no equipment needs to be installed at the local sites and instead the operator carries a simple portable device.

DISADVANTAGES OF EXISTING SYSTEM:

- Mpc controller is completely a manual controller.
- It is not possible to fix the relay on the equipment.
- It is a point to point communication.
- Time delay is more.
- High maintenance cost.
- Poor performance.

III. PROPOSED SYSTEM

The scheme that we propose is designed not to rely on a frequent communication, and in particular, it works in an event-driven manner, where individual events are associated with delivery requests and also with other special circumstances occurring in the canal and requiring extra care, e.g., heavy rainfall.

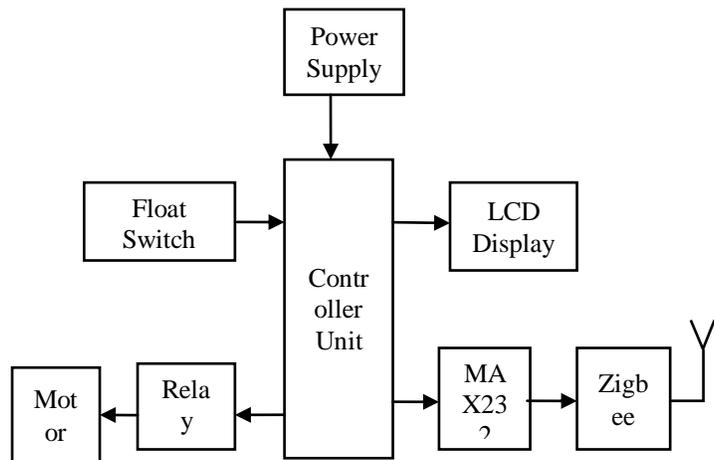
Our scheme will thus step in only when there is a need for it, and if so, it will modify the set points of the local PLC controllers. In times of a normal operation,

we propose to use local decentralized PLC controllers along the canal for upstream control.

BLOCK DIAGRAM:

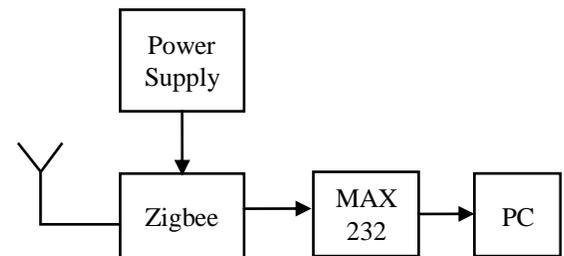
TRANSMITTER:

Figure(i): Transmitter node for irrigation canal



RECEIVER:

Figure (ii): Receiver node for irrigation canal



❖ **FUNCTIONS OF THE ELEMENTS:**

- PIC 16f877a:
It is used to control and perform the operation.
- FLOAT SWITCH:
It is used to detect the water level in normal conditions.

- RELAY DRIVER:
It controls the circuit with low energy level.
- DC MOTOR:
It is used to control the gate level.

BLOCK DIAGRAM DESCRIPTION:

FLOAT SWITCH:

Level sensors stumble on the extent of drinks and different fluids and fluidized solids, together with slurries, granular substances, and powders that showcase a top loose surface.

DC MOTOR:

A DC motor is any of a category of electrical machines that converts direct contemporary electrical electricity into mechanical electricity.

RELAY DRIVER:

A Relay driver is used to control a circuit through low energy sign or where in number of circuit ought to be managed by way of one signal.

MAX-232:

The MAX-232 is a dual driver/receiver and typically converts RX, TX, CTS and RTS signal.

ZIGBEE:

Zigbee is a low-cost, low-strength, Wi-Fi mesh community trendy targeted at the extensive development of lengthy battery life gadgets in Wi-Fi manipulate and tracking applications.

PIC16F877A MICROCONTROLLER:

It is a 40 pin 8-Bit CMOS FLASH microcontroller. The microcontrollers are similar to microprocessors, but they are designed to work as a true single-chip system by integrating all the devices needed for a system on a single-chip. The timing and control unit will generate the necessary control signals for internal and external operation of the microcontroller. Microcontrollers with internal ADC can directly accept analog signals for processing.



Figure (iii): PIC16F877A

RELAY DRIVER:

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.



Figure (iv): Relay Driver

DC MOTOR:

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.



Figure (v): Dc Motor

ZIGBEE:

Zigbee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios.



Figure (vi): Zigbee module

TRANSFORMER:

A TRANSFORMER is a device that transfers electrical energy from one circuit to another through inductively coupled wires. A changing current in the first circuit (the primary) creates a changing magnetic field; in turn, this magnetic field induces a changing voltage in the second circuit (the secondary). By adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other. The secondary induced voltage V_S is scaled from the primary V_P by a factor ideally equal to the ratio of the number of turns of wire in their respective windings:

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

By appropriate selection of the numbers of turns, a transformer thus allows an alternating voltage to be stepped up — by making N_S more than N_P or stepped down, by making it less.

A key application of transformers is to reduce the current before transmitting electrical energy over long distances through wires. Most wires have resistance and so dissipate electrical energy at a rate proportional to the square of the current through the wire. By transforming electrical power to a high-voltage, and therefore low-current form for transmission and back again afterwards, transformers enable the economic transmission of power over long distances. Consequently, transformers have shaped the electricity supply industry, permitting generation to be located remotely from points of demand. All but a fraction of the world's electrical power has passed through a series of transformers by the time it reaches the consumer.

HARDWARE MODULE:



Figure (vii): hardware module

The above figure (vii) represents the hardware setup of the proposed system. The transformer and the rectifier unit together converts the input 230v power supply to 12v and 5v as required by modules. The metal regulator that converts output voltage of 12v or 14v into 5v. PIC Controller used to control the other components, there are two float switches used, they are low level and high level switches used to indicate the water level. if the water is exceed the low level the float low level is on then increase the water float high level switch is on the motor is rotate reverse direction the gate is open level by level the water is outcome, if the water level is touch the low level the motor is rotate forward direction the gate is closed, if water is below the low level no operation is performed.

ADVANTAGES OF PROPOSED SYSTEM:

- ▶ It works fully automatic.
- ▶ Maintenance is easy.
- ▶ Low cost.
- ▶ This system is helpful during unexpected situation like heavy rainfall.

IV. CONCLUSION

Since, the use of irrigation canal system has become more advantages when compared to existing system because This system works automatically and efficient manner. The amount of water is saved and to avoid the effect of flood, this system works under normal condition and unexpected situation like heavy rain. This makes the entire project more reliable and cost effective.

V. FUTURE SCOPE

In future we can use a GSM instead of Zigbee in order to immediately inform the controller head even when he is at far distance from the dam or canals. It updates the signal in the form of message. So that it would be more helpful for monitoring the level of water.

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