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Water Monitoring System Based on GSM

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Abstract: The method to check and control water level for irrigation system. The water is a one of the important natural resource and it is an important assets to save the water on the earth. This paper describes the automatic system to monitor and control water level with the help of water level sensors and wireless network system. The need of this paper is to cut water wastage occur in canel and subcanel, and the WSN system reduces the human efforts.

Keywords: WSN, water level sensors, etc.

I. INTRODUCTION

Water is one of the important natural resource in the world, which is used for different purposes like for irrigation, for drinking, in hydro plant, etc. so it is necessary to save wastage of water in field, in nuclear plant and hydro plant also. Thus this project introduces a simple wireless monitoring and control of water surveillance system which uses water level sensors. The WSN is one of the technologies which has advantages of low-cost, low power consumption and self forming. This proposed project "canel and subcanael water level surveillance "will be designed to monitor and control level of water and save wastage of water in irrigation system. As the country is making its progress through industrialization, our water resources are prone to a threat of pollution especially from the industrial activities. It is a challenge in the enforcement aspect as it is impossible for the authorities to continuously monitor the location of water resources due to limitation especially in man power, facilities and cost of equipment. This project focuses on the use of multiple sensors as a device to check the level of water quality as an alternative method of monitoring the condition of the water resources. The wireless sensor network based on Zigbee technology is developed to solve the defects of existing parameters monitoring system. In the wireless system, all the data will be transmit in wireless method. The environment data from temperature sensors, pH value sensors, tachometer and ammoniacal nitrogen sensors will be collected in every network node and transferred to monitoring center. Since the real-time measuring data could be transmit to monitoring center via Zigbee network and GPRS network, the operation staff will only sit in the office to check up the System running state. ZigBee is developed by ZigBee alliance, which has hundreds of member companies (Ember, Freescale, Chipcon, Invensys, Mitsubishi, CompXs, AMI Semi conductors, ENQ Semi conductors), from semiconductor and software developers to original equipment manufacturers. Power needed for ZigBee is very small. In most cases it uses 1mW (or less power). But still it provides range up to 150 meters in outdoor which is achieved by the technique called Direct Sequence Spread Spectrum (DSSS). Also DSSS consumes less power compared to Frequency Hopping Spread Spectrum (FHSS). It works in the 868 MHz (Europe), 915 MHz (North America and Australia) and 2.4 GHz (available worldwide) ISM band with up to 20kbps, 40kbps and 250kbps data rate.

II. LITERATURE REVIEW

N.Zachos at all [1] in their research paper has implemented remote measuring station in present of wireless system for monitoring of water level. They have achieved an ultrasonic distance measuring system. In this the remote stations are considered as simple measuring units with a communication interface so that they may be operating under the control of base station. the advantages of their paper are no mechanical parts required, remarkable accuracy and resolution. The disadvantage of their paper the water level monitoring is developed slowly and it required temperature compension.

Zhou Yiming at all [2] in their research paper has implemented the Wireless system for monitor and control of water level in greenhouse. They had used ZigBee network and several sensors nodes. The advantage is low cost and high network capacity.

Zulhani rasin at all [3] in their paper elaborate the ZigBee network for water irrigation control monitoring system. They had used a various sensor node to detect the water level in the reservoir and it is based on the signal from the sensors, and a simple electronic circuit either open or close the gate controlling the flow of water. In their paper it is important to mentioned here, the circuit present in their project is on a conceptual scale and not yet in the form than can be directly applied to the available water irrigation controlling gate. The disadvantages of this paper that the battery needed in this project is operated only for 12 hours and require more human effort.

Nuno Brito at all [4] in their paper has implemented control of water level in two tank without interaction. They had performed in a remote collaborative method. In

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this paper the system includes two tanks made in acrylic, a pump to circulate the water from the lower part of tank to the upper tank, two ultrasonic sensors was used for measuring both tank levels, and electronic valve to stop the flow of water between the upper level tank and the lower level tank and a manual valve for security purposes. The disadvantage of this system ,it is not available with local or remote control configuration for demo purposes.

Zhang Zhi at all [5] in their research paper elaborate the control and monitoring of water level in nuclear power plant. In this paper the Steam generator was used for water level control system which was the most important components of the nuclear power plant. In this paper it develop the performance assessment method for a class of SG level of water control systems, two PI controller system. A major contribution of this paper was to take the performance assessment technology into an industrial area, SG water level control in NPPs, where not much work has been done before.

P. Komeswarakul at all [6] in their paper has proposed automatic water monitoring system using microcontroller for dam. In this paper [6], the remote terminal unit (RTU) based on DSPIC30F4011 microcontroller was mainly designed to precisely measure, store and send instruments output to the computer server including real-time communication for dam behavior monitoring system. This system also provides the real-time information via reliable fiber-optic communication. The sensors installed into structure of dam and in reservoir to measure physical quantities of interests such as seepage flow, water level, deformation, pressure and temperature parameters. The aim of this paper [6] presents the RTU that operates in the dam monitor system. The RTU based on DSPIC30F4011 microcontroller is mainly designed to precisely measure, store the analog value of instrument sensor devices related to dam behaviour. It is used to directly exchange data between computer and RTU via RS232 serial communication. fig.1 Remote Terminal Unit Hardware Diagram. fig.2 Communication mechanism.

There are many works on the application of WSN for monitoring system where Zigbee is used to monitor the condition of long span bridge after considering disadvantages of the currently used wire and cable for data communications such as high installation cost of communication and power supply for the sensors, difficulty in the installation of steel pipeline for protecting the cables, sensor data distortions due to temperature changes on noise affecting cables and sensors. The Zigbee is used for the short distance communication while CDMA (Code Division Multiple Access) infrastructure was used for long distance communication between sensors and the server system [5]. Zigbee provides the ability to run for years on inexpensive batteries for a host of monitoring applications: Lighting controls, Automatic Meter Reading (AMR), smoke and CO detectors, wireless telemetry, High Voltage AC control, heating control, home security, Environmental controls and shade controls. Sensor nodes enable environment sensing together with data processing. Instrumented with a variety of sensors, such as temperature, humidity and volatile compound detection, allow monitoring of different environments. They are able to network with other sensor systems and exchange data with external users [4]. This system hardware consists of three parts: wireless sensor nodes, data exchanging nodes and monitoring platform cables,

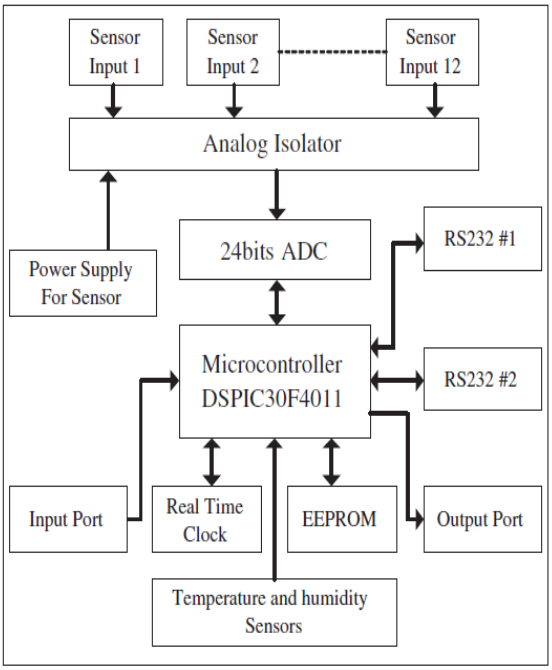

Fig.1 Remote Terminal Unit Hardware Diagram

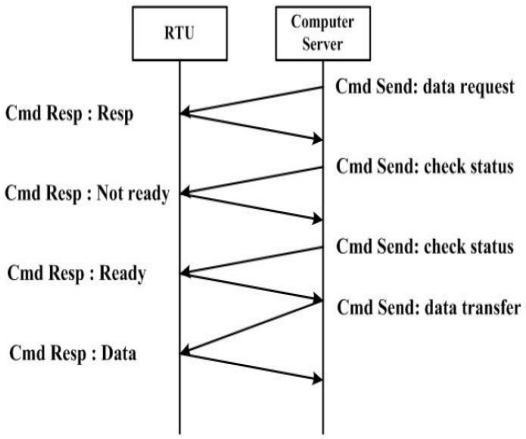

Fig.2 Communication mechanism

Ms.Aparna M. at all [7] in their research paper has implemented a system for water environment monitoring water using GSM system. The control mechanism of the dam gates were done manually and using PLC. But there were lots of errors in manual method Also the PLC based system was huge and hence suitable for major dams due to its cost. For medium and small dams like irrigation dams does not need such huge PLC systems. So to cut these problems a mechanical control system was proposed in their project.

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Communication architecture for sensor networks is configured, and the algorithms and protocols developed for each layer in the

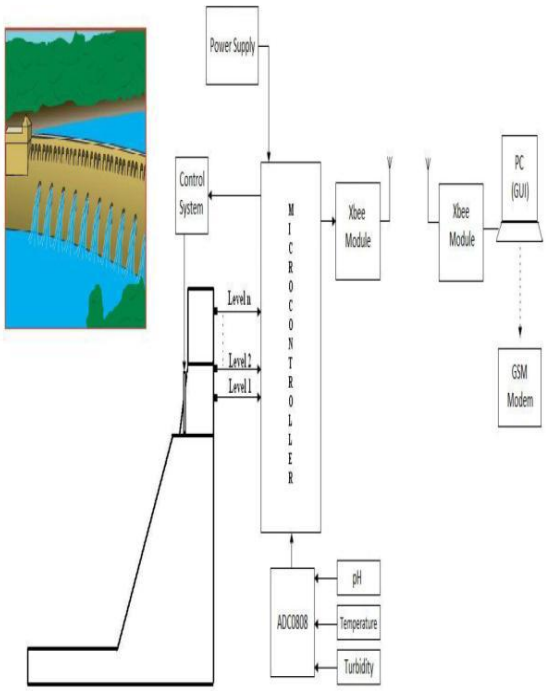

Fig.3 System Block Diagram

III. PROPOSED SYSTEM

The block diagram of the proposed GSM-Bluetooth based system is given in fig. 3. In this system both GSM and Bluetooth modules are interfaced with the main controller chip. GSM is used for remotely monitoring and controlling the devices via a mobile phone by sending and receiving SMS via GSM network. Bluetooth is used for the same purpose but within a range of few meters, say when user is inside the periphery of the building where the system is installed, Bluetooth can be used for communicating with the devices thereby eliminating the network usage cost. This is an important merit of the proposed system.
The motor pumps and fans are controlled automatically using sensor and the other appliances are controlled by Bluetooth or GSM network via SMS. The system informs user about any abnormal conditions like low water detection and temperature rise via SMS from the GSM Module to the user's mobile and actions are taken accordingly by the user. This leads to efficient utilization of power. Even using Bluetooth module, by SMS, pump and fan could be automatically ON or OFF.

IV. SYSTEM ARCHITECTURE

In our project, we are using microcontroller (AT89S52), GSM modem, Xbee module, power supply, stepper motor, water level sensor, temperature sensor, pH sensor, turbidity sensor and ADC. In a very simplistic form, a microcontroller system can be viewed as a system that reads from (monitors) inputs, performs processing and writes to (controls) outputs. The output of the water sensor is digital output.

Hence the output of this sensor goes directly to the microcontroller. Whereas the output of the other sensors are in analog form. Therefore we need to convert these analog values into digital values before connecting to the microcontroller.

ADC is used for this purpose. These values will be sent by a transmitting XBee module to a computer for monitoring purpose. A GUI like Visual Basic is used in our project for displaying the values on the computer. A receiving antenna is connected to the computer to receive values from the site. If the values received are above a dangerous level then a SMS will be sent through the GSM modem. Also, the gate of the dam is controlled automatically by the microcontroller depending on the water level reached.

To solve the problem related to collapsing of dam due to storage of water beyond its capacity, we have proposed to automate the flood gates. We will be fixing water level sensors on different levels on dam walls. When the water reaches these levels, these sensors will send signal to the microcontroller. The microcontroller will then execute the predefined instructions stored in it. This predefined instruction deals with opening of flood gates. When the water level reaches the first level, the gates will open and go up a certain height. When the water level reaches the second level, the gates will further move upwards. In the same way by the time the gate reaches the final level, the gates will be opened completely. When the water starts receding, the gates will start closing up. Also, the sensors for the other environment parameters will continuously send the values to the GUI through XBee module. GUI used in our project is Visual Basic. It will display real time values of different parameters and also which level the dam water has reached. We have set threshold levels for all the parameters. When the values exceed the threshold levels, a message level will be sent through GSM modem to the concerned officials. A predefined message will also be sent when the gates are opened.

V. RESULTS AND CONCLUSIONS

The system successfully provides real time monitoring of the turbidity, water level, temperature and pH. Sensors for measuring various pollution parameters like pH, temperature, turbidity were successfully implemented. Transmission and reception of data from the sensors to the GUI using XBee modules is demonstrated. Automation of flood gates when the water level of the dam exceeds the predefined threshold values is also demonstrated. A predefined SMS using GSM modem is sent when any of the monitored parameters goes beyond the range..Hence by using this monitoring system we can have real time monitoring of various parameters and depending on these observations the concerned authorities are alerted to take the precautionary measures. The thresholds for the various parameters are given below.

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VI. FUTURE WORK

Detail survey of various remote monitoring and control systems have been presented along with the classification based on various parameters and the design of a GSM-Bluetooth based remote monitoring and control system with Automatic irrigation system has been proposed. This system has an advantage of using both GSM and Bluetooth technology which thereby eliminates the cost of network usage to a great extent by using Bluetooth when in the range of few meters with the devices. The system is scalable and allows any number of different devices to be added with no major changes in its core. But it is not efficient in situations which have strong real time requirements. The system has its application in situations where the amount of data to be transferred is mandatory. The study and literature survey based on research papers is proposed in this paper which helps in adopting best suited deployment of system according to feature's requirement. Implementation on above subject will be processed in future work.

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