

ARDUINO BASED AUTOMATIC FLOOD GAUGE FOR TIMELY PREVENTION OF FLOODS

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Abstract – The paper proposes Global System for Mobile Communication (GSM) network based system for the monitoring of river water level and prevention of flood like situation. This system can be used for monitoring increase in the water level in the rivers in case of floods. This system will send the measurements of level of water in the river to the concerned authorities after certain intervals of time continuously. Once the river water reaches the critical level by increase in the level of water, an alarm will be sent via GSM network to the person in charge. The system also opens and closes the flood gate automatically as per the readings received by the microcontroller thereby timely rerouting the excess amount of water and preventing the flooding. This system uses Arduino as a main controller and ultrasonic sensing equipment as the main sensor.

Keywords: GSM, Arduino and Ultrasonic Sensor.

1. INTRODUCTION

The global water level is on the rise due to increase in the Earth's temperature resulting in threat to the humans and also to the aquatic eco system. Most of the nations have from time to time called for water policies and laws for protection of aquatic ecosystems [1], [2]. A number of flood related cases are being reported every year across the globe resulting in the damage to the life and property of people living in low lying areas. A continuous vigil is to be kept in such areas which are prone to floods. In some areas water level monitoring is done by an individual who visits each river and takes water level readings. Often these rivers are in places with difficult access making the procedure difficult, expensive and results unreliable [3], [4]. Obtaining water level measurements manually, and then use the same to analyse the current situation takes a long time and also does not yield reliable results. The results which are obtained after long intervals of time does not allow the people in charge to make the necessary arrangements and corrections in time resulting in large losses in terms of life and property. Measurements of water levels in the main channels of rivers, upland tributaries and floodplain lakes are necessary for understanding flood hazards. But most remote river basins have only a few gauging stations and these tend to be restricted to large river channels [4]. This project proposes the use of wireless system employing ultrasonic sensors, GSM System with a microcontroller interface to monitor water levels in case of floods and send the data automatically to the people in charge Water level information is periodically transmitted to the authorities in charge and stored in a database. The consultation and administration of the data is carried out through the Global System for Mobile Communications (GSM) network. The information system allows real time monitoring and notice about some typical situations. With real time information, it is possible to prevent the supply of water while the level is at a critical point [4], [5-9]. Also with automatic control of flood gates, it is possible to divert the water at appropriate times without wasting any time in calculations and corrections there by preventing a particular area from being flooded.

2. WORKING OF THE SYSEM

The prototype is designed with an idea that the gates of the gauge should open automatically when the level of water in the spillway reach the maximum level and it should alarm the authorities with zero delay whenever the water level in the spillway starts to rise from the safe level through SMS services of GSM network. The level of the spillway in this project has been divided into 3 levels i.e. LEVEL 1, LEVEL 2 and

LEVEL 3. The gates of the spillway are opened automatically at LEVEL 3. The level of the water in the spillway is being measured continuously at each second of time with the help of floating balloon connected a level potentiometer. The variation in the pre-set level of floating balloon due to the rise of water in the spillway are recorded by the level potentiometer which send a signal to the microcontroller and are being stored in the flash memory of the microcontroller.

Warning Level 1

When the floating balloon reaches the level 1 a high request is sent to the microcontroller by the level potentiometer. On receiving the level 1 signal the microcontroller from its data base sends a WARNING LEVEL 1 request which is then being sent through an SMS to the registered authorities IMSI number.

Warning Level 2

If the water continues to rise in the spillway, the level is being recorded at every instant of time by the floating balloon connected to the level potentiometer. When the floating balloon touches the level 2 again a high request is sent to the microcontroller by the level potentiometer. On receiving the level 2 signals the microcontroller from its data base sends a WARNING LEVEL 2 request which then is sent through an SMS to the registered authorities IMSI number.

Warning Level 3

As the water continues to rise in the spillway the level is being recorded at every instant of time by the floating balloon connected to the level potentiometer. When the floating balloon touches the level 3 i.e. is the top most level again a high request is sent to the microcontroller by the level potentiometer. On receiving the level 3 signal the microcontroller from its data base sends a WARNING LEVEL 3 request which then is sent through an SMS to the registered authorities IMSI number.

After the SMS is sent, the microcontroller sends a high request to the two servo motors on the address data line connecting the two servo motors. After receiving a high request the servo motors responds by sending an acknowledge signal that they have received the request and then throw the gates open and the water is being drawn out of the spillway. As the water is drawn out from the spillway the floating balloon starts to recede from the level 3 and again a high request signal is sent to microcontroller. The micro controller responds by send a low signal to servo motors the servo motors responds by sending an acknowledge signal and then close the gates. The gates can be accessed remotely by sending an SMS from the IMSI number of the controller stored in the flash memory of the micro controlled. If we want to drain out the water from the spillway at an early level the gates can be opened by sending a special request signal to the GSM module which is in turn connected to micro controller. Each gate can be opened or closed by sending a special request signal as under:

GATE 1:

OPEN	CLOSE
#123401	#1234C1

GATE 2:

OPEN	CLOSE
#123402	#1234C2

The microcontroller on receiving these special request acts accordingly as per the instructions Stored in its data base and the gates can be accessed remotely by the controller.

3. FEASIBILITY OF THE PROJECT

Mobile phones have become one of the most popular communication devices amongst the people all over the globe. At present with the world population of around 7 billion, 70% use the mobile phones. This is about 4.5 billion mobile phone users and this assistive technology is used in all facets of our livelihoods. Since the inception of GSM network, use of SMS to send short messages has become popular as it provides a convenient and a faster method of communication. Recent advances in automation showed an advert of SMS based intelligent homes which are used to alert the users via SMS in case of an emergency.

4. SYSTEM PERFORMANCE REQUIREMENTS

Remote operatability: The system being wireless in nature should allow the users to operate it remotely.

Event notification: The system has to allow notification in real-time if disruptive events occur [4].

4.1 User Requirements

Performance: The system has to be more accurate in measuring processing through ultrasonic sensor [4].

Flexibility: The system must be flexible in order to allow the user to insert, remove or edit parameters [4].

Power supply: power supply can be provided by using a battery or In order to solve the problem of remote areas located in isolated places, with difficult access, and without power supply, the system needs to be equipped with a solar panel and a battery.

4.3. ADVANTAGES

The main advantages of the project are:-

- Immediate warning provided by the GSM as compared to satellite monitoring.
- Cheap operation cost provided through the use of SMS service.
- Rapid growth of the mobile industry
- Availability of mobile to nearly every household or locality.
- Availability to inform authorities directly without any middleman being involved.
- Automatic opening and closing of flood gates to prevent floods.

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