International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2016): 78.96 | Impact Factor (2016): 6.391

Flood Early Warning System and Distribution of Information Communication Using Radio Link

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Abstract: ***In this paper, early warning of flooding includes several main sections the first is from the sensor height of the water surface consists of three levels, namely a safe, alert and danger the second is a wireless communication system that connects between each point and control systems, wireless is used is wireless with the 433 Mhz frequency and the third is the control center of the main function is to receive data from each of each monitoring point then, analyze the data and send the results to the notification system. The notification system created this system is in the form of alarms and alerts using SMS messages from modem integrated with the control center working principle of the system are made is when two sensors or more indicate the alert level or danger then each point will send an alert data using wireless to the center control, the control center will process simultaneously verify the data and process it into a text message to multiple mobile phone numbers stored in the control system***

Keywords: flood, SMS, sensor, water level, wireless precipitation

1. Introduction

Topography, rainfall, rainfall intensity and the capacity of the river flood runoff inadequate. The lower area of the more potentially affected by the flood and vice versa. The higher the rainfall and the intensity of the rainfall flood discharge will be even greater, if the river is not able to accommodate it will overflow discharge or overflow to region lower and into a puddle or stream destructive.

Makassar city as an object of research in this journal includes flood-prone areas and water hazards. In addition to its territory is situated on the shores of the sea that has a coastline of 20 km that extends from south to north and is relatively flat with a height of land between 0-2 m, there are also two rivers namely Jeneberang River flowing across Gowa regency empties into the southern city Tallo Makassar and river which empties into the northern part of the city.

Many flood warning stations have been developed and installed in prosperous countries but the manufacturing cost is usually too high therefore the development of this system is one solution to the above problems

Various methods have been introduced in the flood detection the last decade. The author in [1] - [3] to analyze the images captured by satellites in different ways to detect the area where flooding occurs. These techniques are only useful in flood localization but they can not predict whether floods or not in the next hour. M. Oprea proposed prototype intelligent systems for flood warnings and alerts in real time [4].The system uses a microcontroller ARM, Marvell 88F6281 and FreeBSD Unix to interface and data integration. For make decisions, data will be transmitted from the hydrological stations in real time via radio communication. E.Tate and K.Cauwenberghs introduce a flood warning systems rely on Web-based approach to Demer basin in Belgium [5].In this system, a group of servers will collect and process data from hydrological observation stations in real time and the results are available can be displayed on the client computer by remote access. The advantage of this system is to help operations manager to decide the flood warning messages more quickly, precisely in real time. However, this study did not bring out a way to transmit information flood citizen. Short message service (SMS) used in flood alerts in [6] - [8]. This system uses the same type of GSM modem to send SMS messages containing water Information measured levels of the wireless water sensor, liquid sensor or an ultrasonic sensor. The users can receive real time Water level data in case of exceeding the specified limits. General Packet Radio Service (GPRS).

The rest of this paper is organized as follows description and methodology into the design and implementation of design in the early detection of floods explained in the section II, Section III shows the operation of the designed system and the procedure to set up the initial parameters The results of system testing are described in section IV Finally, section V concludes the paper.

2. System and Design

The model system described in Figure 1, which consists of three main parts: the station flood warning, flood center and notification system. Flood warning station contains the water level sensor, solar batteries as the main power supply and wireless 433 Mhz. Data received from the sensor is processed by a microcontroller atmega 328 then sends the data in the form of text data using a wireless transmitter 433 Mhz, the data received by wireless 433 Mhz will be processed by a microcontroller atmega 328 then would be sending the message using a command at a command number GSM on the microcontroller.

Figure 1: System Overview

Figure 2 This Microcontroller (Arduino) water level indicator uses an ultrasonic sensor or Ping sensor to determine the level of water in the water level of the river. The Ping sensor measures distance using sonar. An ultrasonic (well above human hearing) pulse is transmitted from the unit and distance-to-target is determined by measuring the time required for the echo return. Output from the Ping sensor is a variable-width pulse that corresponds to the distance to the target

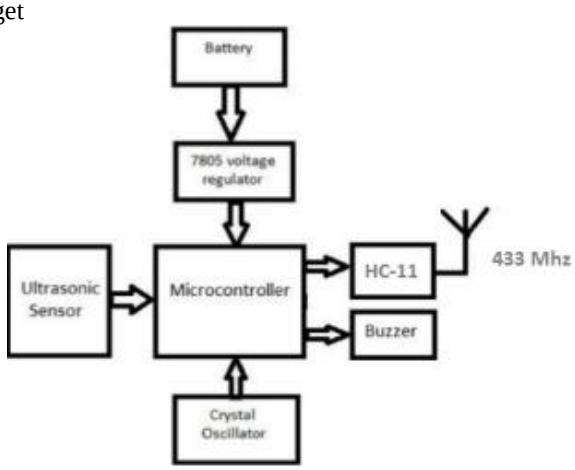


Figure 2: Block Diagram Station

A. Sensor Ping Parallax

The Parallax PING)))™ ultrasonic distance sensor provides precise, non-contact distance measurements from about 2 cm (0.8 inches) to 3 meters (3.3 yards). It is very easy to connect to microcontrollers such as the BASIC Stamp®, Propeller chip, or Arduino, requiring only one I/O pin. The PING))) sensor works by transmitting an ultrasonic (well above human hearing range) burst and providing an output pulse that corresponds to the time required for the burst echo to return to the sensor. By measuring the echo pulse width, the distance to target can easily be calculated the shape of the ultrasonic sensor can be seen in figure 3 [11]

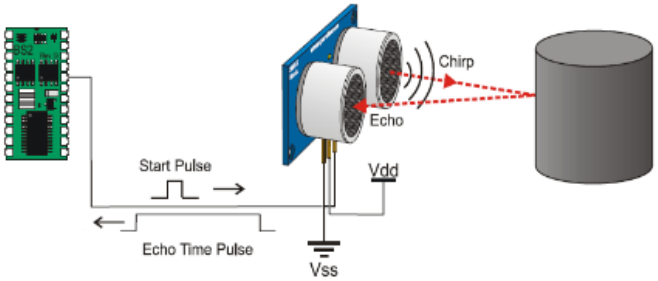
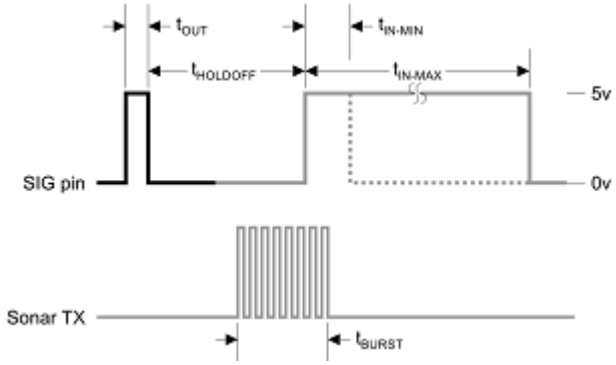


Figure 3: Sensor Ultrasonic

Communication protocol figure 4, The PING))) sensor detects objects by emitting a short ultrasonic burst and then "listening" for the echo. Under control of a host microcontroller (trigger pulse), the sensor emits a short 40 kHz (ultrasonic) burst. This burst travels through the air, hits an object and then bounces back to the sensor. The PING))) sensor provides an output pulse to the host that will terminate when the echo is detected; hence the width of this pulse corresponds to the distance to the target.



Water Silent Condition Water Silent Condition

Figure 4: Communication protocol sensor ping

B. Modem GSM Wavecom Fastrack M1306B

Serial GSM Modem Wavecom Fastrack Fastrack M1306B M1306B is a wireless modem device plug and play which is produced by Wavecom connectivity with GSM / GPRS applications for machine to machine. Fastrack M1306B proved to be relied on for stable performance on wireless networks worldwide. The following is a Figure 5 is a modem wavecom

Figure 5: Modem Wavecom Fastrack M1306B

C. Wireless HC-11 433 Mhz

HC-11 wireless communication frequency band is 434M. Multiple types of serial port transparent transmission modes have respective features, and the mode is changed by command. (V1.8) User needn't program the modules, and four modes are only responsible for receiving and sending serial port data, and are convenient to use. Low current consumption; the idle current is 80μA, 3.5mA or 22mA, depending on the selected mode. The number of bytes sent to serial port of module unlimited to one time. All functions and parameters are changed by command, and can be saved in case of power failure.[12]

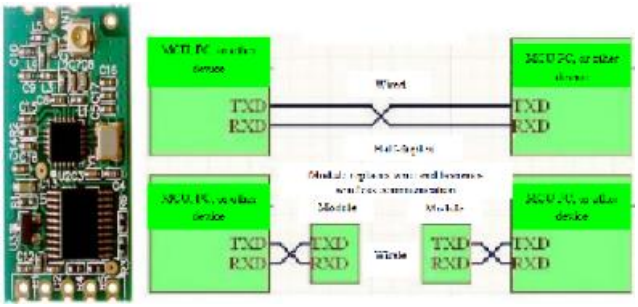


Figure 6: Wireless HC-11 and Simple Communication

Simple description of working principle when the device on the left of the above figure sends serial port data to module, and the RXD port of the left module receives the serial port data; it will automatically send the data in the air by means of radio wave. The right module can automatically receive the data, and restore, from TXD, the serial port data originally sent by the left device. It is the same from right to left.

D. Microcontroller Arduino

A microcontroller is a functional computer system on a chip. It contains a processor core, memory (a small amount of RAM, program memory, or both), and input and output equipment. In other words, the microcontroller is a digital electronic device that has inputs and outputs as well as control with a program that can be written and erased in a special way, how the actual microcontroller to read and write data. Microcontroller is a chip inside the computer that is used to control electronic devices, which emphasize efficiency and cost effectiveness. Is literally can be called "little control" where an electronic system which previously was often require supporting components such as TTL and CMOS IC can be reduced / minimized and ultimately centralized and controlled by the microcontroller. (Http: //www.kelas-mikrokontrol)

Figure 7: Arduino Board

Has its own advantages compared Arduino microcontroller board other than open source, arduino also has its own language programming form of language C. Also in arduino board itself is already there in the form of USB loader making it easier for us when we program the microcontroller in the arduino. While in most other microcontroller board that still require a series of separate loader to enter the program when we program the microcontroller.

The USB port in addition to the loader when reprogrammed, can also function as a serial communication port.Arduino provides a 20 pin I / O, which consists of six analog input pin and 14 pin digital input / output. To 6 analog pin itself can also function as a digital output if required digital output pins in addition to 14 already available. To change the pin analog to digital simply change the pin configuration on the program. In the board we can see annotated digital pins 0-13, so to use the analog to digital output pin, pin analog on the information board 0-5 we change into pin 14-19. in other words the 0-5 analog pins also function as a digital output pins 14-16.

3. System Operation

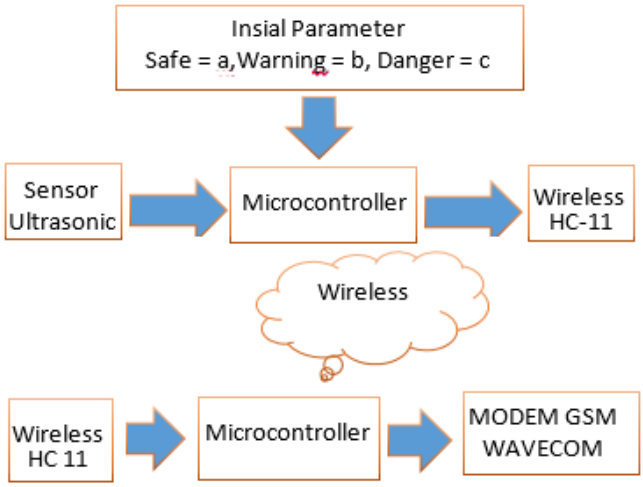


Figure 8: System Operation

In Figure 7 can be explained that in the pemancar1 ultrasonic determined there are three levels of state that is a safe level, alert and danger when a safe level, the system transmitter will send character letters a, the alert will be sent character letters b and the danger level would send a character letter c on the transmitter 2 is also determined there are three levels of state that is a safe level, alert and danger when a safe level, the system transmitter will send a letter characters 1, the alert will be sent character letters 2 and the danger level would send a letter characters 3 when receiver control system receives the character b and character 2 alternately, the control system will send an sms alert to no telephone that dimemorikan by mirokontroller the case if the character received 3 and c received will send sms danger

4. Result and Discussion

In this section, the results of our application test are shown and discussed. First water level measurement results using ultrasonic ping sensor, The following table 1 shows the percentage of errors in data measurement using ultrasonic sensors

Table 1: Ultrasonic measurement errors

No	Distance Ultrasonic Sensor		
	Ruler	Water Silent Condition	Error
1	10	10,18	0,18
2	20	20,25	0,25
3	30	30,27	0,27
4	40	40,32	0,32
5	50	50,4	0,4
6	70	70,4	0,4
7	90	90,38	0,38

8	110	110,33	0,33
9	130	130,3	0,3
10	150	150,3	0,3
11	170	170,3	0,3
12	200	200,41	0,41
13	220	220,48	0,48
14	240	240,6	0,6
15	250	250,67	0,67

Table 2: SMS Control Table

Transmitter		*Receiver*	*Output*	
TX 1	TX 2	TX1,TX2	BUZZER	SMS
a (Safe)	1(Safe)	a,1	OFF	OFF
b(warning)	1(Safe)	b,1	OFF	OFF
b(warning)	2(warning)	b,2	ON	Alert
c(danger)	2(warning)	c,2	ON	Alert, Danger
c(danger)	3(danger)	c,3	ON	Danger, Dager

The first system will be read distance surface water to the ultrasonic sensor then comparing the readings sensor 1 and sensor 2 with a base knowledge that is embedded into the system. Furthermore, the readings will be known whether the conditions in the river or surface water Normal conditions, or Alert Flood Alert 1. For sensors were given the maximum range with the range as long as 26 cm, Stand I 15 cm to 10 cm at once send SMS message with the text "Alert", and Flood Hazard status to the sensor when the water level was more than 10 cm with a send an SMS message with the text "Danger of flooding" When the station is installed, this system will record the water level and precipitation value from the corresponding sensors. After predefined period, the data will be read on microcontroller for statistics in long time and transmitted by using GSM module as in figure 9. The content of each message includes the warning level, the measured data, and the occurrence time of flooding. Whenever the water level exceeds the threshold, the station immediately sends the data to the Internet that flood control unit could recognize that flood will occur.

Figure 9: Implementation System

5. Concluding Remarks

Early flood detection system has been designed low cost and implemented at low cost, the system will work if two or more sensors indicate danger Traffic alert or other systems designed can be used are supported mobile wireless capabilities HC-11 with a frequency range of 433 Mhz equal to 1 KM. Furthermore, how to extend the reach to some point sensor and a combining analysis of several warning stations and can be accessed online

6. Other Recommendations

Should be used in wireless which have a longer range and sensor systems that are used are resistant to water.

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