

Flood Alert Notification System (FANoS)

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Abstract – In Malaysia, flood is one of the most common disasters that happen especially in monsoon time at the end of the year; where it will cause death and property lost. Today the human activities is the major problem that contribute for this disaster such as uncontrolled development, obstruction in river, forest harvested that damage rain catchment area and others factor that contributes to flood. In many rural area in Malaysia to detect flood occurrence public use conventional way to predict phenomena ; where a they will keep watch for some anticipated event near the river side. This action is risky by observing at the area that had known in danger. The public sometimes have it own humanity weakness, this will affect the result collected. Therefore, a project based on human and properties protection from flood is designed. In this “Flood Alert Notification System” (FANoS), the LCD display were used to show the water level indication to the public ; where it will be placed at selected zone area so the resident will always know and be alert . When FANoS detect dangerous water level, the siren will be alarm and send short message service (SMS) to resident and the authority using GSM (Global System for Mobile) mobile phone. The device plays an important role in maintaining and monitoring the safety of properties and human life. The FANoS has two main systems, the detection system and the action system. The detection system operates as the flood detect by using flood detector. In this project there is three level of water. Level 1(normal), level 2(chary) and level 3(critical). Once the level 3 detected, the flood sensor will send a signal to microcontroller. The microcontroller will trigger the action system that contains four parts which is the LCD display unit, LED unit, siren unit and SMS unit. The LCD will show the condition of river. While the LED will turn red. The siren will emit sound. Finally the system will alert the resident by send a simple message in the form of SMS through the SMS unit. This system will help residence to act before the flood becomes worst and avoid from being trap in flood.

Keywords: *flood, alert, notification, rural, disaster*

INTRODUCTION

Flooding is Malaysia commonly occurred natural disaster that causes unsafely manner to human by causing death and great property loses; having 189 river basins throughout Malaysia, including Sabah and Sarawak rivers might be the largest danger to entire corridor areas. The target areas for this FANOs are rural area near Muar and Batu Pahat District, Johor where in December 2006 and January 2007, these areas and all other districts in Johor Bahru have been hit by flood due to a couple of “abnormally” heavy rainfall events which caused massive floods that caused damages of life and properties; considered as the most costly flood events in Malaysian history. [1]

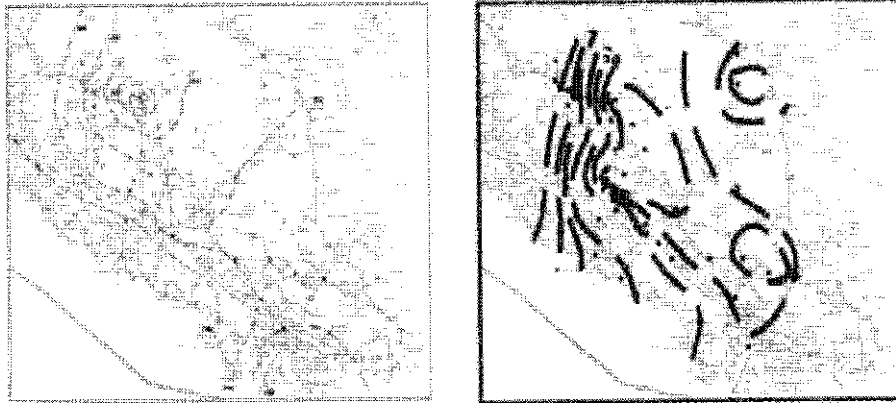


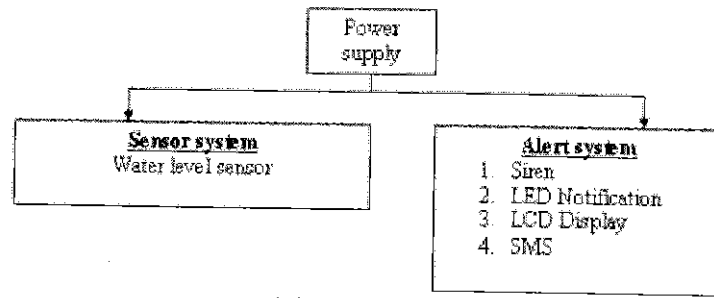
Figure 2: Isohyet Maps from i)18-20 December 2006 and i)11-13 January 2007 for Johor, Malaysia [1]

Today many of flood system in rural area in Malaysia used the conventional way to predict the disaster; where the resident keeps watch for some anticipated water raises event near the river side. This action is risky, where the public will observe the area that had known in danger, may perhaps collected the wrong data thus delay in notifying all residents [2],[3]. Several work have been done for flooding prediction monitoring system such as [4],[5] and [6]. This FANoS prototype focuses for rural area and remote area application with limited access to telecommunications. This system will display the water level indication to the public using the LCD display; where it will be placed at selected zone area so the resident will always know and alert with water level. When FANoS detect three types of water level; level 1(Alert), level 2(Warning) and level 3(Danger). This prototype will be located at the selected river bridge. The siren will be alarm depending on the level of water indicated to inform all the residents, that the water level status in alarm mode. Thus FANoS will help residence prepared and avoid from being trap in flood. This paper is organized as follows; section discussed the FANOs design. The result and analysis is described in section 3. and conclude in section 4.

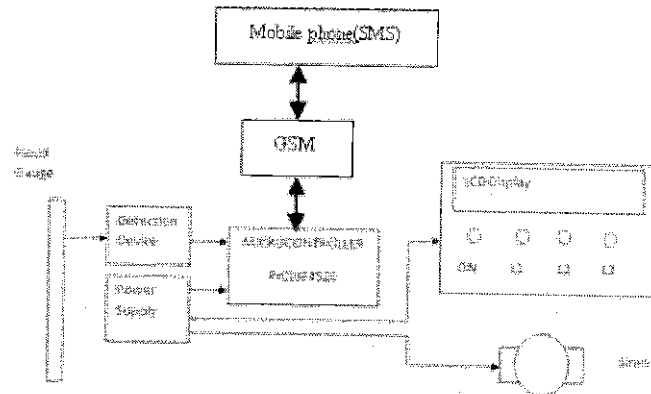
FANOS DESIGN

FANOs system were divide into 2 parts; detection system and alert system. Fig 1 shows the overall component for FANOs design

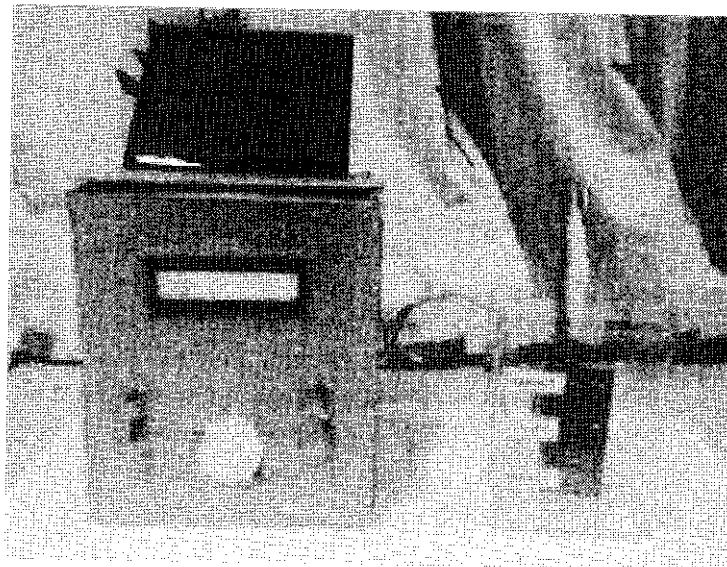
- (a) FANOs concept
- (b) FANOs architecture
- (c) FANOs system



(a) FANOs concept
(b)



(b) FANOs architecture

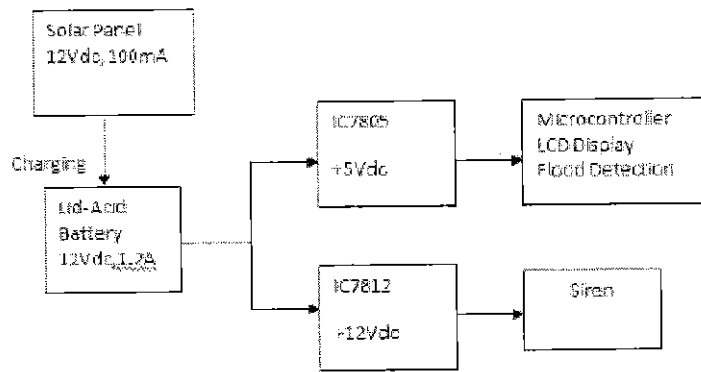


(c) FANOs system

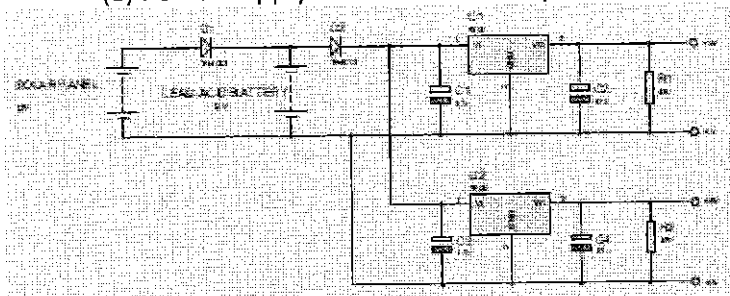
Fig 1: Overall block diagram

A. Hardware

As depicted in Fig. 1, the architecture of the system consist six main component : flood detector, siren unit, LED indicator , LCD display unit ,SMS gateway and the power supply, where the system uses solar panel to charging the battery . When the switch is triggered , the LCD will display value of the water level indicator ; thus displaying several level such as 'LEVEL1/NORMAL', 'LEVEL2/CHARY' and 'LEVEL3/CRITICAL'

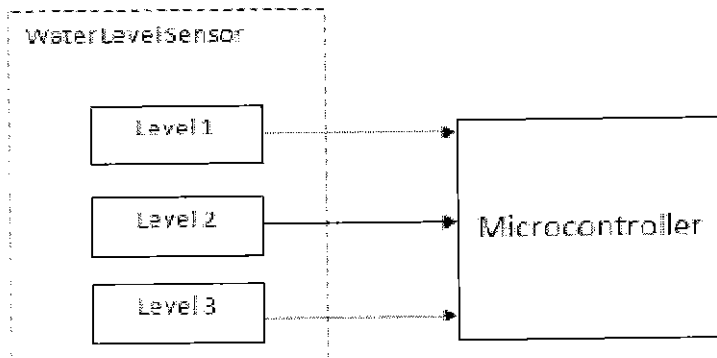


(a) Power supply distribution concept block

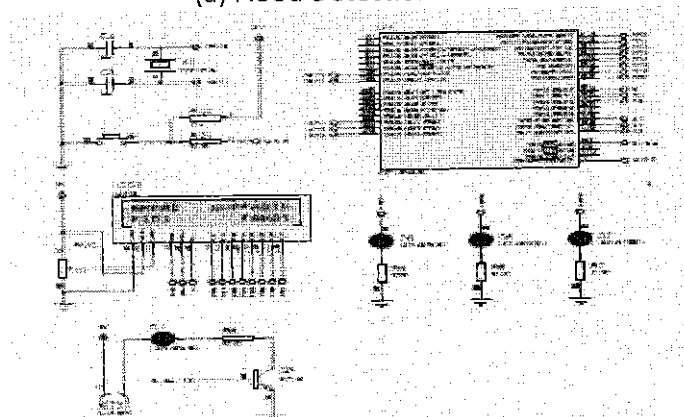


(b) Power supply circuit

Fig 2: Power supply



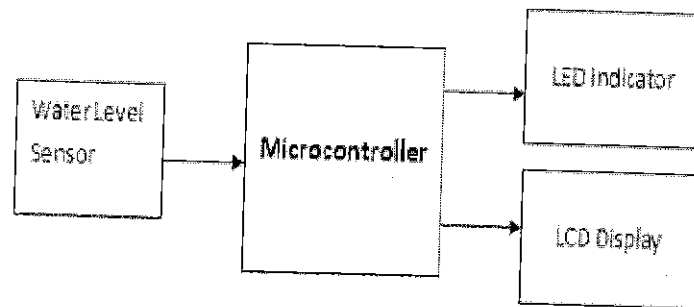
(a) Flood Detection block



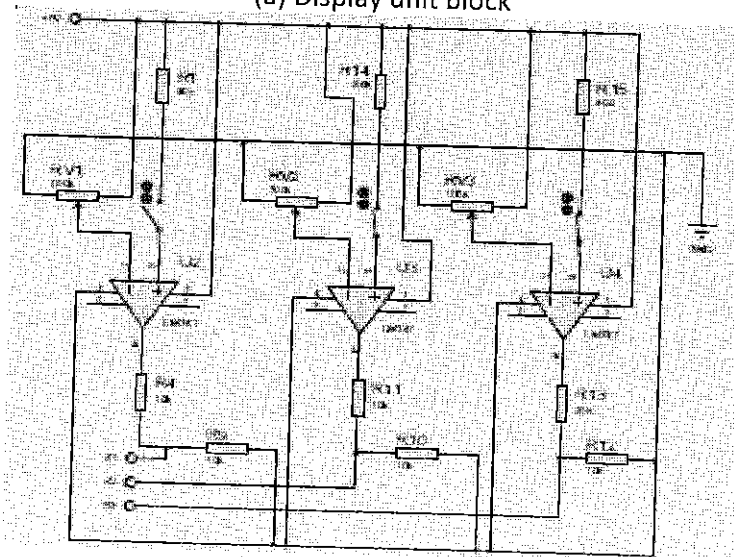
(b) Flood Detection circuit

Fig 3: Flood Detection Block

With the present of water, current will flow from point to another. Which one point connected to voltage source and another one connected to power amplifier IC741; The use of op-amp is needed to make sure sufficient voltage can be detected by the microcontroller because voltage from probe might be low because of unstable resistance of water. For the siren unit, sirens systems have three difference type of sound. Each level will emit their identical sound. This to ensure resident know the level of water although they not come to the prototype to see the LCD display especially in rural area with minimum communication coverage. This makes the resident easier to be noticed about the water level in that time.



(a) Display unit block



(b) Display unit circuit

Fig 4: Display Unit

For display unit, LED indicator for level 1 is green, level 2 is yellow and level 3 is red. The LCD display use to display the water level and to warning resident about the level of water.

B. Software

FANoS uses PIC18F4520 as the main controller. For this project, MPLAB IDE is use to programming the microcontroller in C language. MBLAB IDE allows writing, debugging and simulating. MBLAB use to program the programming in hex file and then it will download and interface with microcontroller that chosen to be use. in order to make programming the basic understanding of microcontroller architecture and the C language are needed. The other software that needs to use is Proteus. Where this software use to design the circuit of

the project. This software provides variety of electronic part and circuit simulating that needed for circuit analysis

C. SMS gateway

The Gsm system is selected as the communication medium due to wide coverage and provide mobility GSM SMS service provides a method of sending alphanumeric and character messages by using mobile phone. Each SMS able to send up to maximum 160 characters. One of the advantages of the system employing GSM SMS for low cost of sending and unlimited distance thus provide information to monitor properties and fast notification.

RESULT AND ANALYSIS

A functionally test was conducted to evaluate the system performance based on each system component. Tables below indicate the analysis results for FANOs. The solar panel analysis is shown in the output in table 1 where the reading were taken for four sample. The average voltage obtain is 11.4 V and 86.25mA average current depends on the sunlight lighting .

Table 1 Solar Panel Charge

	Voltage	Current
Test 1	10.53	75
Test 2	11.34	87
Test 3	12.01	93
Test 4	11.73	90

Table 2 Lid-Acid Battery

Test	Voltage	Current
Lid acid 12Vdc,1.2A	12.4	1.23A

Table 3 Flood detector level of detection

Component (LM741)	Not Detect (V)	Detect (V)
IC1	1.54	4.51
IC2	1.48	4.57
IC3	1.61	4.49

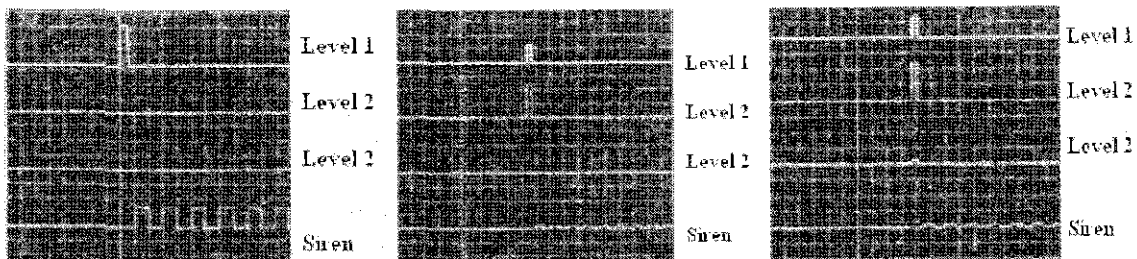


Fig 5: Water detection output (a) Level 1/Normal (b) Level 2/Chary (c) Level 3/Critical

Table 3 shows the output voltage indication of level detection for each level for signal triggering in microcontroller. For siren, 12Vdc with 5-100mA current is needed in order to alarm the residents . The connection of siren to the microcontroller. The LCD display have 16x2 display where the input pin is from microcontroller for D0 to D7,RS,RW and E. Vss use as ground, Vdd as power source and Vee use as contrast of backlight. Fig shows the analysis result for the integration system for 3 level of water detection and the siren behavior toward the output.

CONCLUSION

In summary, Flood Alert and Notification System for rural area as a flood preparation suitable for for slow kind reverine flood and catstropic flood types was presented. By implementing the FANOs system , the rural area resident can monitor the water level outside the location causing by water accumulates across an impermeable surface (e.g. from rainfall) and unexpected event e.g. dam breakage. Further studies will focused on verifying this system and perform an experiments for acceptance in handling usage.

ACKNOWLEDGEMENT

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