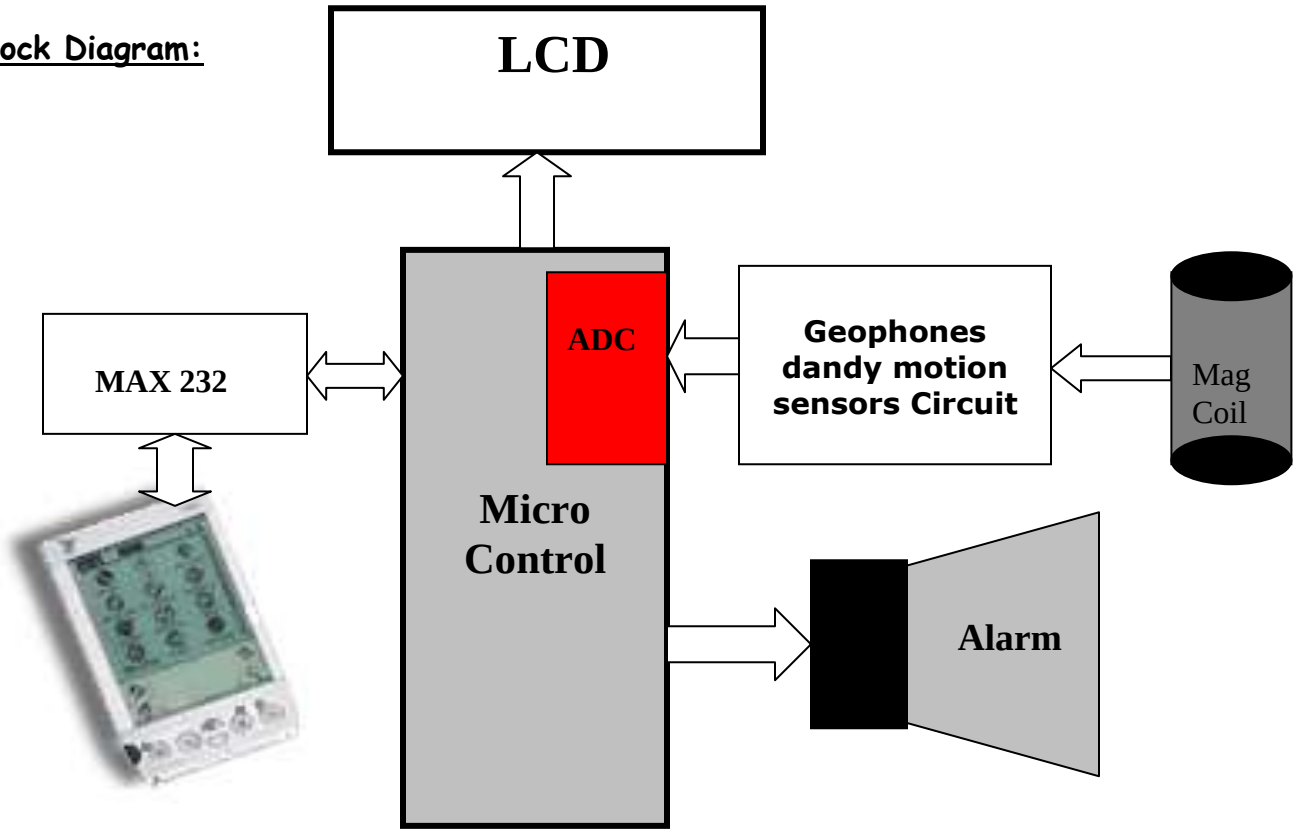
GSM Implementation of tsunami alert system

AIM:

TAS, Tsunami alert system is a system being developed by Asian Institute of Technology (AIT). The concept of system is that the information of earthquake which is possible to generate Tsunami will be disseminated to ordinary people using the modern technology of mobile phone by sending SMS.

Block Diagram:



Objective of Study

- To develop a system that will provide Tsunami alert.
- To disseminate information obtained from earthquake as Tsunami alert message.
- To apply this TAS for all countries in Indian Ocean.

Present Work

The present procedure of TAS is summarized as follows;

1. Get information of earthquakes which are magnitude, location and depth of epicenter. From website survey, there are totally SMS to publish real time earthquake information. The update one is every 20 minutes.
2. The criteria to accept that the alert message will be sent out is summarized as follows;

- Magnitude of earthquake is equal to or greater than 7 Richter.

This criteria is based on Tsunami magnitude (m) proposed by Iida (1958) as summarized in Horikawa (1978)

$$\mathbf{m = 2.61\ M - 18.44}$$

m : Tsunami magnitude
M : Earthquake magnitude

Tsunami magnitude m	Tsunami height H	Damage
-1	50 cm	None
0	1 m	Very small damage
1	2	Coastal and ship damage
2	4 ~ 6	Damage and lives lost in certain landward areas
3	10 ~ 20	Considerable damage along more than 400 km of coastline
4	30	Considerable damage along more than 500 km of coastline

Table 1: Tsunami magnitude (m).

Table 1 shows Tsunami magnitude related to damage. It is noted that when Tsunami magnitude is zero, there is very small damage. This condition is corresponded to earthquake M < 6.4.

Therefore earthquake magnitude M for alert message can be set as 6.4 Richter.

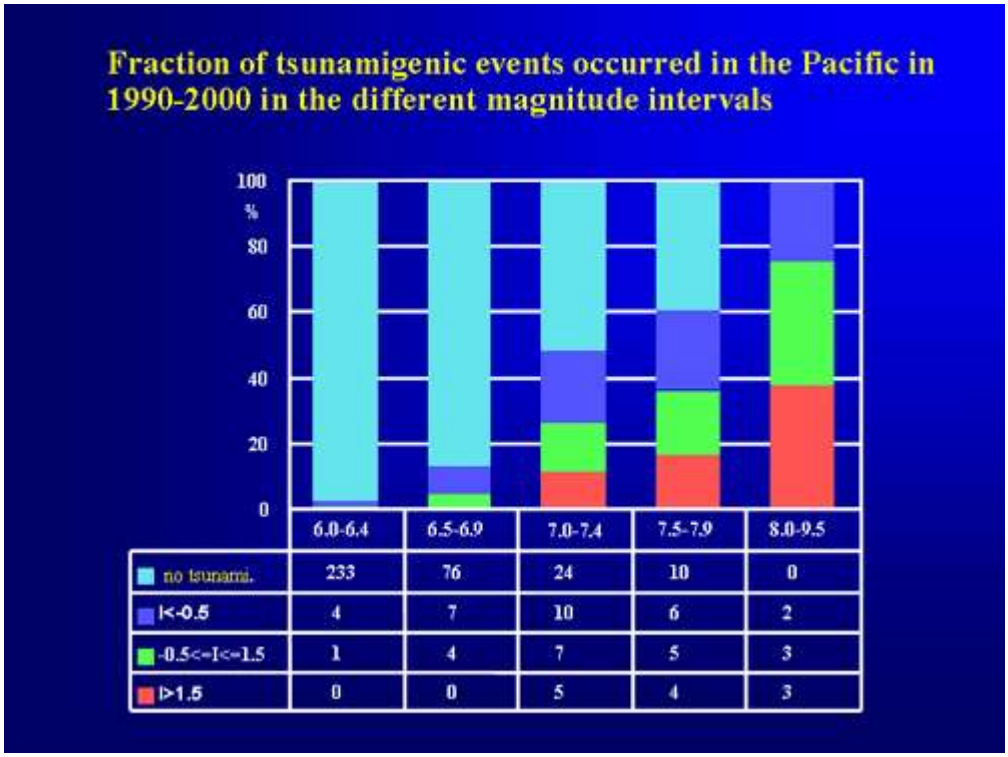


Fig. 1: Summary of Tsunami Events

Magnitude of Earthquake, M	Approximate percentage of Tsunami occurrence *
6.5 to 6.9	18 %
7.0 to 7.4	50 %
7.5 to 7.9	60 %
8.0 to 9.5	100 %

* It is noted that all magnitude of Tsunami from small size to large one are included herein.

The occurrence chance of Tsunami is 50 % relate to earthquake magnitude 7 Richter. Comparing the magnitude of earthquake for Tsunami alert purpose the value of 7 Richter is selected such that the possibility of any magnitude of Tsunami occurrence is 50 %.

- Location of earthquake epicenter should be less than 60 km below seabed.
- The area of earthquake is limited in Indian Ocean having the past earthquake record which are;

i. Northern Sumatra, Indonesia
ii. Off West Coast of Northern Sumatra
iii. Andaman Islands, India
iv. Nicobar Islands, India

3. When earthquake information is in the above criteria then SMS will be sent out for Tsunami alert purpose.

Fig.2 summarizes procedure into flow charts. The present system will send alert message only. However when the line source of Tsunami generation is assumed, the wave celerity can then be computed and finally, arrival time to the provinces is the west coast of Thailand can be determined.

Future Study

- The framework of the system has been developed and the preliminary work has been accomplished. At present, the computer program is in the testing stage.
- More in depth analysis of earthquake information should be conducted including detail of bathymetry in Indian Ocean to provide detail information of Tsunami arrival time.
- The present system can be applicable to Thailand only. The system should be extended to cover all countries in Indian Ocean.
- Develop MMS system to show location of Earthquake.
- Not only earthquake information that can be used in the present system but other sensors which record useful information can be input in the system.

Methodology of this Project:

1. **GSM (Fbus Protocol)**
2. **I2C - PROTOCOL**
3. **Image Processing in Mat lab**
4. **PC RS232 Communication**