Light Fidelity Based Monitoring of Ship Performance and Data Transmission in WSN

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Abstract – The objective of this project which consists of high priority components of the Environmental Investment Program is to put in place the policy and institutional arrangements necessary to have physical planning, land use control, infrastructure investments and environmental protection managed in a coordinated and rational way. In this project the ship is monitored by using the controller and the sensors that we fixed in the ship. MEMS is used to find the tiltation of the ship when the tidal waves is in extreme range of cyclonic action and the ultrasonic sensor is used to find the obstacle before the ship. Using LIFI we are transmitting the data to the control room at the other end at night time by receiving the light energy.GPS is used to track the position of the ship using the particular ID and it is useful to rescue the ship when it is in dangerous situation. And the alarm signals are intimated using voice play back and speaker. All these things will be monitored in PC.

Index Terms – Monitoring, navigation, Li-Fi Technology, sensor.

1. INTRODUCTION

The objective of this project which consists of high priority components of the Environmental Investment Program is to put in place the policy and institutional arrangements necessary to have physical planning, land use control, infrastructure investments and environmental protection managed in a coordinated and rational way.

The ship navigation status monitoring system plays an important role in the prevention and reduction of ship accident as well as navigation security. The project would also enable the government to take immediate remedial measures including selective investments to reverse the trend of environmental degradation and to develop a system of environmental monitoring and analysis for setting environmental standards and assessing the viability and cost-effectiveness of future investment.

The hardware part of the system achieves the function of data collection, including the collection of ship status information, operation information, and speech information and so on.

The software part of the system realizes the function of data processing and monitoring. In this project the ship is monitored by using the controller and the sensors that we fixed in the ship. MEMS is used to find the tiltation of the ship when the tidal waves is in extreme range of cyclonic action and the ultrasonic sensor is used to find the obstacle before the ship. Using LIFI we are transmitting the data to the control room at the other end at night time by receiving the light energy.GPS is used to track the position of the ship using the particular ID and it is useful to rescue the ship when it is in dangerous situation. And the alarm signals are intimated using voice play back and speaker.

The system has functions of ship status data collection and recording, status monitoring and alarming using li-fi technology and sensors. All these things will be monitored in PC.

2. EXISTING SYSTEM

In marine monitoring our world is constantly changing in ways that impact every facet of our society. To keep coastal communities, economies, and ecosystems healthy requires keeping track of ocean and coastal areas monitoring and assessing how these areas are changing. The marine monitoring is not that much easy to monitor the specific ship. The ship in rescue condition is identifying later and the rescue process was proceeding later after some time. These drawbacks will lead to human damage and heavy property damage that will give heavy loss to the government as well as for the fisherman. No new technology makes the ship to reach the shore, only light house is used to reach the shore.

3. PROPOSED MODELLING

In this project the marine monitoring deals with high technology range and the technologies we used here are very initiative. In this project the ship is monitored by using the controller and the sensors that we fixed in the ship. MEMS are used to find the tiltation of the ship when the tidal waves is in extreme range of cyclonic action. And the ultrasonic sensor is used to find the obstacle before the ship. Using LIFI we are transmitting the data to the control room at the other end at night time by receiving the light energy.GPS is used to track the position of the ship using the particular ID and it is useful to rescue the ship when it is in dangerous situation. And the alarm signals are intimated using voice play back and speaker. All these things will be monitored in PC.

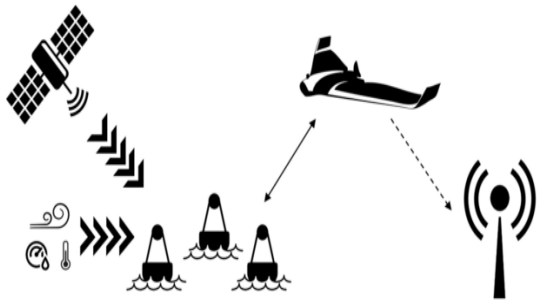

Figure1. Monitoring of marine environment

4. METHODS

1. LI-FI Technology
2. Controlling module
3. Sensor module

1. Li-Fi TECHNOLOGY

The affordable, speed change in the optical form of Wi-Fi is the Li-Fi and it is based on Visible Light Communication i.e. Visible Light Communication where VLC is a medium of information communication which avails quick pulses of light to send the data wirelessly. If the LED is on, a digital string '1′ is transmitted and when the LED is off then a digital string '0′ is transmitted. For example, there is a LED at one end and a photo detector at the other end, whenever the LED is on, a binary '1′ and when the LED is off a binary '0′ is registered by the photo detector. Thus a message is build up by many flashes of LED. There is Many highly developed technologies can be used in ship navigations. Li-Fi increasing the data rate of VLC, a recent research in Berlin attained rates of 500 megabytes per second. Parallel data transmission where each LED generates a separate data stream and has been focusing on many teams in the University of Oxford and Edinburg.

Figure 2. Data transmission in Li-Fi Technology

2. CONTOLLING MODULE

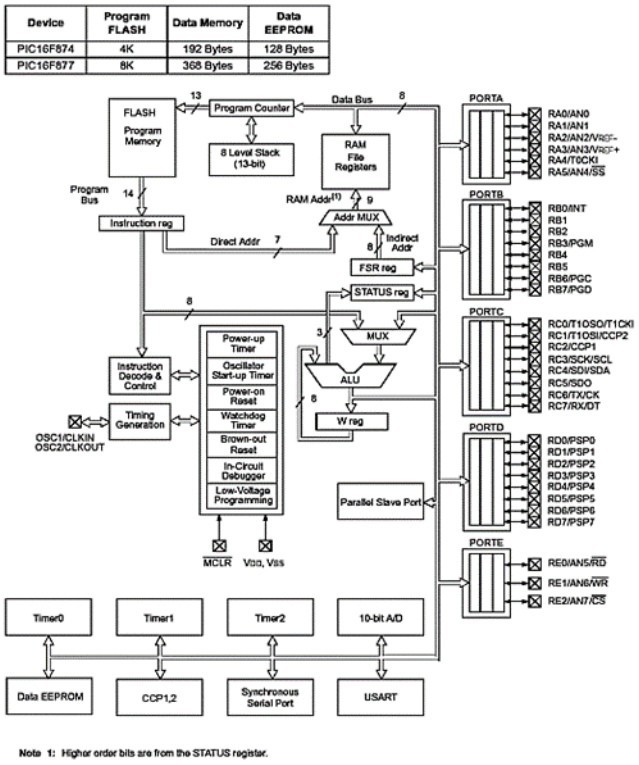

Figure 3. Architecture of PIC 16F877

PORT-A	RA-0 to RA-5	6 bit wide
PORT-B	RB-0 to RB-7	8 bit wide
PORT-C	RC-0 to RC-7	8 bit wide
PORT-D	RD-0 to RD-7	8 bit wide
PORT-E	RE-0 to RE-2	3 bit wide

In this project we are using PIC 16F877.It is one of the most advanced microcontroller from Microchip. This controller is widely used for experimental and modern applications because of its low price, wide range of applications, high quality, and ease of availability. It is ideal for more advanced level A/D applications in automotive, industrial, Machine application, appliances or consumer applications.

The PIC16FXX series has more advanced and developed features when compared to its previous series.PIC16F877 has 5 basic input/output ports. In this controller, "PORT A" is only 6 bits wide (RA-0 to RA-7), "PORT B" , "PORT C","PORT

D" are only 8 bits wide (RB-0 to RB-7,RC-0 to RC-7,RD-0 to RD-7), "PORT E" has only 3 bit wide (RE-0 to RE-7).

The port A, port B, port C, port D are all the bidirectional ports .TRIS(X) register is used to control the direction of the port .TRIS(X) bit '1' is input. TRIS(X) bit '0' is output.

3. SENSOR MODULE

In this project the sensing module plays an important role in various ways. The first and foremost activity is to find the obstacles.

a. ultrasonic sensor:

Ultrasonic sensors is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. The sensor emits an ultrasonic wave and receives the reflected wave from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception.

b. ultrasonic pulse oscillator:

IC1 is the oscillation circuit .The sending-out time of the ultrasonic pulse is controlled by IC1. The circuit is same as the ultrasonic range meter but the value of the resistors and the capacitors can be modified. The oscillation frequency is the same. This time is calculated by the following formula.

The condition: RA = 1M-ohm, RB = 15K-ohm, C = 0.1μF

$$T_L = 0.69 \times RB \times C$$

$$= 0.69 \times 15 \times 10^3 \times 0.1 \times 10^{-6}$$

$$= 1 \times 10^{-3}$$

$$= 1 \text{ m/sec}$$

$$T_H = 0.69 \times (RA + RB) \times C$$

$$= 0.69 \times 1015 \times 10^3 \times 0.1 \times 10^{-6}$$

$$= 70.0 \times 10^{-3}$$

$$= 70 \text{ m/sec}$$

b.mems (micro electro mechanical sensor)

The offered product is a low power, low profile capacitive micro machined Accelerometer that is used to measure proper acceleration of the devices such as process control systems, pumps, fans, rollers, compressors, etc. Apart from this, this product is known for its outstanding performance and accuracy. Can be used to measure vibration in vehicles, we offer this multipurpose product at very reasonable prices.

c.mems gyroscope

Based on the principles of angular momentum, Gyroscope device to measure orientation. Although this orientation doesn't remain set, it changes in response to an external torque much fewer and in a different way than it would without the large angular momentum associated with the disk's high rate of spin and moment of inactivi ty. Since external torque is minimized by mounting the device in gimbals, its orientation remains nearly set, regardless of any motion of the stage on which it is mounted.

5 HARDWARE REQUIREMENTS AND IMPLEMENTATION

PIC 16F877 is one of the most advanced microcontroller from Microchip. The PIC16F887 is a microcontroller. Its features 256 bytes of EEPROM data memory and self programmer. This controller is widely used for experimental and modern applications because of its low price, wide range of applications, high quality, and ease of availability. It is ideal for more advanced level A/D applications in automotive, industrial, Machine application, appliances or consumer applications.

The affordable, speed change in the optical form of Wi-Fi is the Li-Fi and it is based on Visible Light Communication i.e. Visible Light Communication where VLC is a medium of information communication which avails quick pulses of light to send the data wirelessly.

Ultrasonic sensors is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. The sensor emits an ultrasonic wave and receives the reflected wave from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception.

MEMS is a low power, low profile capacitive micro machined Accelerometer that is used to measure proper acceleration of the devices such as process control systems, pumps, fans, rollers, compressors, etc. Apart from this, this product is known for its outstanding performance and accuracy.

APR33a3 Voice play back is Single chip, high quality voice recording and playback solution. Total 11 minutes of recording time each channel (M0 to M7) having 1.3 minutes of recording time. User friendly and easy to use operation, Non-Volatile flash memory technology, no battery backup required. Audio output to drive a speaker or audio out for public address system. it is suitable in simple interface or need to limit the length of single message.

A DC motor is the direct current motor. In this project DC motor is used to give the current to monitor the ship.

6. CONCLUSION

In this paper we have illustrated the capabilities of Li-Fi technology and MEMS sensor. The MEMS were used to find the tiltration of the ship. The proposed system is low cost and efficiency to monitoring the ship by using the controller and sensor that fixed in the ship. The ultrasonic sensor is used to find the obstacle before the ship. The speed of the wind was detected and by using LI-FI we transmitted the data to the control room with the help of solar panel. The alarm signals are intimated using voice play back and speaker. All the information from the sensors were also monitored in PC.

7. FUTURE SCOPE

In the proposed project only LI-FI Technology is used. This project can be further enhanced by using both LI-FI Technology and WI-FI Technology in the same ship. If in case either of the components doesn't works, then other can be used (either LI-FI Technology or WI-FI Technology).

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