Multi Parameter Detection in Warfield using WSN

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ABSTARCT: Wireless sensor network is used in many applications such as volcanic activity, disaster management and border surveillance. By using this method we can detect and monitor the human intrusion across the border. In this paper we use different sensors to detect the human intrusion, detection of weapon, sound and vibration either from human or vehicle and send the message to the controller room its displayed through a graphical LCD.

KEYWORDS: Wireless Sensor Network, Sensors, UAV, Microwave

I. INTRODUCTION

The main characteristics of the sensors are small in size, less energy consumption and low cost. By using this sensors we can cover wide geographical area which cannot be covered by satellite and reduces terrorism .wireless sensor network is used in many military application to provide safety for soldiers across the border it consist of two sections one is sensor section and another one is control section. In sensor section which consist of different sensors such as passive infrared sensor to detect the motion, micro electro mechanical sensor for magnetic and vibration is used to detect the weapon and vibration from shocks, acoustic sensor is used to record the sound from either human or vehicle and the value sensed by the sensor is given to the microcontroller after processing the value sensed by the sensor is given to the radio receiver for wireless communication. In control section the information from the radio receiver is received by the transceiver and send the human intrusion message to the control room displayed through graphical LCD, the control section use peer to peer wireless network to identify the fault in communication and it can be easily recovered. The image captured by the camera is stored in the micro SD card for future use.

II. METHODOLOGY

ARCHITECTURE:

It has two sections:

- ❖ Sensor section
- ❖ Control section
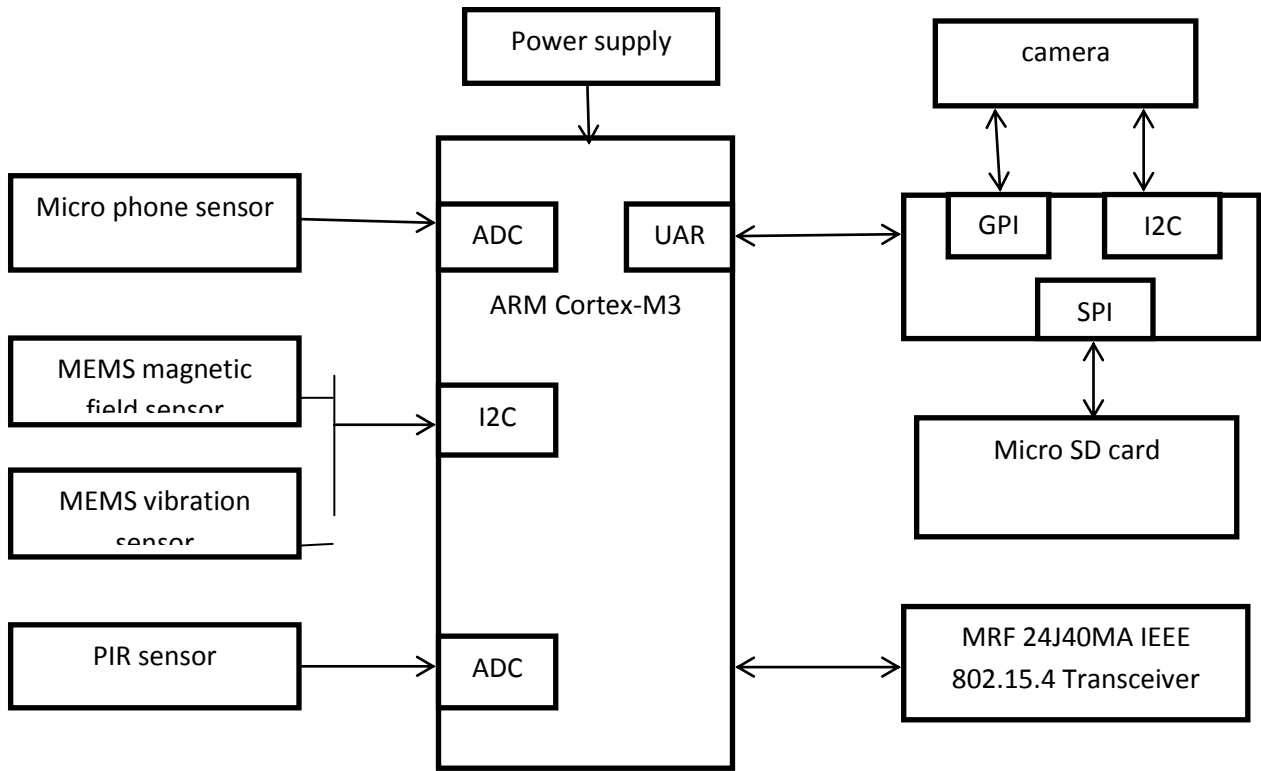
Fig.1. Block Diagram of Sensor Section
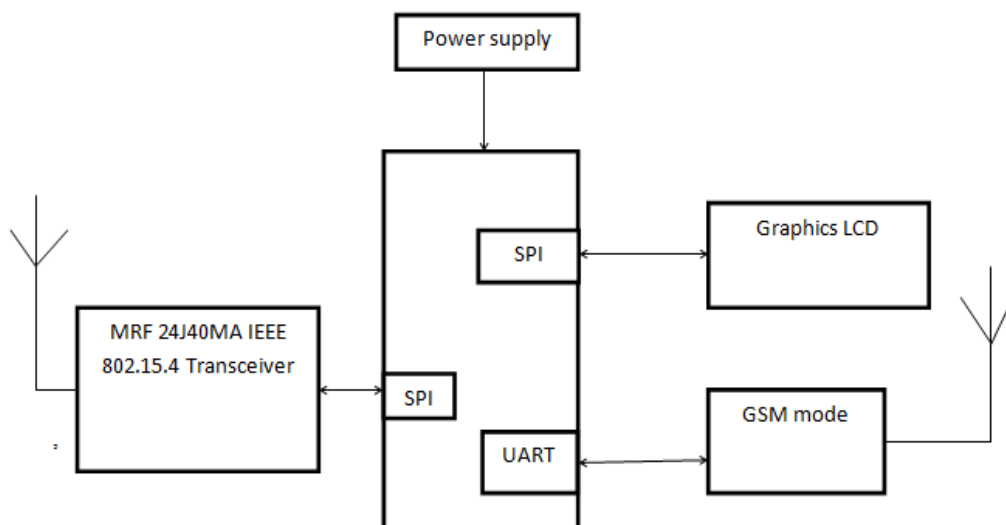
Fig.2. Block Diagram of Control Section

III. DESIGN OF HARDWARE

PIR Sensor: Passive infrared sensor is an electronic sensor that measure infrared light radiating from objects in its field of view .It does not generate or radiate any energy for detection purpose. It is used to detect the intrusion by absorbing the IR emitted from the object. Every object emits some amount of IR. Human body generates heat .IR emitted from human range from 8 to 14 micro meter range [1].It is also called as motion detector.

MEMS Magnetic Sensor: It is used to measure the strength and the direction of magnetic fields. From this we can detect the type of interruption, whether it is a weapon or vehicle. It can also detect large objects such as military tank or heavy military vehicle across the border [1] and send the value sensed by the sensor to the control section. It has high spatial resolution.

MEMS Vibration Sensor: Accelerometer is a vibration sensor. It is used to measure the vibration and shocks from either bomb or vehicle .It is measured by g-force. The 3-axis MEMS accelerometer is used to detect heavy movement in land area which happen due to movement of large vehicles or bomb [1].

Acoustic Sensor: It is used measure the sound from vehicle and human by using micro phone sensor. MEMS microphone targets all audio applications where small in size, high quality, reliability and affordability. The output from the acoustic sensor is a analog signal and it is processed by microcontroller through a ADC and the processed value is given to the control section to track the target. This sensor is used to measure the sound intensity.

MiWiP2P Protocol: MRF24J40MA is operated at 2.4 GHZ IEEE 802.15.4 radio transceiver .It has an integrated PCB antenna, matching circuitry and supports the zigbee[TM], MiWi[TM] andMiWiP2P protocol. It connects to 100 of PIC microcontrollers via a 4- wire SPI interface and ideal solution for wireless sensor network .The major problem in this prototype is no line of site, especially when it comes in indoor applications [2]. Some consider the feasibility of using microwave communications for wireless backhauling of radio base station in an outdoor environment [3]. However the advantage come with this approach fade due to the antenna alignment and weather condition .Even though point to point microwave technology is cost effective[4].On the other hand ,simulation experiment result([5][6]) shows that IEEE 802.15.4a network can provided fair location accuracy for both indoor and outdoor with direct LOS and NLOS. It can be overcome by network densification and it increase the overall performance of wireless network in terms of bandwidth, throughput and number of connecting devices [2].

ARM Cortex-M3: It is a32 bit ARM processor based on ARM 7 Harvard architecture [7][8] and it as a separate instruction and data bus that allows parallel fetching data storage. It has three stages such as fetching, decoding and executing .It has been chosen for following reason such as high efficiency, small code size and high battery life.

GPIO: General-Purpose Input Output (GPIO) is a computer board it as input and output pin it is controlled by the user at run time. The purpose of GPIO in this paper is to connect the camera to capture the human intrusion in the borders and stored in the SD card for future use.

I2C: In I2C multiple chip can be connect to the same bus and each one act as a master by initiating a data transfer. It is used in video devices, TV and computer monitors. Digital sensors can be interfaced by I2C protocol.

SPI: Serial to Parallel Convertor that converts the input serial data to parallel data in the output. It is also called as single to multiple simultaneously.

UART: Universal Asynchronous Receiver / Transreceiver. It is a microchip with programming that controls a computer interface to its attached serial devices and some internal modems.

GSM Mode: Goble System for Mobile communication developed by European telecommunication standard institute. By using this we can receive the information from the sensor section and send the message to the controller section through GSM mode.

Graphics LCD: It is interface via a serial protocol it as 48 rows and 84 columns CMOS LCD controller consume less power. The information in the control room is display through the LCD screen.

IV. SOFTWARE DESIGN

LPC Xpresso IDE: LPCxpresso IDE was developed by NXP platform .It is a family of 32-bit microcontroller integrated circuits. The componentused by LPC xpresso ide is eclipse- based IDE, a GNC- C complier, linker, libraries and an NXP LPC ARM-based microcontroller.The LPCXpresso IDE is a customized version of eclipse CDT it will

increases efficiency and act as a platform for an embedded system .LPC Xpresso IDE is developed by red code technologies and embedded artists that include an JTAG debugger .

The advantage of LPCxpresso IDE can allow the customer to build a code in any executable size and there is a restriction to download afile above 128kb.

III.   RESULT AND DISCUSSION

This device provide high accuracy compare to other system and it can be use to monitor and track multiple target location and overcome the drawback of single tracking in other system.
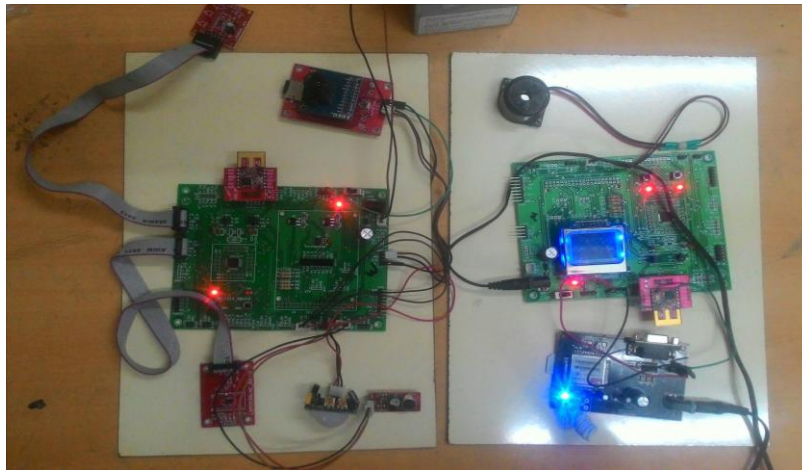

Fig.3. Model of Sensor and Control Section

IV.   CONCULSION

The system is used to detect and monitor the human intrusion across the border. The advantage of the sensor network is light weight and it can be install in few hours .Depend upon the size of the sensor network the power consumption can be varies it can be avoided in future by using solar cells.

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