Land Mine Data Collection System

Using long range WiFi and P2P computer network.

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***Abstract*—With the advancements in the Military technology and increasing tensions among the neighboring nations, It has become very-very important to keep track of even the smallest movements of the enemies. Land mines are laid across the border so that in an event of infiltration the enemies are stopped from entering at the border itself. However these landmines before explosion, can be used for collection of several critical data. This is important because in an event of explosion, our soldiers have to go on site of and verify the cause of explosion. Moreover when a mine blast occurs there is no system that notifies the troops about the occurrence of blast, they are completely relied upon their primary senses such as sight, hearing, etc. Other indication may be smoke in the area, etc. This system collects foremost information such the time at which the blast occurred, the weight on the land mine at the time of blast, temperature in the region, climate change such as rainfall or earthquakes, determines the direction in which the person, vehicle, convoy, was moving at the time of the blast. This not only helps us determine what caused the Mine blast but also tells us about the weather conditions in that area, this helps our soldiers to be ready before entering the area!**

***Keywords*—Surveillance, Military, Army, Landmine, Military Data, Wifi, Detection, Temperature sensor, Proximity sensor, Barometer, Gps, Tcp mobile, Touch Module.**

INTRODUCTION

Hundreds of our soldiers die every year protecting us from our enemies both internally and externally. Most of the time our soldiers are completely or partially unaware of the threat that is approaching them. This system will help them provide critical data that will help them to be prepared while the enemies are approaching.This will help them determine whether the backup is needed or not, and if required then call for it before the enemy reaches.

I. NEED FOR INTEGRATION OF DATA COLLECTION SYSTEM IN LANDMINE

A. The Critical Data

To collect the variable data models of the factors triggering the landmine explosion by which to generate the critical statistics to ease the military investigation methods and processes, using wireless communication procedure.

The System can send encrypted data that will enhance the security of the system. The System can also provide us with exact coordinates of the explosion and location our army personals and military convoy.

B. Utilizing the data for real time surveillance

To provide necessary information to the operating soldiers or military personnel's and give them all the possible critical real time information which is not available via other sources.

The device can be used to also collect images from the battlefield. This will give critical information that will help our soldiers to determine safe locations to land on the battlefield. It will help them determine locations to take cover after landing.

Finally, The system can also be used to enhance signals on a battlefield or Line of Control if there is a loss of signal. This system can be used to route important data to the base camps.

II. Abbreviations,Acronyms and Nomenclature

I2C : (I square C) Inter-Integrated Circuit.

DTS : Digital Temperature Sensor.

GPS : Global Positioning System.

LUX : Unit For Measurement of light intensity.

R : Red.

G : Green.

B : Blue.

A : Alpha.

X : Represents x-axis.

Y : Represents y-axis.

Z : Represents z-axis.

Gyro : Gyroscopic sensor value.

Baro : Barometer sensor value.

WiFi : Wireless Fidelity.

dBm : Power ratio in decibels milliwatt.

Azimuth : Horizontal angle measured from north.

P2P : Point to Point communication.

IP : Internet Protocol.

MAC : Media Access Control.

TCP : Transmission Control Protocol.

CPU : Central Processing Unit.

LED : Light Emitting Diode.

III. PERIPHERALS OF THE SYSTEM

Camera and the on board storage are the only peripherals used in this system. All the other devices used are linked to the system through the I2C bus. The camera can be invoked remotely and the data can be stored on the on board storage. The onboard data can be manipulated or accessed remotely using the TCP protocol.

IV. I2C Parameters

The light sensor, proximity sensor, DTS & humidity sensor, gyroscope, barometer, Compass, Touch Module, GPS and WiFi are linked to the CPU using the I2C bus. Raw data from these sensors is collected and processed.

The data from the light sensor is in terms of four color values namely R,G,B and A. Each color takes values from 0 to 255. 0 Being the darkest and 255 being the brightest. Alpha is the opacity and takes values from 0.0 being the lowest and 1.0 being the highest.

The proximity sensor is a boolean sensor. It is an optocoupler unit. It consists of an infrared LED and a Photoresistor. The optocoupler unit is effective to a distance of 8 cm. If an object is in very close proximity the light from the infrared led is reflected back to the photoresistor. When an object is in close proximity the photoresistor starts conducting.

The Gyroscopic sensor returns the orientation of the device in terms of X,Y & Z respectively. Each axis returns values ranging from 0 to 359.

The Barometer sensor gives us the atmospheric pressure. The unit is pascals. The sensor gives us values in terms of kilo-pascales or hecto-pascales.

The compass is a direction sensors. It returns values in terms of degrees from the north. Eg: 180 degrees to the north represents the south direction.

All the data from the sensors are received by the Cpu in terms of variation in voltages. The CPU converts the voltage reading in the human readable format.

V. Connectivity

The system consists of a Landmine, Transreceiver and the Base station. For data transmission between the land mine and the base station, the landmine and the base station are required to be in the same network. The trans-receiver acts as a link between the land mine and the base station. The trans-receiver is a wifi access point, it brings the devices connected to it in the same network so that the devices can interact with each other.

In order to increase the range of the wifi an unregulated point to point network is formed between the devices coupled with an antenna of approximately 3dBm power output. With this configuration an effective range of 750 meters and a maximum range of 1.1 kilometers is achieved.

VI. At the base station

A connection is formed between the base station and the land mine using the TCP sockets. Data from the land mine can be retrieved at the base station via this socket.

The landmine can enabled/disabled from the base station. The base station can retrieve data from the landmine and locate it incase of a natural calamity such as an earthquake, floods etc.

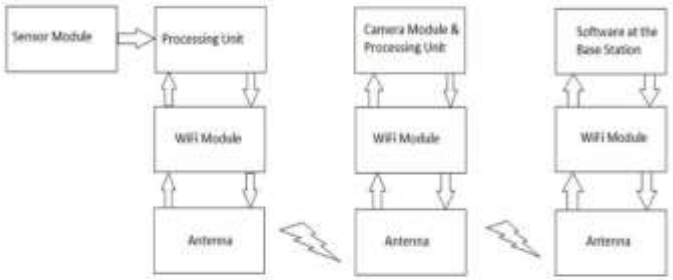
The landmine can also be used to transmit false data to fool the enemy.All aspects of the landmine can be controlled from the base station. The data transmission can be encrypted in order to increase security of the network.

VII. WorkFlow

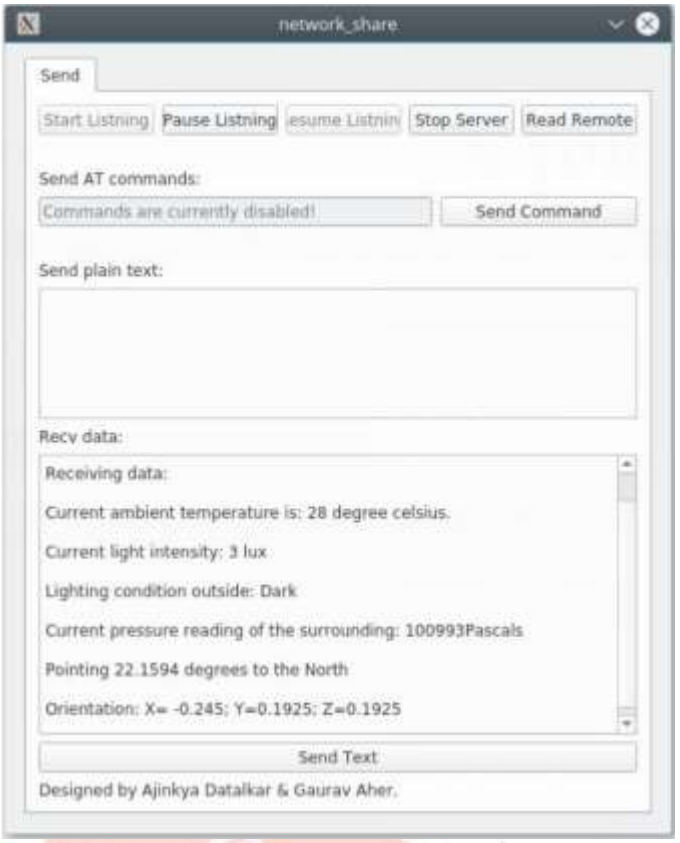
The data from the sensors is processed by the processing unit. The data is received through the I2C bus. The processed data is further given to the WiFi module through which it is transmitted.

The data is received by the transreceiver module and is then forwarded to the base station. The base station receives the data decodes it and displays it to the officer at the base

station. All the data is transmitted and received using the TCP sockets.



VIII. Output



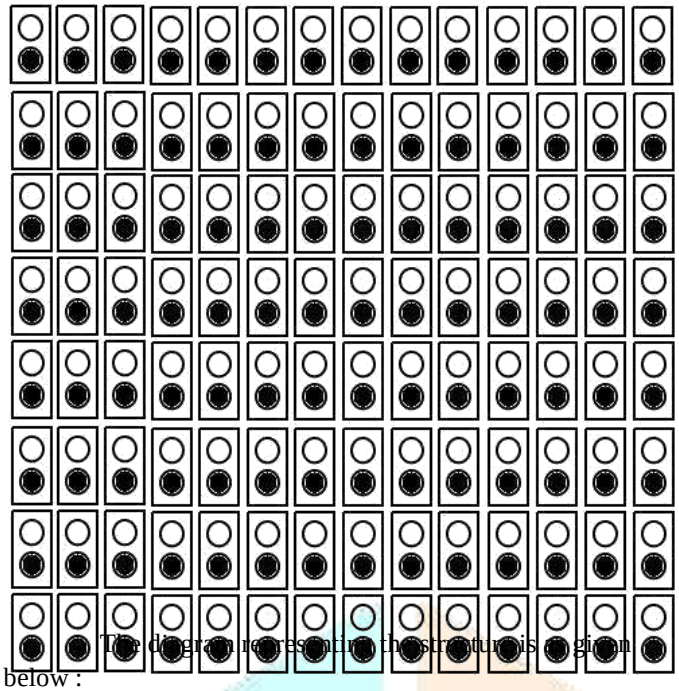
Here for testing purposes we have used sensors from an android device. The device selected is such that it has all the required sensors present on board. The application creates a TCP client socket. The software creates a TCP server socket and the device connects to the server socket.

The transreceiver acts as the link between both the landmine (i.e. the mobile device) and the software (i.e. the base station). We can also say that the transreceiver acts as a repeater.

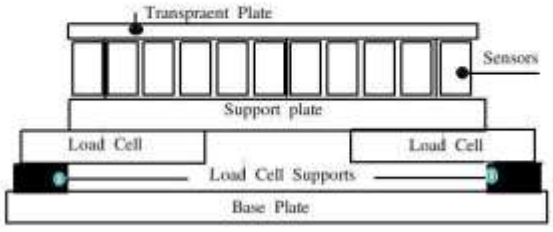
IX. Optacouplars and Loadcells

The optacouplars are used to determining the direction in which the object the stepped on it is moving. This is done by determining the sequence in which the optacouplar unit was activated.

The load cells will help us determine the weight on the land mine when it was activated. This will help us get an idea about the size of object. The diagram showing sensors on the top of landmine is as given below:



The diagram representing the structure is given in below :



The top layer is a transparent plate to protect the sensors from getting damaged. The plate has to be transparent in order to allow the light to pass through it.

The second layer consists of optacouplar units. The black dots represents a IR detecting sensor and the blank dots represents an IR LED. The third layer is a support plate made of hard metal. The support plate is followed by a set of load cells. The support plate should only partially cover the load cells. The fourth layer is the load cell support. The load cell should be only place partially on it. The last layer is the base plate. The base plate supports the land mine.

X. Conclusion

As the famous military quote states “It’s not the Lions roar that signals the danger, it’s their silence.”, In a battlefield that is more deadly than the wild even a small information such as the cause of the land mine blast, time, temperature, pressure,etc at the time of blast can save lives of many soldiers protecting us.

XI. Declaration

All authors have disclosed no conflicts.

XII. References

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