Designing Wireless System for Disaster Prevention

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Abstract: For the prevention of illegal or unauthorized woodcutting of trees the wireless system is designed, in this sensor network are coupled with wireless technology. Sensor network in the system comprises of Accelerometer which monitors the illegal woodcutting of trees in farms and the camera will take a snapshot. This paper is proposed to design and implement a wireless system based on Arm 7, The exact location of illegal activity in the form of latitude and longitude is obtained from Global positioning system (GPS), This information is send using Global System for Mobile (GSM) technology at the gateway. This enables the maintenance department authority to have automated technique for the supervision under the enforcement of law.

Keywords: GSM, GPS, ACCELEROMETER, ARM 7.

I. INTRODUCTION

In the field of monitoring illegal wood cutting, real time monitoring the vibrations on trees can correctly guide maintenance department and prevent trees from disaster. Here the major part of networking is sensor network, which is responsible for sensing vibrations generated by axe on bark of trees. On the basis of vibration spy camera is automatically switched on.

Today increasing illegal woodcutting has been a major issue for the mankind, which is ultimately resulting in the loss of natural resources as well as financial losses.

In order to achieve important parameters on the technical requirements, the technology that we are adopting of wireless sensor network based on GSM. Using of Accelerometer sensors results in low cost, low power consumption, flexible connectivity monitoring system [1]. The system is a complete set of wireless sensor network induction, acquisition, storage, application, reporting, solution, which has a good man computer exchange interface.

Users need not go into farms, in a corner anywhere in the world, could prompt understand the disaster like illegal woodcutting condition of farmland, and scientifically guide maintenance authority to take appropriate action against it.

YEARS	TOTAL TREES CUT	TEAK TREES	NON-TEAK TREES
2007	Over 1.86 Lakh	88,640	97,578
2008	Over 1.86 Lakh	87,720	98469
2009	Over 2.00 Lakh	10,0446	10,0698
2010	Over 1.66 Lakh	81,445	84,914
2011	Over 1.39 Lakh	64,618	75,249

Table 1: statistics of illegal wood cutting of trees

Organization of remaining paper is as follows. Section II includes System architecture Section III. Design of Wireless Sensor Network IV gives description about Network Management Platform Design and finally Section V Describe the proposed system.

The overall structure as figure 1 shows the system, consists of wireless sensor and network management scheme. Accelerometer sensor respectively transmits acquisition of the vibrations generated by axe on bark of tree and GSM stations passes information to gateways node. The automatic networking realizes through GSM technology.

II. THE SYSTEM ARCHITECTURE

It Forms between each sensor and the Gateway network, then transmits the analog data to ARM 7 which in response activate GPS (Global positioning system) through a serial port, exact location of the affected area in the form of latitude and longitude is obtained from GPS module.[4]

This information is send via GSM (Global system mobile) at the gateway GSM node. At the gateway, GSM module will receive these signals and via RS232, these signals are displayed on PC. The whole system designs good human-machine interface.
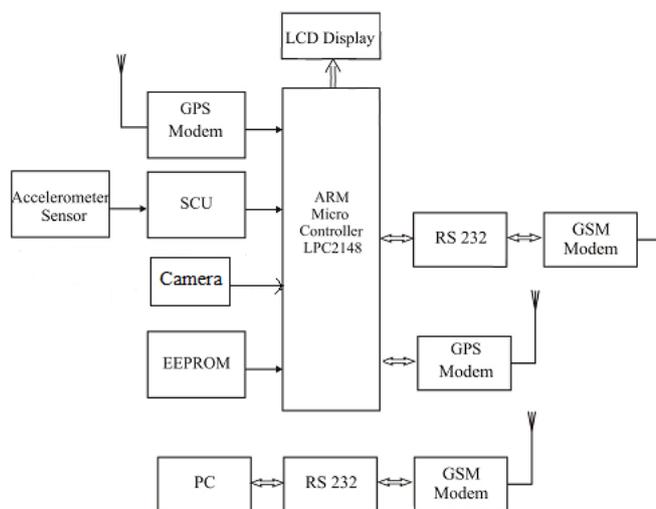

Figure 1 System Architecture

III. DESIGN AND WIRELESS SENSOR NETWORK

A. Wireless sensor network node hardware design

Firstly, considering wireless sensor network that is low cost, low power consumption, high performance and highly sensitive. In this paper we choose Philips's ARM7 LPC2148 controller chip of 32-bit ARM7 TDMI-S CPU with real-time emulation and embedded trace support, MMA7260QT chip for accelerometer sensor, web camera, iTrax130 chip for GPS module And AVR323 chip for GSM Module.

1. LPC2148

ARM Intelligent Monitoring Center uses Philips's LPC2148 processor as its main controller, the performance and frequency of which are suitable for real time processing applications [3]. Embedded Linux operating system and embedded C run on the main controller to manage various types of equipments including sensor networks, GSM and GPS modules. Output of accelerometer sensor is connected ADC of ARM 7 kit. GPS module is connected at the I2C port and the GSM module is connected at serial port of ARM 7 kits.

2.   Accelerometer Sensor

MMA7260QT is a tiny sensor. The vibration is measured using accelerometer sensor, which also sense motion of a structure. Tri axial accelerometers measure the vibration in three axes X, Y and Z... The ACC301 has lightweight titanium construction and 10 mV/g output with a dynamic range of +/-500 g's over a range of 3 to 10 kHz. **[1]**

It consists of two surface micro machined capacitive sensing cells (g-cell) and a signal conditioning ASIC contained in a single integrated circuit package.

The g-cell is a mechanical structure made from semiconductor materials (polysilicon) using semiconductor processes (masking and etching). [1]Whenever the vibrations are sensed by accelerometers the distance between the fixed plate and the variable plate changes which in response changes capacitor value which is equivalent to vibration generated by axe on the bark of the tree.

In this Switched capacitor techniques is used in ASIC to measure the g-cell capacitors and extract the acceleration data from the difference between the two capacitors. This acceleration value will be analog value. This analog value is than converted into digital value using ADC before applying to ARM 7 controller.

B. GSM communication protocol realizing

The protocol included in GSM modems for setup and control is based on the Hayes AT-Command set. The AT-Command interface is for GSM compatible modems and defined by the GSM 7.05 European telecommunication standard instate (ETSI), for testing compatibility of GSM modem AT command are used, which check whether the serial interface is working properly or not. Wide-range wireless communication standard compatible, and greatly improve the reliability of wireless communications.

The gateway node at the receiver has an information management and localization of wireless sensor network platform, which have quicker processing speed and strong information management functions. In this design, we focus the core GSM building wireless sensor network gateways hardware platform.

IV. DESIGN OF NETWORK MANAGEMENT PLATFORM

1.   GSM Station

In this paper, we embedded GSM receiver node at the gateway, as a fully functional devices, collecting all nodes data. Communication between receiver GSM module and PC is through serial RS232 port, also can directly communicate with the PC, realizing real-time data checking and monitoring.[7]

2.   Power supply

The LM7812 is three terminal regulators which is available with several fixed output voltages making them useful in a wide range of applications. The voltages available allow these regulators to be used in logic systems, instrumentation, and other solid state electronic equipment. This is primary designed as fixed voltage regulators these devices can be used with external components to obtain adjustable voltages and currents. The series 78 regulators provide fixed regulated voltages from 5 to 24 V.

3.   GPS

In this Global positioning system (GPS) is used for finding the location field from where the trees is being cut. The first NMEA messages after the start command contain the information from the "last known good" fix. The last known good fix is stored to the flash memory of iTrax each time a "stop" command is given. Notice that if iTrax's power is switched off without giving a stop command, the last known good isn't stored to flash memory and thus the position output at the first message may be empty or older than expected at the next start.

V. PROPOSED SYSTEM

This project consists of sensor node, ARM 7 Microcontroller along with an accelerometer, GSM modem and a GPS modem. These nodes will be fitted into trees. [1] Whenever a person tries to cut the tree with axe, it will detect the vibration on accelerometer, these vibrations are in the form of analog value which is generated by accelerometer sensor; further this information is converted into digital value using a ADC converter on ARM 7 controller kit.

This digital value is compared on Arm 7 kit with the threshold value which is a highest vibration value. If the incoming accelerometer value is greater than or equal to threshold value than the fitted web camera will automatically turn on and take a snapshot, at the same time the arm 7 will get latitude and longitude information from GPS module this information is carried by GSM module and transmitted on the Gateway GSM module, in response the GSM modem is interfaced via RS232 with PC, so the exact location of illegal woodcutting can be detected in very short time. The program will be written in C or embedded C.

The whole system is made using ARM7 microcontroller which is best suitable for the monitoring applications and its initial proposed perspective is of development and interfacing.
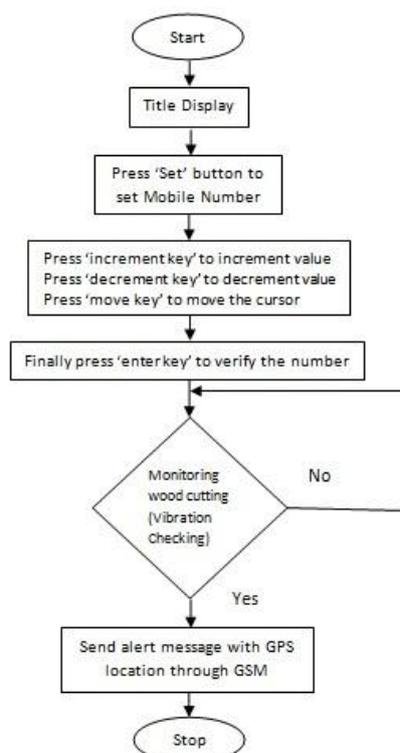

Figure 2 Flow chart

VI. RESULTS

The personal attending the personal computer will get the information and he can proceed to carry on the precautionary measures as required. Latitude and longitude information is displayed on the computer screen. After getting this information on computer screen we can click on map and get exact location of affected area directly on Google map.
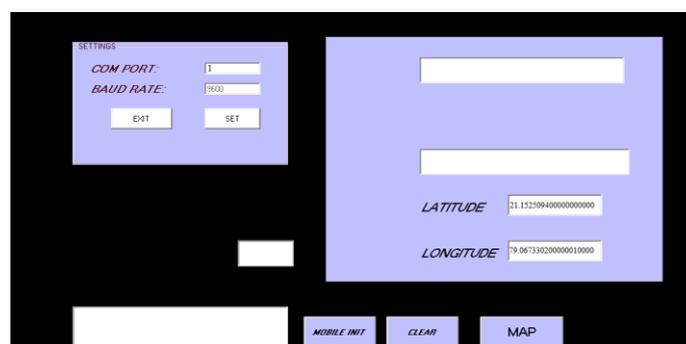
VII. CONCLUSION

In the specific application, need of trees monitoring system and analysis those problem existing in monitoring illegal wood cutting of trees, we designed and implemented a wireless sensor network based on the illegal woodcutting of trees monitoring system t eradicate illegal wood cutting . The system can realize rapidly automatic networking and real-time data acquisition, transmission, display. With the characteristics of low cost, low power consumption, flexibility networking, without cabling, friendly interface, etc. Through GSM technology we can realize the function of the data networking, remote monitoring, it shows that the system can meet the requirements of the management authority. In future, we can monitor the complete forest or even road side trees by using appropriate sensor. Further the research could also be enhanced to produce a system that can monitor the whole activities taking place in farms.

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