

Arduino Based Radioactive Tracking System

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Abstract: *There is a clear need to enhance security action to prevent any malicious use or inadvertent abuse of radiation sources. Some of these radioactive sources are consistently transferred beyond the office or laboratory grounds for work and consulting reasons. This paper presents the early development of the radioactive citation tracking, which combined the Arduino microcontroller, Global Positioning System (GPS) and Global Mobile Communication System (GSM) systems. The monitoring scheme will assist the proprietor track the motion of irradiated sources. The system is completely capable of monitoring the motion of the toxic substance through GPS satellite signals. The GPS position could either be transferred to the headquarters at a set interval Short Messaging Service (SMS) enables real-time surveillance or storage on a flash drive for offline surveillance and information capturing..*

Keywords : *Arduino, Radioactive, Tracking system..*

I. INTRODUCTION

Radioactive reports bring excellent benefits to humanity across their use in farming, industry, medicine and analysis. However, there is increasing concern that terrorist or criminal organizations could gain access to high-level radioactivity sources and intentionally use the sources. [1]. Consequently There has been a worldwide trend toward certain increased control, billing and safety of radioactive groups in order to avoid their misuse and any prospective resulting effects. [2][3][4]. Implementation of the security control elements is parallel with the Notice of Adoption of The Code of ethics of the IAEA (CoC) on Radioactive Sources Personal security. In line with the enforcement, the aim of this project is to develop and install a radioactive source tracking system, as a measure to ensure nuclear security. Some Radioactive samples are frequently transferred outside the fieldwork and consulting office or research premises. The system will be capable of tracking radioactive sources in real time through Global Positioning System (GPS) satellite signals and mobile telecommunication networks. The tracking system will provides immediate alerts to the owner during any unauthorized removal of radioactive source and helps to monitor the possession and movement of radioactive sources.

Arduino is an open source prototyping platform centered on easy-to-use operating systems. [5][6][7][8]. Arduino Uno and Arduino shields are used in the design and development of system as it provides ideal tool for rapid design development and prototyping especially for proof of concept. This article introduces the original creation of a radioactive element tracking scheme based on Arduino.. The design focuses on integration of Global Positioning System (GPS) and Short Messaging Service (SMS) for wireless on-line and off-line location tracking. The design hardware, software, as well as preliminary results will be discussed in this paper

II. METHODOLOGY

A. Hardware of the System

The design of the The system is split into two components: the transmitter and the receiver. as shown in Figure 1. The transmitter will be attached to the casing of the radioactive source. Transmitter is the portable part of the system and powered by battery source. Its hardware consists of Arduino Uno as the controller board, GPS shield with built-in Maintaining the Integrity of the Specifications

SD-card for position tracking and off-line data logging, detector module to record the dose rate data, and GSM shield for real time data transmission via SMS. The receiver section is used for monitoring and data logging. Receiver consists of a GSM modem to receive the SMS, and host computer with position mapping and data logging software.

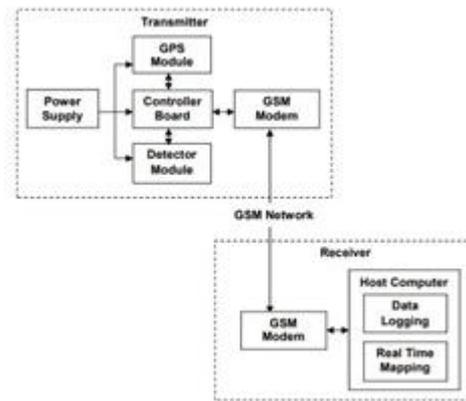


Fig 1. Block diagram of the system

III. SOFTWARE OF A SYSTEM:

The heart of the system is the Arduino firmware of the transmitter that synchronizes the operation of GPS module, GSM module, and SD Card. Transmitter will send GPS data to host at a preset interval time. The flowchart of the firmware is shown in Figure 2.[9]

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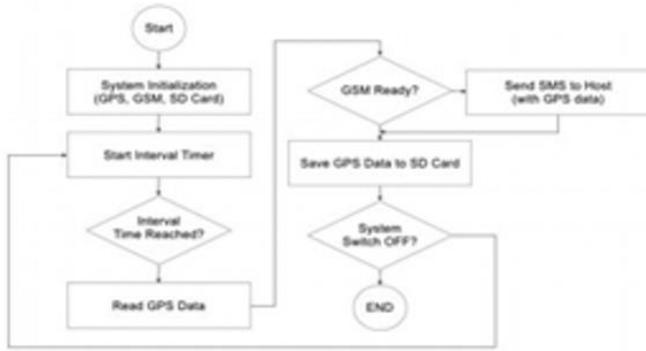


Fig.2 flowchart of transmitter firmware

Initialization of the system involves initialization of GPS, GSM, and SD Card. GPS module must fix to at least three satellites in order to read the latitude and longitude of the current location. Latitude and longitude of the location are the key data in this system. To avoid data loss due to problem such as GSM network coverage limitation, the data will also be recorded in SD card for off line monitoring.[12-18]

IV. RESULTS AND DISCUSSION:

Currently, the system is capable of chase the movement of radioactive supply through the GPS satellite signals. The GPS co-ordinate may either be transmitted to host at fastened interval via Short electronic communication Service (SMS) to change real time observation, or hold on during a memory card for offline observation and information work. The online GPS mapping software for the receiver is still under construction. At the moment, location data is extracted manually from the SMS or from the SD card. GPS shield produces NMEA sentences that consists of several data such as time, date, number of satellite fixed, latitude and longitude, as well as travelling speed, angle, and altitude as shown in fig.3.[20]

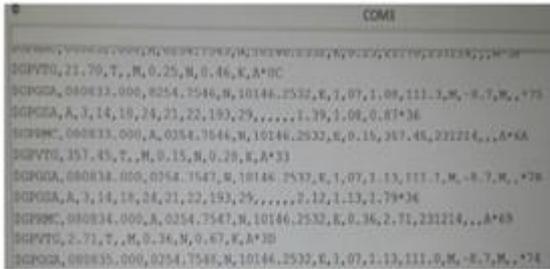


FIGURE 3. GPS NMEA Data.

Fig.3 GPS NMEA data

These data need to be parsed and extracted as the system will only records the time as well as location latitude and longitude. Example of single location mapping on Google Map is shown in Figure 4. This is done simply by manually entering the latitude and longitude of the location on the website. Early state the units for each quantity that you use in an equation.[11]



Fig 4 Single Data Location.

To create multileveled equations, it may be necessary The system has also been tested for continuous tracking. The result is shown in Figure 5 where the route of transmitter is highlighted by the red line. Data is recorded at one minute time interval. These prove that the Arduino based tracking system is working accordingly and capable to produce consistent and continuous data for the tracking system.[19-]



Fig .5 Continious GPS data Mapping For Tracking System.

V. CONCLUSION

This paper concludes that an initial design for radioactive source tracking system has been successfully implemented by using Arduino UNO, GPS, and GSM shields. The system is able to provide real time or off line position data (latitude and longitude) via SMS and SD Card. The design process of the transmitter is simplified by using Arduino Uno, GPS, and GSM shields, as well as the library for the firmware. The next step is to test the integration of real time data with GPS mapping software to evaluate the reliability and the efficiency of the system.

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