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Microcontrollers and Embedded Systems(ECE3031)

**TOPIC - RESCUE MANAGEMENT
AND EMERGENCY
TRACKING SYSTEM**

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Project by:

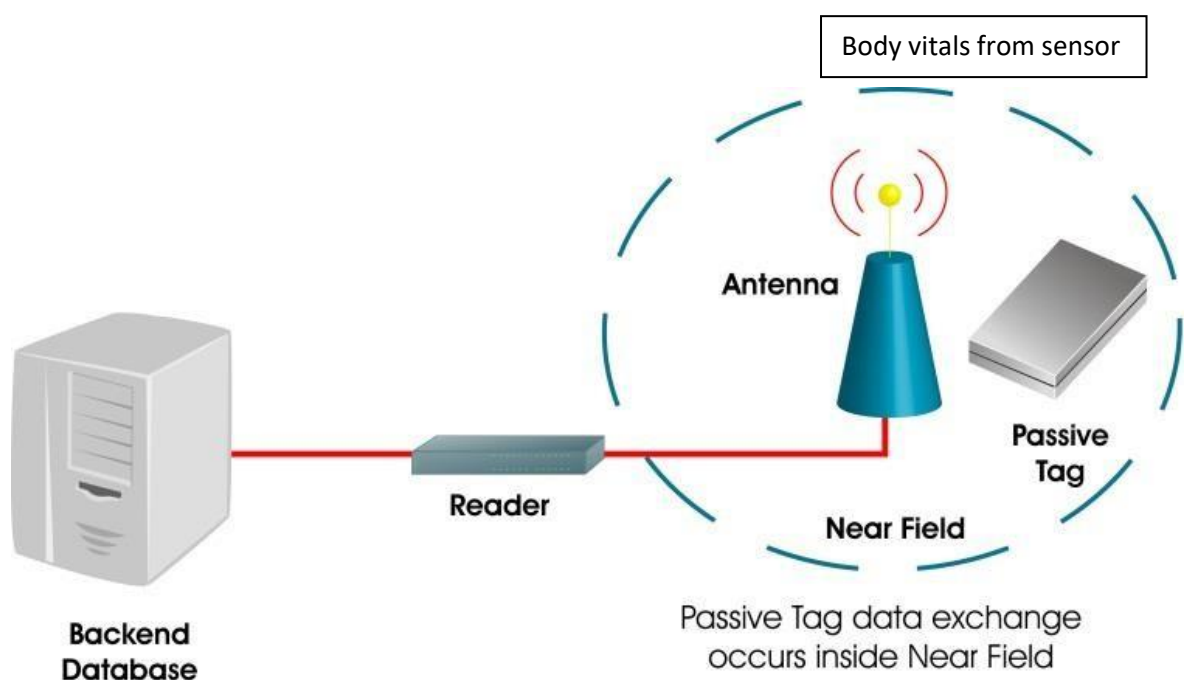
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ABSTRACT

It is crucial to keep track of disaster victims at the time of rescue operation. The operation may involve multiple hops between multiple towns in order to reach the victim to a caretaker/nurse. We propose to build a 8051 based wearable that can detect body vitals and position of the victim and send the data to a caretaker. This includes an RFID tag that links the patient to a particular nurse/caretaker and enables the nurse to identify the victim. This ensures tracking of the rescue operation and safe recovery of the disaster victim from the point of accident to a home/hospital. Pulse Count Sensor will be used to monitor the heart rate of the victim and those who require immediate attention will be separated out. This project can also cover military applications while rescuing ailing soldiers/ refugees.



INTRODUCTION

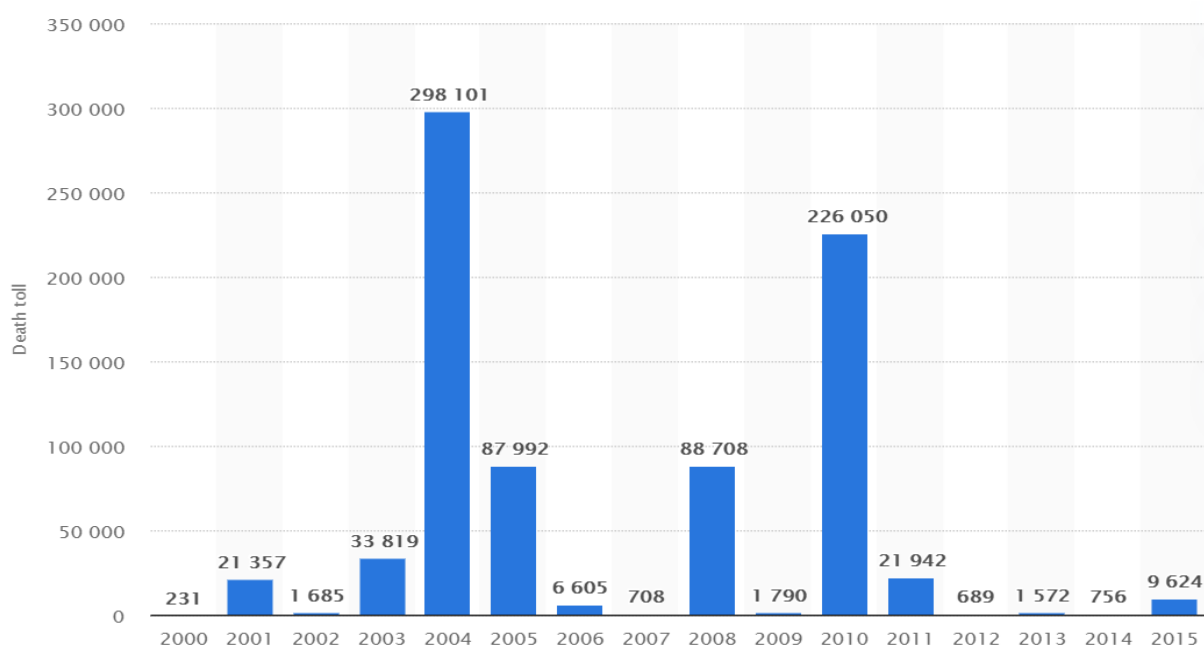
Natural disasters, as an unexpected event, cause damage and destruction of human life and health. The injured person, without others' assistance are not able to meet their needs. Most of the Natural disasters in India are related to the climate of India which causes massive losses of life and property. Droughts, flashfloods, cyclones, avalanches, landslides brought by torrential rains, and snowstorms pose the greatest threats. Building collapses are also a major cause of mortality and morbidity around the world. In the last decade, a number of buildings have collapsed causing a significant number of deaths and illness.

These times of disaster disrupts all daily affairs of society, such as economic activities, city services, communication systems and community services, and public health. Developments for dealing with such situations is of utmost important to us. Certain natural/climatic crises cannot be avoided by humans as per their wish but making it easy for us to deal with them, is the only wise step. Being prepared for them is the need of the hour.

RFID is an acronym for "radio frequency identification" and refers to a technology whereby digital data encoded in RFID tags or smart labels are captured by a reader via radio waves. RFID belongs to a group of technologies referred to as Automatic Identification and Data Capture (AIDC).

The literature was searched on the role of RFID technology in improving patient safety with the help of libraries, books, conference proceedings, databases, and also search engines available at Google, Google Scholar. In our searches, we employed the following keywords and their combinations; RFID, victim, disaster, rescue, and earthquake in the searching areas of titles, keywords, abstracts, and full texts in the searching areas. More than 60 articles were collected and assessed, and 39 of them were selected based on their relevancy. This was published in the International Journal for Health and disaster management.

The below graph represent death toll during earthquakes in 15 years. Most of the death were due unable to track people buried under the fallen building and hence no help could reach them.



PROBLEM STATEMENT

The aim of the project is to use a microcontroller to regulate the transfer of human victims from point to point. Multiple points in the locality will have RFID based device that can record the detected tag information and its related vitals. The victim's body will be scanned at multiple points in the journey. Any point that doesn't show a consistent vital can be attended to by calling emergency doctors at that point. If the patient is trafficked or any one point doesn't show RFID reading, there will be a police inspection on that patient's current location based on last scanned location. This will avoid the slightest chances of a mishap.

This system can be deployed in disaster time in patients' management systems and in Realtime vitals communication to the doctors. It will avoid human errors and can register large data in a very less amount of time. The system is very helpful as it provides effective identification method for the patients along with security of information stored. This device displays potential to fit military use cases and to prevent trafficking of humans (child and woman trafficking).

The main objective to track down the people who are trapped inside collapsed building and rescue them.

THEORY

Human RFID Tracking System is used to track the activities of the particular person in an organization, school or University. Our system operates through the help of Radio Frequency Identification technology. With this Human RFID Tracking System unit it is possible to document and keep track of daily arrival and leaving times of the employees anytime and anywhere as well as with the help of optional GPS receiver it is also possible to determine the location of the device where it is installed. This efficient and compact time registration system is a perfect solution for any type of organizations, and can be installed very easy and super-fast. Employees simply clock in and out by holding their RFID card next to the device. This data is transmitted through TCP/IP over GPRS to a remote server, and you will have the essential details allowing you to optimally structure your business processes.

Extending this existing systems to have an interface of sensors that gives information of body vitals leads to a powerful use case, as demonstrated in our project. Disaster victim management is a sparsely explored area using this technology presently. There was a study done on the literature on the role of the RFID technology in natural disasters to rescue victims on a formal research framework. Our study was divided into three phases: Literature collection, assessing, and selection.

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. An RFID tag consists of a tiny radio transponder; a radio receiver and transmitter. When triggered by an electromagnetic interrogation pulse from a nearby RFID reader device, the tag transmits digital data, usually an identifying inventory number, back to the reader.

The RFID is already used to track and trace the victims in a disaster situation. Data can be collected in real time and be immediately available to emergency personnel and saves time by the RFID.

The RFID system consists of following five components:

- Tag (attached to an object, unique identification);
- Antenna (tag detector, creates magnetic field);
- Reader (receiver of tag information, manipulator);
- Communication infrastructure (enable reader/RFID to work through IT infrastructure);
- Application software (user database/application/interface).

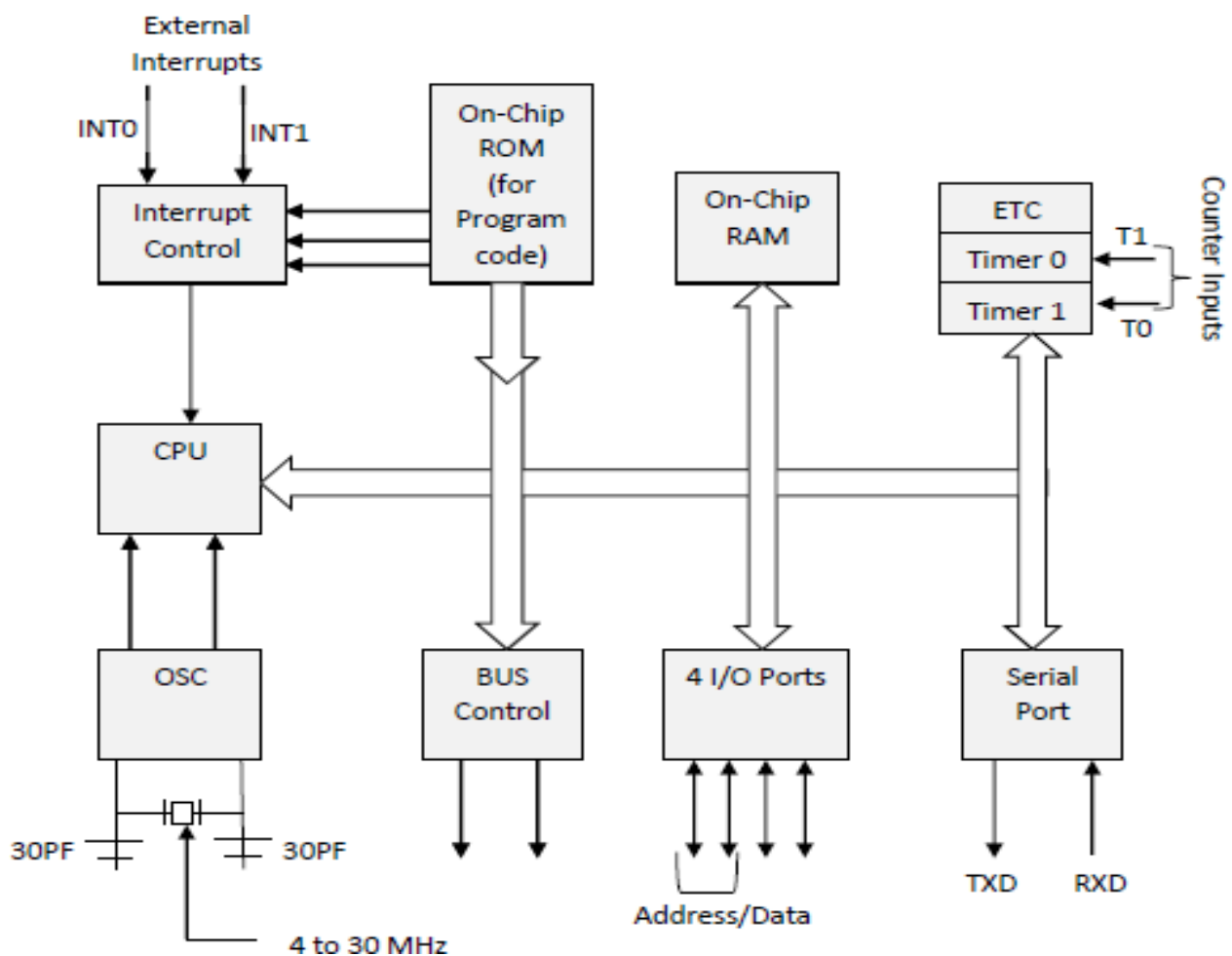
During a disaster, there are a lot of barriers such as network disconnection, fix phone and cell phone unavailable, to track and find victims. Therefore, to rescue victims who had the RFID tags before a calamity or not, it would be useful to rescue them by using this technology. Therefore, the aim of this study was to introduce the RFID technology and explain how it can rescue victims who saved from collapsed building after an earthquake.

COMPONENTS USED

8051 Microcontroller

8051 microcontroller is designed by Intel in 1981. It is an 8-bit microcontroller. It is built with 40 pins DIP (dual inline package), 4kb of ROM storage and 128 bytes of RAM storage, 2 16-bit timers. It consists of are four parallel 8-bit ports, which are programmable as well as addressable as per the requirement. An on-chip crystal oscillator is integrated in the microcontroller having crystal frequency of 12 MHz

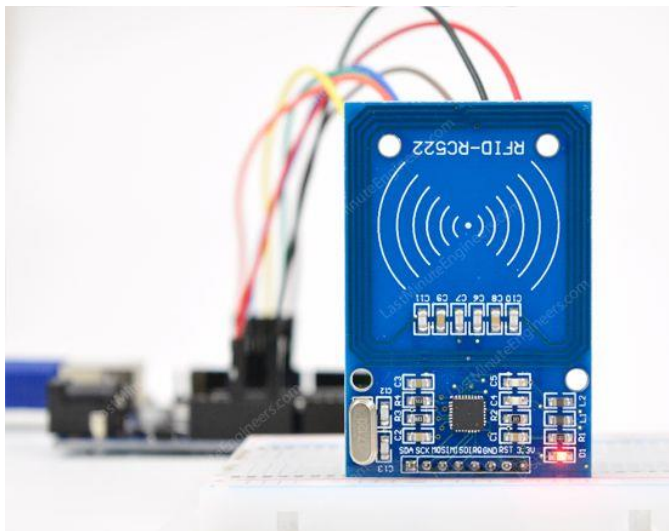
Internal architecture of 8051



RFID Reader

EM-18 RFID reader module uses a RFID reader that can read 125 KHz tags. So, it can be called as a low frequency RFID reader. It gives out a serial output and has a range of about 8-12 cm. There is a built-in antenna and it can be connected to the PC with the help of RS232.

EM18 module radiates out 125 KHz through the coils. When a 125 KHz RFID passive tag is brought to the field module will get energized from the field. By the change in modulation current through the coils, the tag will be sending the information back to the program memory array.



Pin No.	Name	Function
1	VCC	5V
2	GND	Ground
3	BEEP	BEEP and LED
4	ANT	No Use
5	ANT	No Use
6	SEL	HIGH selects RS232, LOW selects WIEGAND
7	TX	UART TX, When RS232 is Selected
8	D1	WIEGAND Data 1
9	D0	WIEGAND Data 0

RFID Tag

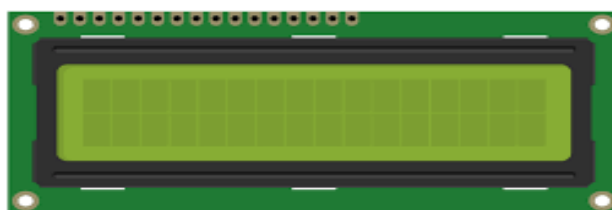
An RFID tag works by transmitting and receiving information via an antenna and a microchip — also sometimes called an integrated circuit or IC. The microchip on an RFID reader is written with whatever information the user wants.

There are two main types of RFID tags: battery-operated and passive. As the name suggests, battery-operated RFID tags contain an onboard battery as a power supply, whereas a passive RFID tag does not, instead working by using electromagnetic energy transmitted from an RFID reader. Battery-operated RFID tags might also be called active RFID tags.

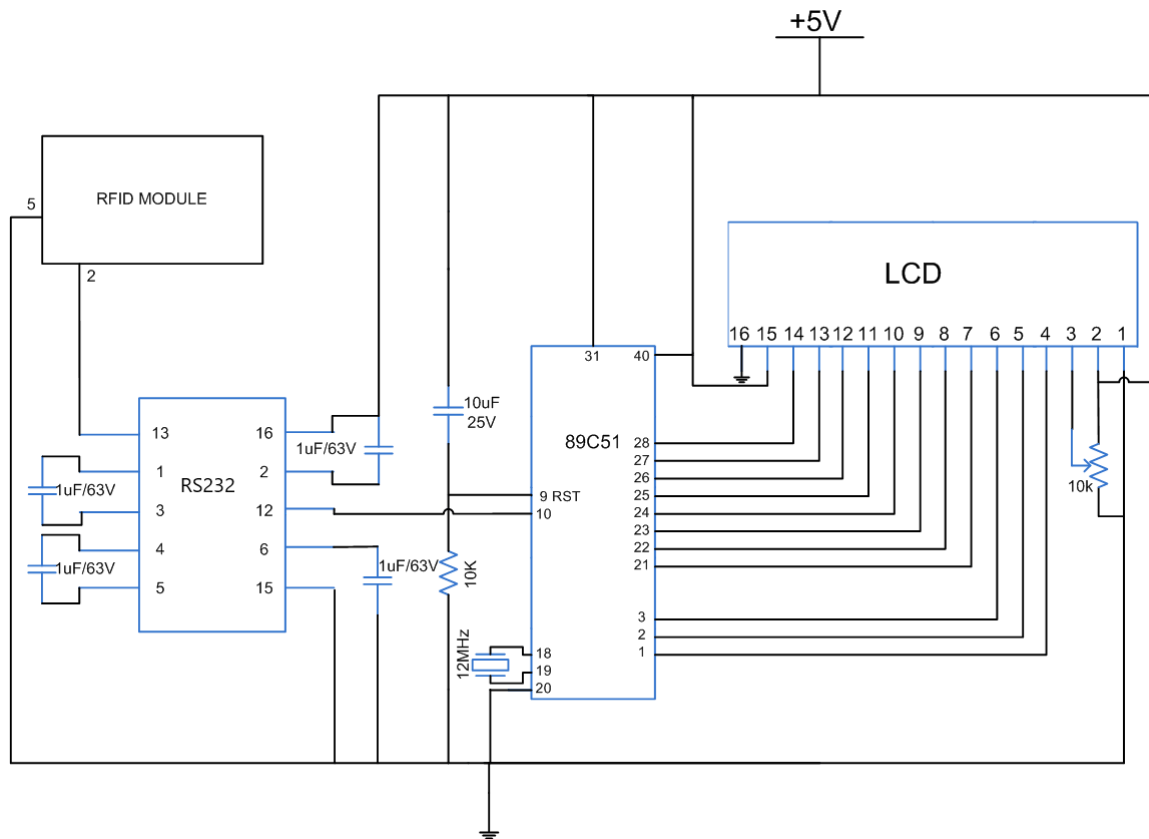


LCD (16x2) screen

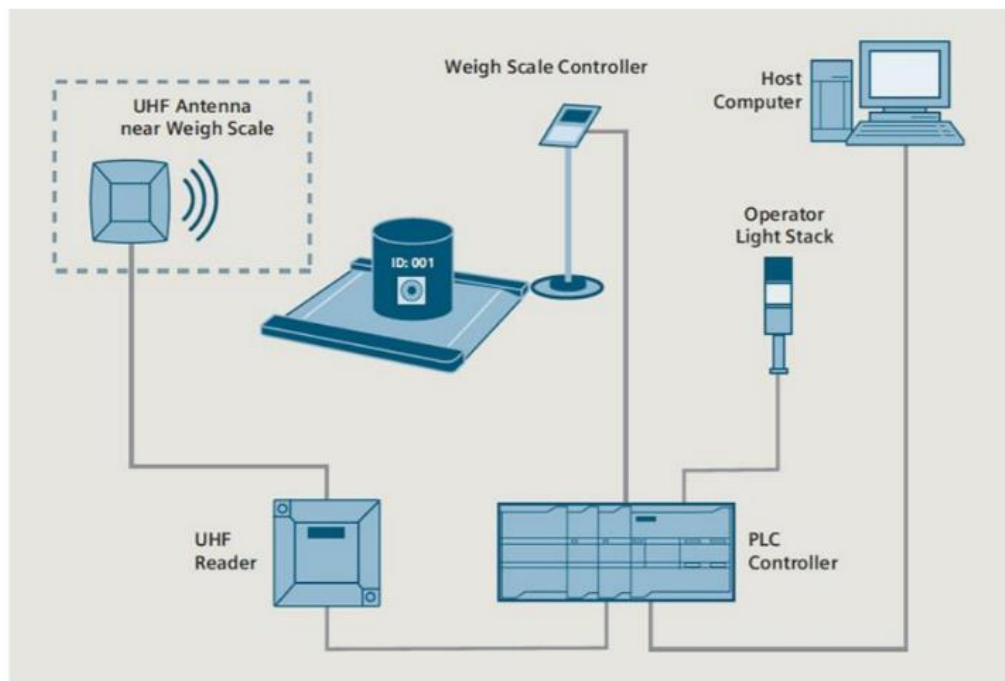
This is a peripheral that can display text and cursor in two lines. Programmable using the 8051 output pins. It has multiple options to display text.



CIRCUIT DIAGRAM



➔ Popular use case of RS232 based object tracking in warehouse management



WORKING

- The RFID reader (used for reading the RFID sensors) are placed at different localities of the building where employees pass through.
- Also, they are located at all entrances and exits.
- Whenever there is natural disaster and immediate rescue is required, this project locates all the employees in the building.
- Every employee has a RFID sensor tag containing their information.
- Whenever the evacuation of the building is required, the RFID sensors senses these RFID tags that they are wearing.
- As soon as one passes through the RFID tag reader, the reader senses the tag and thus the information about the employee is gathered and displayed on the LCD screen
- This keeps the count of the employees in the building and thus helps in finding the missing people during the disaster.

RESULT

As our main objective of tracking people is successfully implemented as result the death toll will decrease by huge amount. We will be able to rescue more people trapped under fallen building with the help of their unique RFID tags. It is also feasible as it is cost effective and can be implemented in places where there are frequent earthquakes.

Limitations

There are several limitation to use RFID device for chase victims when the earthquake as follows:

- It is not possible to browse wet tag
- Vulnerability tags; once they get wet
- Tags and reader interaction
- The issue of safety (lower security than the barcode)
- Economic issues thanks to the high price with the RFID
- Hardware RFID problems;
- Accredited standards development;
- There is associate degree moral and ethical dimension to tagging human

Recent studies in Medwell journals published primarily based following resolution that alter a better bastion of learning or organization to adequately manage their human resources and enhance productivity. we tend to developed an internet primarily based human following system that leverages on the Microsoft ASP. web MVC five framework and a desktop application to act with the RFID reader victimization.

RFID tags in defence had been used in the following case:

The Library of Defence Scientific Information & Documentation Centre (DESIDOC), Delhi is known as Defence Science Library. It has a rich collection of more than 75,000 books in various fields of S&T including rockets and missiles, defence electronics, physical and life

sciences, material science, military science and technology, management, materials, and naval R&D, etc. In addition to books, it has access to 2 lakhs technical reports and 1 lakh bound volume of periodicals. The books were to be tagged by RFID tags. Recent research also involves the use of such RFID tag based system in tracking of defence drones and defence unmanned vehicles.

ADVANTAGES

- Reduce time and cost by using RFID in the process of victims tracking.
- Reduce errors to recognize and track victims by using RFID.
- Localize the victims in shelters and rescue victims faster.
- Give better services to victims.
- Decrease wasting time to rescue victims making mistakes through data collection.
- Improve victims' logistics for tracking and servicing.
- Improve communication among doctors, nurses, and rescuers and facilitate medical and supportive data recording..
- Track and identify victims from various distances and hence increase speed of recognizing victims of information system.
- Reduce time and information processing by its ability to read several tags simultaneously.
- Increase security data and information.

DISADVANTAGES

There square measure several important barriers to use RFID device for chase victims when the earthquake as follows:

- It is not possible to browse wet tag
- Vulnerability tags; once they get wet
- Tags and reader interaction
- The issue of safety (lower security than the barcode)
- Economic issues thanks to the high price with the RFID
- Hardware RFID problems;
- Accredited standards development;
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CONCLUSION

The RFID technology automates data collection and vastly reduces human effort and error. RFID supports tag reading with no line-of-sight or item-by-item scans required

RFID readers can read multiple RFID tags simultaneously, offering increases in efficiency. All RFID tags within range can be detected instantly and matched with information in your database RFID can be integrated with active scanning and fixed readers for a totally automated tracking solution.

The major disadvantage of the system is that it cannot send Realtime patient information to cloud for global immediate response diagnosis. This system makes the middle point doctors more responsible and accountable than a single end point service doctor.

Future Scope

The future scope chiefly involves logging the data into a decentralized/centralized server in order that the data can be accessed in a long distance scenario like distant militant operations. This requires the use of Wi-Fi module (ESP-8266) and the use of IoT based real-time backend platform for database such as Google Firebase.

Further, multiple sensors can be integrated like IRIS health scanner, footsteps counter to use machine learning algorithms on the data collected and make valuable first stage predictions to simplify diagnosis. For this whole project to be used at its best, systems like this will have to be deployed at different checkpoints while rescuing the victim.

The data gained can be then transferred to an online server. A care taker then can see full record of location of victim from a remote site. Also, this project can be used in other applications in which constant location of the victim is required. For example, transportation of prisoners, army men, packages, mails, etc.

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