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## Infant Hazard Activity Recognition Using RFID Technology and Tracking System Using GSM and GPS Technology

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### **Abstract:**

*This paper presents a child activity recognition and tracking system using RFID technology and GPS and GSM to prevent child accidents such as unintentional injuries at home and missing cases. It is an Android based solution to aid parents to track their children in real time. Nowadays, most mobile phones are equipped with location services capabilities allowing us to get the device's geographic position in real time. It allows the parent to get their child's location on a real time map. The system consists of two sides, child side and parent side. The application works with the help of android mobile. The android application based on GPS and SMS services in Android mobile.*

**Keywords:** Child activity detection system, Child Tracking System, Global Positioning System (GPS), Global System for Mobile Communications (GSM), SMS-based Mobile Application, Radio Frequency Identification device (RFID).

### **1. Introduction**

As babies usually start crawling/walking between 9 and 16 months, they are at risk of falling from furniture or stairs, and wandering near electric circuits in home, going out of home alone etc. Those types of risk are frequent and cause of injury in children. In children younger than four years of age, most falls related injuries occur at home. Thus, a new safety management method for children is required to prevent child home accidents. Currently medical service, prevention is preferred over the treatments and health management is considered primarily. Since the major causes of fall related injuries change as a child grows and develops, fall prevention needs to be addressed. In a view of health concern, the baby's body temperature can be continually monitored.

The Child has to wear device consist of RFID reader on the body. To recognize daily activities in home we should place RFID tags wherever we need to monitor child activity.

The control unit of our project consist Microcontroller, RFID, GSM, GPS, RF encoder, RF transmitter. The microcontroller processes the input from RFID then it gets encoded. The RF transmitter transfers the encoded data to RF receiver. The data is decoded again. If the RFID code got match the buzzer is used to notify that the child is at risk. Also GSM communication is used to send notification about child, if child crosses some boundaries (predefined GPS locations) it is intimated to parents via GSM and voice alert is obtained. Global System for Mobile communication (GSM) is the most popular standard for mobile phones in the world. It is introduced by the European Telecommunication Standards Institute (ETSI) to describe technologies for second generation (2G) digital cellular networks. GSM also pioneered a low cost, alternative to voice calls, this short message service which is now supported on other mobile standards. Global Positioning System (GPS) is space based satellite navigation system that provides location and time information in all-weather conditions. PS consumes 30% less power than predecessors. It delivers top notch accuracy. Satellite transmits data that allow users to a precisely measure the distance from the selected to its antenna and to compute, position, velocity and time parameters.

### **2. Literature Survey**

In Al-Suwaidi and Zemerl (2009), they solved the problem by application "Locating Friends and Family Using Mobile Phones with Global Positioning System (GPS)". Client server based approach used in the architecture. The registration of client phone done by

server and after that login saved in database of server. Then client sends location coordinate updates to server the updates saved in database of server. Then with the help of Location Updates the location is tracked. This application was developed for helping to locate the family members and the friends.

In 2011 the Chandra *et al.* used an approach with the help of SMS services. Application was implemented for JAVA a mobile device which supports GPS. The client shares his location through SMS to the web server. The Client views his location on the map.

The paper by Almomaniet *al.* (2011) proposes “Ubiquitous GPS Vehicle Tracking and Management System”. This system architecture is Client-server based application and mobile application. In server side it uses GPS and SMS for storing user details. At Client side have a box which contains GPS tracking device and GSM modem. When user is registered and logged in web server then user details are saved to server. This application developed for monitoring driving behavior of their employees.

Radio-frequency identification (RFID) is a way in which automatic identification can retrieve and store data remotely by utilizing RFID tags and readers. The main components of the RFID tags are an integrated circuit (IC) and an antenna. The IC will be able to store data and its unique identifier while the antenna is responsible in receiving and transmitting data from and to RFID readers [1]. There are many current implementations of RFID. Several current studies on RFID implementations are described in the next section.

Brewer *et al.* [2] have used RFID technology in manufacturing for tracking purpose. In the implementation, an RFID wireless system provides constant identification at a distance, hands-free operation and real-time control. Information can be added to the ID number of a particular tag thus allowing the storage of dynamic information with the asset to be tracked making it very suitable technology for monitoring assets.

RFID has been on an evolutionary path where at first the tag only stores its unique identifier but as time progresses we are able to store a larger amount of data ranging from personal information to medical records to body temperature and traveling logs. Several benefits of this technology include storing information, activating electrical appliances and a form of electronic identification. One of the problems that might be encountered when implementing this technology is that the information may be freely accessible to anyone as these tags broadcast data without any encryption.

Ethical concerns on how a person’s personal data can be easily accessible to unethical individuals may have impact on personal privacy [3]. tracked making it very suitable technology for monitoring assets.

### 3 Proposed System

The proposed system focuses on implementing child activity monitoring system to prevent child from home accidents such as falling from stairs, going near dangerous areas such as electric socket, gas etc. And also to monitor the body temperature using temperature sensors.

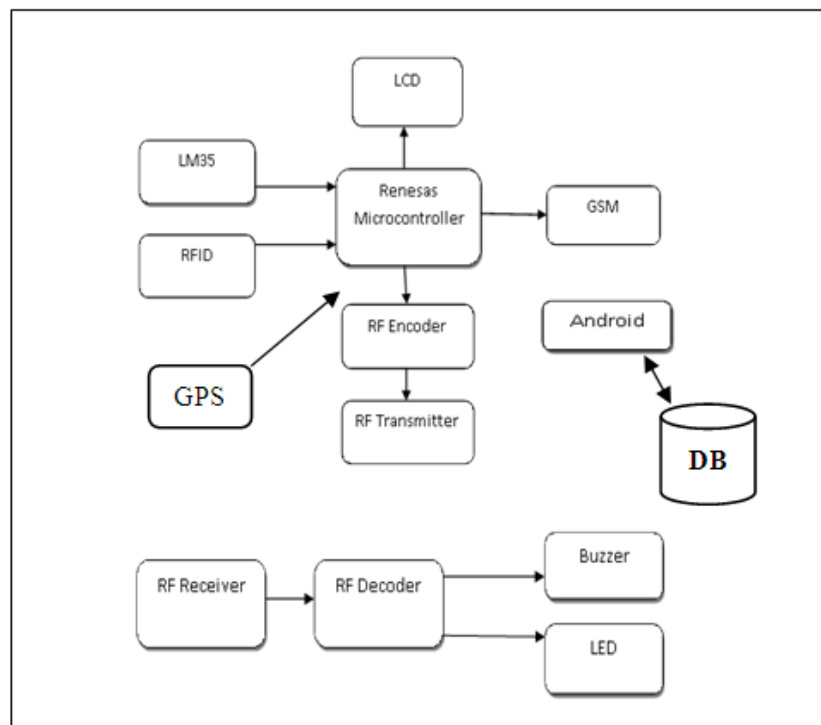


Figure 1: Block Diagram

The main hardware used in our proposed system are the RFID reader, RFID tags, GSM, GPS, temperature sensor(LM35),renesas microcontroller(RL78). RFID equipment’s such as RFID reader and RFID tags are deployed to provide the ability to prevent accidents within the house premises. If the child moves out of the house premises or is taken away from the house premises the, GPS detects the action and is notified to the parents through buzzer, light and notification is sent to the parents.

Type	Sensor	Value	Feature
Space	RFID	ID	Location (e.g. living room, dining room)
Object	RFID	ID	Object Name (e.g. electric socket)
Temperature	Temperature sensor	[-40°C, 125°C]	Ambient temperature

Table 1: Sensor Types of the wearable Sensor Device

In terms of software, most of the applications are custom developed using various types of programming Languages. The application is used to track the Childs location. For implementation of application, Android SDK tools and Eclipse Kepler which support android is used. Reason for choosing android OS is that to target more users. Lots of people use android mobile phones. The data that is sent to the android application is stored in the database using SQLite.

The code for handling hardware devices is written in EMBEDDED C.

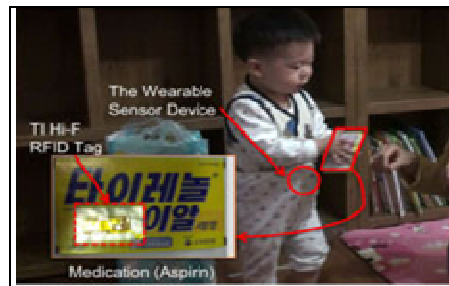


Figure 2: The RFID tag.

The device will be wearable sensor device to recognize different activities like moving to places such as room, hall, kitchen and dangerous places like electric socket, refrigerator. The wearable module includes microcontroller Renesas, sensors like temperature sensor and RFID reader and tags and RF transmitter and RF receiver and receiver module will be android device.

The RFID tags will be placed in different areas like room, hall kitchen, electric socket, refrigerator etc. When the child enters the all such areas mentioned above the child module reads the ID in the RFID tag

Graph: The below graph depicts level of security of child.

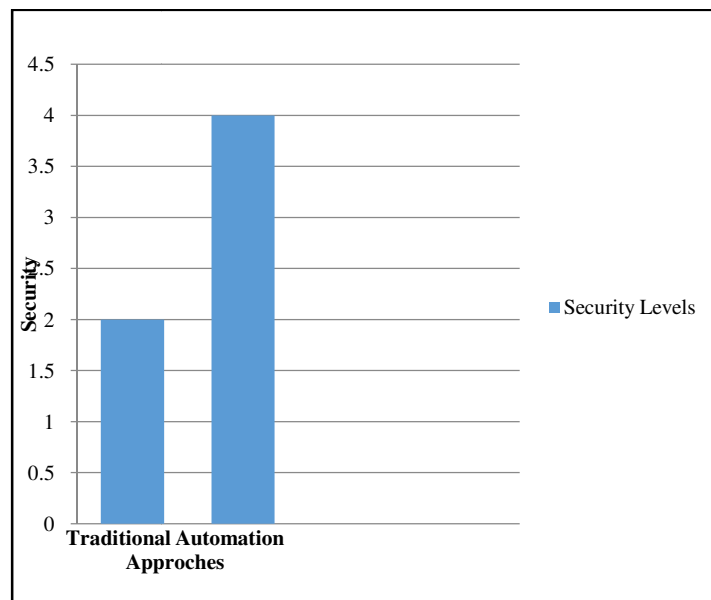


Figure 3

The heart of our project is renesas RL78 microcontroller it takes input from three components- LM35, RFID reader, GPS. LM35 senses the temperature and sends signal to microcontroller. RFID reader reads the RFID tag placed in the danger zones as mentioned above. GPS locates the current position of the child and sends the longitude and latitude and time value to the microcontroller. Child living area will be predefined using GPS, if the child crosses boundary, it is intimated through alarm or voice output. When the child wearing the device is taken away from the home premises or outside the gate, the microcontroller gets ON and sends signal to GPS. When supply is given to GPS board, by means of current sensation, position of child gets tracked and data is forwarded to microcontroller



Figure 4: Above Figure shows the Successful Login Screen

The microcontroller now processes the data, if the temperature received is greater than 40 °, if the RFID tag id matches, if the location varies from the predefined location. RF encoder encodes the data and the RF transmitter transmits the signal. The RF receiver receives the signal and the RF decoder decodes it and the buzzer and light is activated.

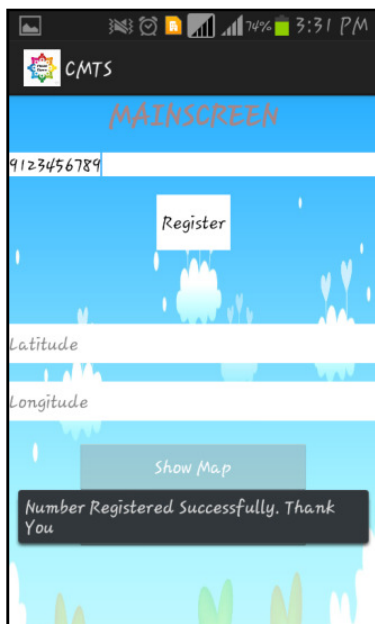


Figure 5: The Successful registration of Phone Number

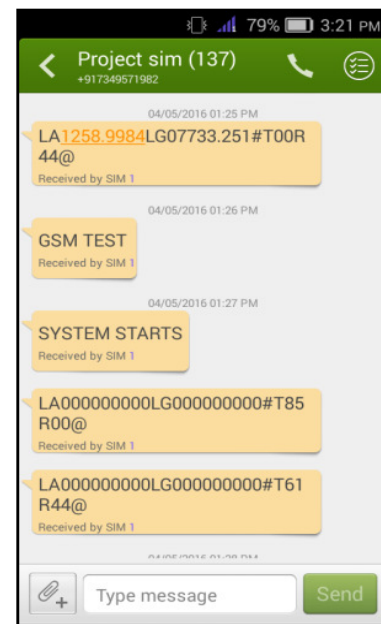


Figure 6: This figure shows Notifications from Child Module to Parent's Module

At the same time message is sent to parent's android phone through GSM.

FETCH DETAILS							
SINo	Date	Time	LAT	LONGT	Tem	Rfid	
1	4/5/16	11:24:51	1258.3934	07732.500	11	83	
2	4/5/16	13:17:39	, I tried	alling vo	P	ea	
3	4/5/16	13:19:42	Reading Record13 000000000000000000000000				44
4	4/5/16	13:20:46	1258.9966	07733.244	00	44	

Figure 7: This figure shows History Stored in Database

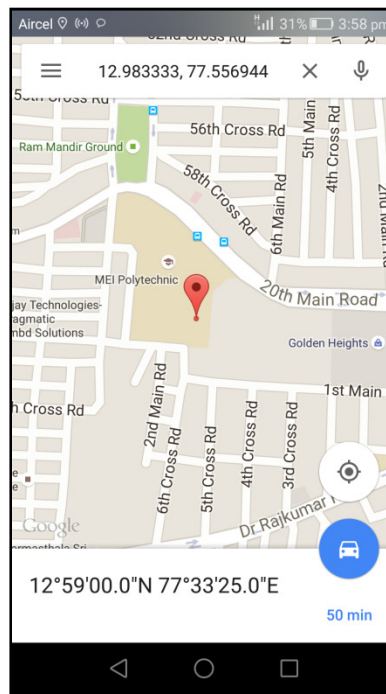


Figure 8: Location shown when child moves out of GPS range

The message received by the android application contains the location, RFID number, the name of the location inside the house, activity time and the phone number to which the message is sent. The above information is stored in the database using SQLite.

#### 4. Conclusion

This paper proposes the child Monitoring method for children, to prevent child accidents at home. To prevent accident of child using RFID system to detect the position of child if child is found in danger situation and alert message is send to the parent's Android mobile through GSM and the data is stored in the database. The temperature sensor give the body temperature of child and temperature value will be display on LCD.GPS give the location of child. The early warning system will give the parents enough time to save their babies, and, thus, minimize any instances of falling accidents or sudden infant death syndrome.

#### 5. Acknowledgment

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