AN INNOVATIVE APPROACH FOR WOMEN AND CHILDREN’S SECURITY BASED LOCATION TRACKING SYSTEM

SUPPORT FOR MINOR RESEARCH

PROJECT REPORT ON ENGINEERING AND TECHNOLOGY

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# INDEX

<table>
<thead>
<tr>
<th>S.No</th>
<th>Title</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Objective</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Introduction</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Existing System</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Proposed System</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>Architecture Diagram</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>Module Design</td>
<td>12</td>
</tr>
<tr>
<td>7</td>
<td>Methodology</td>
<td>13</td>
</tr>
<tr>
<td>8</td>
<td>Output</td>
<td>15</td>
</tr>
<tr>
<td>9</td>
<td>References</td>
<td>16</td>
</tr>
</tbody>
</table>
AN INNOVATIVE APPROACH FOR WOMEN AND CHILDREN’S SECURITY BASED LOCATION TRACKING SYSTEM

OBJECTIVE:

Now a day women and children face many security related problems. They can be easily kidnapped by strangers or in case of children, they can be missed anywhere. In such situations, they are helpless and have no immediate ways to protect them or inform to the family members or neighbors or police station. Taking the mobile phone, searching for a contact, then calling and then informing will be difficult in that time. So the main objective of our project is to provide help in a simple manner and ensuring security when they are not having any communication device with them.

ABSTRACT:

The system will be like a gadget. The user can wear it (for example, like a watch). When the user needs help, all they need to do is just clicking a button. Then the location of the user will be sent to the stored contacts. From that the helper can identify that the user is in some difficult situation and immediately go and help them. For that, the system contains GPS (Global Positioning System) to detect location of the help seeker and GSM (Global System for Mobiles) to establish communication with the helper and an UART (Universal Asynchronous Receiver Transmitter) to control both GPS and GSM modules. Whenever the help seeker needs help, they can get help by clicking the push button in system. Then the location of the help seeker is sent as a Google-map URL to the helper. And we cannot assure that the user will be in the same place after sending the message. So for tracking purpose, the location information will be sent to the helper for every 2 minutes.
TECHNOLOGIES USED:

- GPS – for identifying the location of the person
- GSM – to send the location information as an SMS

INTRODUCTION:

The misbehaviours against children and women are increasing day by day. They are under the threat of easily being kidnapped. In such unsafe situations there must be a mechanism that is easily affordable to handle those situations. Hence this system combines both GPS and GSM technology to provide a hand in such situations. The GPS is used for identifying the locations and GSM is used for sending them as a message.

Global Positioning System (GPS):

GPS receiver is a navigation system. It works based on satellite signals. It pinpoints the geographical location of itself. The GPS satellite rotates around the earth and transmits signals to the earth. These signals are received by the GPS receiver to calculate user’s exact location using the methodology called “Triangulation” (show in fig.1). In triangulation the exact position can be computed in 2 dimensions as well as in 3 dimensions.
Fig. 1 Triangulation

GPS receiver needs 3 satellites to find the position in 2 dimensions. By using 4 or more number of satellites, GPS receiver pinpoints the user’s position in 3 dimensions (shown in fig.2). In 2D, we can get the latitude and longitude information and in 3D we can get latitude, longitude and altitude values. After the determination of the location, the GPS can also calculate the information like distance, speed, bearing, track and trip distance.

Fig. 2 Finding user’s position in 3 dimensions
**Triangulation Technique:**

Satellites transmit microwave signals to the GPS unit, which enables the GPS receiver to determine its location, speed and direction. A GPS receiver calculates its position by measuring the distance between itself and three or more GPS satellites. The GPS satellites transmit the time at which the microwaves are sent. The speed of microwaves is $3 \times 10^8$ m/s. From the time and speed, the GPS receiver calculates distance. This is the distance between the GPS unit and each satellite. Now, the GPS unit takes the distance as radius and the position of each satellite as centre and generate circles. At one point exactly these circles will interfere. This point is taken as the exact location of the GPS unit.

**Global System for Mobile communication (GSM):**

GSM stands for Global System for Mobile communication. It was originally developed with the help of digital technology which can carry data up to the rate of 64kbps to 120mbps. It uses the variations of Time Division Multiple Access (TDMA) technique for transmission of signals. GSM provides many services; some basic services are voice and data services including roaming services. Roaming is the ability to use GSM phone number in another GSM network. The working of GSM starts with digitization and compression of user data then sending the user data stream through a channel. Its frequency band limit is either 900MHz or 1800MHz. In our system, one of the services of GSM is Short Message Service (SMS) which is used to share the location information from the system to helper's mobile.

**AT Commands for GSM:**

AT commands are instructions used to control a modem. AT is the abbreviation of ATtention. Every command line starts with “AT” or “at”. That’s why modem commands are called AT commands. Many of the commands that are used to control wired dial-up modems are also supported by GSM/GPRS modems and mobile phones. Besides this common AT command set, GSM/GPRS modems and mobile phones
support an AT command set that is specific to the GSM technology, which includes
SMS-related commands like AT+CMGS (Send SMS message), AT+CMSS (Send
SMS from storage), etc.,

The starting “AT” is the prefix that informs the modem about the start of a
command line. It is not part of the AT command name.

**UART microcontroller:**

In our project we make use of UART microcontroller to control the GPS
module and GSM modules. UART is a computer hardware that translates data
between parallel and serial forms. A UART is usually an individual integrated circuit
(IC) used for serial communications over a computer or peripheral device serial port.
UARTs are now commonly included in microcontrollers. Compared to other
microcontrollers, UART microcontroller gives high baud rate with GPS. Baud rate
represents number of bits transmitted for a second.

**EXISTING SYSTEMS:**

In "GPS and SMS-Based Child Tracking System Using Smart Phone”, the child
cannot send its location by itself. The parent of that child has to send the message to
the child's system to know their location.

In "Mobile Tracking Application for Locating Friends”, a tracking application
software must be installed in the mobile phone and the friends must be previously
registered in the friends group of application. To track their friends mobile phones are
needed in both sides.

“Patient Monitoring System” uses a lot of sensors to detect the surroundings.

In “Tracking System Using WIFI”, it needs to have the WIFI device all the time
to make communication.
In “Design and Implementation of Vehicle Tracking System Using GPS/GSM/GPRS Technology and Smartphone Application” the vehicle will be monitored all time.

Apart from these systems, our system used SMS as the basic service. So when compared to sending data over network, better connectivity is ensured. Other systems monitor the person or vehicle all the time. So privacy of the user is limited. But in our system the location is tracked only when the user clicks the button, hence the control is in the hands of user.

When kidnappers try to kidnap, they won’t allow any communication devices to use. But our system will be like a gadget and won’t be identified as a communication device by them. So it can serve as a secret communication device. Our system can send the current location and does not require mobile phone or any software on the help seeker’s side. Google map/Browser is the only application that is needed to be installed on the helper side, which is the default application found in any smartphones. Also unlike other systems no sensors are required and no devices are needed to be held all the time. So when comparing to similar tracking systems, our system will be more comfortable.

**PROPOSED SYSTEM:**

The problem of feeling helpless in a missed situation can be solved by this system. This system is required in situations like being kidnapped by strangers or being missed somewhere. Hence this project is mainly implemented to provide security in such aspects. The system is very portable. Short Message Service (SMS) is the basic service which is mainly used here. The helper needs a mobile phone with internet facility that is used only to show the located position in the map. The help seeker needs a device with GPS and GSM services to inform where they are.
This system is fully controlled by help seeker. The architecture of this system consists of SIM card for making communication through radio channels, GPS transceiver for getting position information from satellite, a programmed UART (Universal Asynchronous Receiver/Transmitter) microcontroller to pass the location information into the default link parameters and an emergency pushbutton (shown in Fig.3). The UART microcontroller is used for programming and controlling purpose.

GPS transceiver is interfaced with the UART microcontroller because GSM module gives high baud rate with UART. Thus the system can achieve faster data transmission. Voltage converter is used between GSM and microcontroller for making compatibility. LCD is also used in this system to show the system status like signal strength, whether the SMS has successfully sent or not and whether the sim card is inserted or not.

During communication, the microcontroller receives data from GPS receiver and it sends commands to send the data as a message. GSM modem is used for sending the message. Sim card is placed within the GSM modem.

Here the help seeker has to initiate the communication by clicking the emergency pushbutton available in the system, which boots the microcontroller to run the code written for enabling the GPS to get latitude and longitude data from satellite. Then the fetched data from the satellite using GPS transceiver is applied to the following google map link:

http://maps.google.com/?t=k&q=LATITUDE,LONGITUDE

This link is the default SMS sent by this system to the helper’s mobile with the help of the GSM service (sim card)(Fig.5). The online map that is google map is used to show the exact real time location for the latitude and longitude values. It also shows the path to reach the help seeker from helper’s current location. Two parameters are used in URL, t (Type of map) and q (query). To display the location in satellite view, ‘t’ parameter in the URL is set to ‘k’ and the latitude, longitude values are passed to the ‘q’ parameter. When the helper clicks on the link, google map gets opened
automatically pointing the location of the person (fig.6). Thus by finding the location, the helper can take necessary steps to help the person.

For tracking the person, the current location of the person will be sent for every 5 minutes so that even if the person has moved to any other location, the helper can exactly find and help.
ARCHITECTURE DIAGRAM:

Fig. 3 Location tracking system architecture
**MODULES DESIGN:**

1. Interfacing GPS with microcontroller
   - The GPS chip must be interfaced with the microcontroller

2. Interfacing GSM with microcontroller
   - GSM modem must be interfaced with the microcontroller

3. Getting location data from GPS
   - Next phase is activating the GPS chip to calculate latitude and longitude values using the signals received from satellite

4. Embedding location data into Google Map URL
   - The location data got from GPS must be integrated into a Google Map link

5. Sending Google Map URL to helper’s mobile
   - Next phase is writing code to send the Google Map link to the registered mobile phone number

6. Implementing location tracking
   - Obtaining the location data and sending the Google Map link to the helper’s mobile continuously for every 2 minutes until push button is clicked another time
**METHODOLOGY:**

When the pushbutton is pressed, the GPS transceiver/modem communicates with the satellites and then finds latitude and longitude information using triangulation method. Then the GPS modem communicates with the microcontroller and stores the data about location in small sized memory of UART microcontroller. The GSM module is interfaced with microcontroller to send and receive messages. Receiving pin of microcontroller is connected to the transmitting pin of GSM module, transmitting pin of microcontroller is connected with receiving pin of GSM module. The microcontroller has been coded with programs to encode the location data as a google map URL which is a short message to be send to the helper’s mobile. In coding some AT commands are used to send short messages.

![Fig.4 SMS delivery process](image-url)
The UART sends the AT+CMGS AT command to the GSM module along with the recipient’s number and short message which is the google map URL. Then GSM transmits the SMS by radio waves along air interface to the Base Transceiver Station (BTS) which connects to the GSM network. Along the $A_{bis}$ -interface the SMS is passed to the Base Station Controller (BSC). Once SMS leaves BSC it is transmitted to Mobile Switching Centre (MSC) via A-interface. After that the SMS sent by the system is temporarily stored in Short Message Service Centre (SMSC) to get recipient details and to store it in Home Location Register (HLR). Mobile Switching Centre gets the location information from Visitor Location Register (VLR). To send the SMS to recipient the Mobile Switching Centre gets helper’s mobile number from Home Location Register. After that SMSC releases the stored SMS. Then the SMS is forwarded to appropriate Mobile Switching Centre which covers the current location of the helper. Then it connects to the nearer Base Station Subsystem (BSS) within the helper’s region. Finally SMS is send to the helper’s mobile phone by the nearby Base Transceiver Station (fig.4). Thus the system forwards the SMS to the helper’s mobile.

**LANGUAGE USED:**
- Embedded C
- AT commands

**COMPONENTS REQUIRED:**
- GPS chip
- GSM module
- UART microcontroller
- Push button
- Voltage converter
• LCD
• SIM card

**OUTPUT:**

Fig. 5 SMS sent by the system

Fig. 6 Result of google map link
**ACKNOWLEDGEMENT:**

We are going to publish an IEEE paper for this project. The paper is in progress. Conference date for the paper is 08.03.2016. We have attached the IEEE paper we prepared for this project.

**REFERENCES:**


