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A NOVEL DESIGN OF REAL TIME CHILDREN TRACKING SYSTEM USING RASPBERRY PI

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ABSTRACT

This paper deals with an Android based solution to aid parents to track their children in real time. The system consists of credit card size computer called Raspberry Pi B+, Global System for Mobile Communication (GSM) and Global Positioning System (GPS). A parent's device send a request location SMS to the child's device to get the location of the child. On the other hand, the child's device replies the GPS position in return. The exact location of the children can be identified using Google Maps. The system could manage many children efficiently and achieve better security.

Keywords: *Android, Raspberry Pi-B+, GPS, GSM.*

I.INTRODUCTION

In recent years, kidnapping of children happens in many places. Most of the mobile phones are equipped with location services capabilities allowing us to get the device's geographic position in real time[1][2]. The mobile application use the GPS and SMS services found in Android mobile phones. It allows the parent to get their child's location on a real time map[1][2].

Many developments were made in order to implement Children tracking using different technologies. Autonomous Clustering technique used to manage groups of Android terminals attached to children in school. Android terminals have wireless LAN and Bluetooth device[1][2]. It adopts Bluetooth communication among Android mobile terminals in every cluster to collect information and cluster head delivers the same through tags to server at school using wireless LAN. It results in lack of individual attention towards the children since the cluster head sends the information about the children group and not about each individual and also does not concentrate on child crying inside the school. This system offers less security[2].

In mobile adhoc networks based system, GPS[2] and tag based system cannot obtain group information on the vicinity of the child[5]. Through field experiments, it is evident that as long as children walked at normal speed on the predetermined way to and back from school, the system could provide location and group information[5]. Multihop Clustering scheme incorporated in adhoc networks includes dynamic change in

topology of adhoc networks, does not include design of generic function to evaluate adaptability of clustering schemes. It is noted that system independent factors such as power shortage in phone and performing wrong registrations in Bluetooth tags dominate in lowering average tag recognition rates for school routes[4]. The efficient indoor/outdoor tracking in hospital environment has realized using integrated ultra wideband and GPS[3][6].Thesystem may provide extra protection for patients but system rely on WiFi network to transmit data and updation rate is quite low due to network jam[8]. It includes complicated calibration procedure as well as high set up cost for the UWB sensor network[7][8].

To improve the above mentioned system we included few features and make it more secure compared to the existing system. This paper is summarized as follows. Section-II deals with general block diagram of the system. The description of the hardware design and software design are illustrated in section-III. The results are discussed in section-IV. Finally it is concluded in section-V.

II. BLOCK DIAGRAM

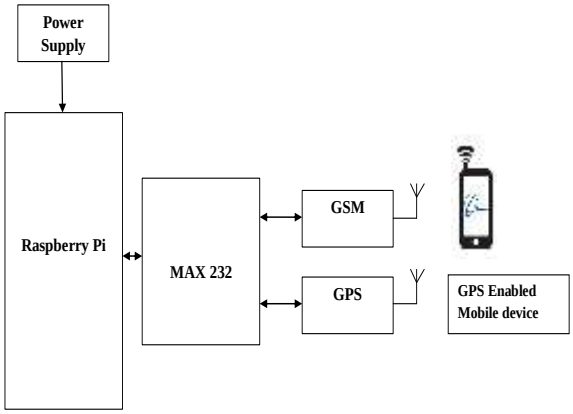

Figure.1 General Block Diagram of the System

Figure.1 shows the general block diagram of the system. The children information is transmitted and received using the GSM technology. The child module act as a transmitter which includes Raspberry Pi B+, GSM module, GPS module and Max 232.The receiver module includes Android mobile device with SMS and Google map application. The child module is fixed to the child. This system initializes the GSM and GPS in initial stage, after that it will be waiting for the SMS from the mobile terminal to send the GPS details. If formatted message is received in the GSM which is connected to Raspberry Pi, it reads the current GPS position and send it over the GSM network. Requested mobile will receive the Real time GPS value of the children. The position of the moving child is tracked by GPS and the information is send to the Raspberry Pi. After filtering it forwards the GPS data (latitude and longitude) to GSM. The GSM will intern send the position of the moving child to receiver.

III.HARDWARE DESIGN AND SOFTWARE DESIGN

a) Raspberry Pi B+

Raspberry Pi B+ Model is shown in figure.2. Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. Raspbian provides more than a pure OS. The Raspberry Pi Model B+ incorporates a number of enhancements and new features. Improved power consumption, increased connectivity and greater IO are among the improvements to this powerful, small and light weight ARM based computer. It is an SOC chip based on RASPBERRY PI with low power, high performance, very suitable for embedded product development. The specification of the device is given below.

- Chip: Broadcom BCM2835 SoC
- Core architecture: ARM11
- CPU: 700 MHz Low Power ARM1176JZFS Applications Processor

- GPU: Dual Core Video Core IV, Multimedia Co-Processor
- Provides Open GL ES 2.0, hardware-accelerated Open VG,
- 264 high-profile decode Capable of 1Gpixel/s, 1.5Gtexel/s or 24GFLOPs with texture filtering and DMA infrastructure
- Memory: 512MB SDRAM
- Operating System: Boots from Micro SD card, running a version of the Linux O S
- Dimensions: 85 x 56 x 17mm
- Power: Micro USB socket 5V, 2A

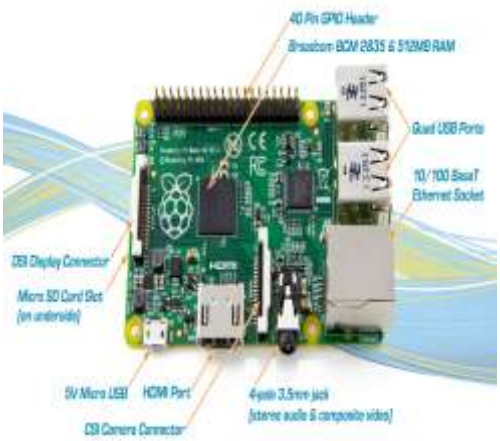

Figure.2 Raspberry Pi B+ Model

b) GSM

Global System for mobile communication is a standard developed by the European Telecommunications Standards Institute (ETSI). The advantage of GSM is improved battery life, efficient network design for less expensive system, efficient use of spectrum, advanced features such as short messaging and caller ID, a wide variety of handsets and accessories, high stability mobile fax and data up to 9600baud, Easy to use over air activation, and all account information is held in a smart card, which can be moved from handset to handset. The GSM module used in this project is SIM300 which offers all features mentioned above and serves as a medium between transmitter and receiver. GSM board shown in figure.3 receives a latitude and longitude values of the exact position of the child and send this to receiver.

Figure.3 GSM Board

c) GPS

GPS receiver provides a solution that is high in position and speed accuracy performances, with high sensitivity and tracking capabilities in urban conditions. This module shown in figure.4 delivers major advancements in GPS performances, accuracy, integration, computing power and flexibility. The general specification of the module is given below.

- Automatically senses the current position of the child Chipset: MTK MT3318
- Frequency: 1575.42MHz
- Signal Output: 8 data bits
- Baud Rate: 9600bps (Default)
- Protocols: NMEA 0183 v3.01, MTK NMEA Command

Figure.4 GPS Board

d) MAX 232 IC

MAX 232 is an IC that converts signals from an RS232 serial port to signals for digital logic circuits. The MAX 232 is a Dual driver/Receiver and typically converts the RX, TX, CTS and RTS signals. The driver provides RS-232 voltage level outputs from a single +5V supply.

e) LINUX Raspbian OS

RaspberryPi B+ model operates in Raspbian software. **T**he recommended OS is called Raspbian. The Default username and Password is Pi, Raspberrypi. Syntax is the command for GUI of PI. Raspberry Pi uses Linux Kernel. In order to reduce the complexity of coding, Shell scripting is used.

f) Python scripting language

Python is a high level programming language. The syntax allows programmers to express concepts in fewer lines of code than would be possible in languages such as C++ or JAVA. Python supports multiple programming paradigms, including object-oriented and functional programming. It features a Dynamic type system and automatic memory management and has a large and comprehensive standard library.

IV RESULTS AND DISCUSSION

Figure.5 Input Message to GSM

Figure.6 Acknowledgment from Child
Device

Figure.7 Latitude and Longitude in
Google map

Figure.5 shows the input message which we sent to GSM module. Figure.6 shows the message from child device to mobile. The formatted message received in the GSM which is connected to Raspberry Pi, it reads the current GPS position and sends it over the GSM network. Figure.7 shows the the latitude and longitude in Google map. Requested mobile will receive the real time GPS value of the children. The position of the moving child is tracked by GPS and the information is send to the Raspberry Pi. After filtering it forwards the

GPS data (latitude and longitude) to GSM. The GSM will intern send the position of the moving child to receiver. The implemented output board of the module is shown in figure.8.

Figure.7 Implemented Module

V CONCLUSION

The Android based real time solution to track the exact location of the missed children is implemented using Raspberry Pi B+. It provides the parents to navigate their children easily. This system could manage many children efficiently; provide better security solution against suspicious individuals. Further it can be extended to perform in many real time applications such as fixing it to ID card to the child Future work can be extended by adding features like camera and sending the picture of the location to the parent's module or parent's mobile.

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