Findings on Real-Time Location Tracking by Implanting Different Mechanisms

A. Sai Hanuman, Kanegonda Ravi Chythanya

Abstract: ***Monitoring individuals or important things has never been simpler, thanks to advances in communication technology. A tracking device is an electronic unit intended to communicate its area, either in light of a sign or at set interims.Tracking devices can permit you to screen stock, find imperiled creatures, or help salvage laborers discover you in a crisis.So Real-time location tracking consistently takes on a vital job in the life of the person. Growth in advanced technology advancements such as 2 G, 3 G, 4 G, LoRa, and ZigBee has gained progressive changes in real-time location tracking. Technology only works when it reaches the user's every standard. This study explored the appropriate technology to track the real-time position amidst the technologies listed above.This paper proposed a model for real-time location tracking through a device that offers the ability to track the location in case of emergency. The tracking system involves the GSM-based GPRS activated unit that continuously transmits the moving object's GPS location to a mobile device that has activated the specified software and sends the SMS in an emergency to the registered mobile number.***

Keywords: LoRa, Zigbee.

I. INTRODUCTION

The GPS-GPRS tracking system is the system that uses GPS technology to determine the exact global position whenever the distance voyaged through the GPS receiver attached to the target from the Global Positioning Satellites. The GPRS and GPS tracking system will provide data on the global position in real-time and efficiently[1]. This system uses a module consisting of a GPS receiver and a Microcontroller-interfaced GSM modem. Google Maps is used to map the locations as follows. The GSM modem takes the region of the GPS and sends it to the GPRS server. This reveals how such innovative developments of GPS and GSM-GPRS can be intelligently integrated for a real global issue[2]. The combination of GPS and GSM technologies was first developed through the use of SMS as a GPS transmission procedure[3]. Improving GPRS invention to GSM to relay region directions to a remote server allows remote monitoring through the use of any internet-related PC.

II. PROPOSED TRACKING SYSTEM

The tracking system involves the GSM-based GPRS activated unit that continuously transmits the moving objects GPS location to a mobile device that has activated the specified software and sends the SMS in an emergency situation to the registered mobile number. For the plan and usage of the proposed framework, a combination of emerging technologies has been developed.

Fig 1: Design of the Tracking System

1. Components

The proposed tracking system provides the expected results of efficient communication and interaction between components such as the integrated SIM808 GPRS-GPS shield module with the Arduino microcontroller board and communicates via the UART serial interface.

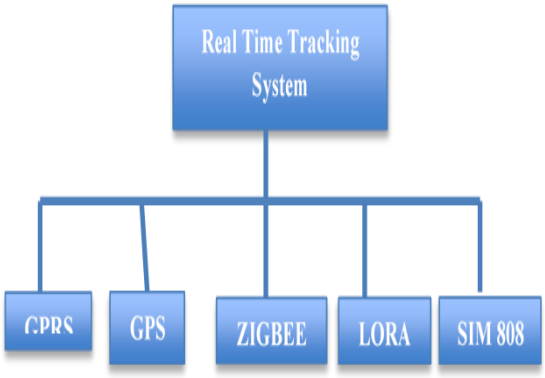

Fig 2: Components of Application

Fig 3 represents the Real-time tracking system that uses GPRS, GPS, ZIGBEE, LORA, and SIM 808 services help in to find the real-time location.

III. LITERATURE SURVEY

There are several tracking systems reported in literature based on GPS,GPRS, RFID, Wireless LAN, Bluetooth, LoRa etc.

SeokJu Lee, proposed a vehicle following framework utilizing GPS/GSM/GPRS innovation and a Smartphone application to offer better support and savvy answer for clients[1]. Morii et al, proposed a children Tracking System using android terminals,

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in which Bluetooth technology was used to enable communication among android terminals and configure a Bluetooth MANET [2].

Pham Hoang Oat, proposed the improvement of vehicle following framework utilizing the Global Positioning System (GPS) and Global System for Mobile Communications (GSM) modem is embraced with the point of empowering clients to find their vehicles easily and in an advantageous way. The framework will give clients the ability to follow vehicle remotely through the versatile system[3]. J.Saranya, proposed an actualizing child following framework for each child going to class. This framework incorporates a youngster module and two beneficiary modules for getting the data about the missed kid on periodical premise [4]. M. A. Al Rashed proposed a GPS based tracking system which keeps track of the location of a vehicle and its speed based on a mobile phone text messaging system. The system is able to provide real-time text alerts for speed and location [5]. Hind Abdalsalam Abdallah Dafallah proposed a system that effectively got GPS flags, prepared and transmitted the information to the following place. In the following community the directions have been shown appropriately on Google maps, which revive naturally like clockwork to get the new area [6]. A. Omanakuttan proposed design of unique engine locking system to control seizing of vehicles using GSM and GPS technology based embedded system [7]. Ms.Sonali S. Kumbhar, proposes a speedy reacting system that helps ladies during inconvenience. At the point when somebody will disturb, she can simply press the catch and the area data is sent as a SMS alarm to not many pre-characterized numbers regarding scope and longitude [8]. Kunal Maurya proposed to plan an inserted framework which is utilized for following and situating of any vehicle by utilizing Global Positioning System (GPS) and Global framework for versatile correspondence (GSM).In this Device AT89C51 microcontroller is utilized for interfacing to different equipment peripherals. The present plan is an inserted application, which will consistently screen a moving Vehicle and report the status of the Vehicle on request.Benny Vejlgaard proposed the inclusion and limit of SigFox, LoRa, GPRS, and NB-IoT is analyzed utilizing a genuine site sending covering 8000 km2 in Northern Denmark.

1. GPRS

GPRS (General Packet Radio Service) is a packet switched mobile data service on the Global Mobile Communications System (GSM) of the 2G and 3G cellular network, expanded to use the Voice Facilities over the Communication Channel as opposed to GSM, which is not suitable for non-voice facilities due to its circuit switching capabilities. It provides its users with the fast and moderate Internet facilities. It agrees to use the GSM to use the Voice Services, but when the user is expected to transmit the data, the GPRS program must send it. It offers up to 171.2 kbps of transmission rates. The GPRS packet transmission leaves the networks of GPRS-GSM, the packets are transported to the Internet. This therefore along with the new protocols, provides the modern transmitting and signalling method.

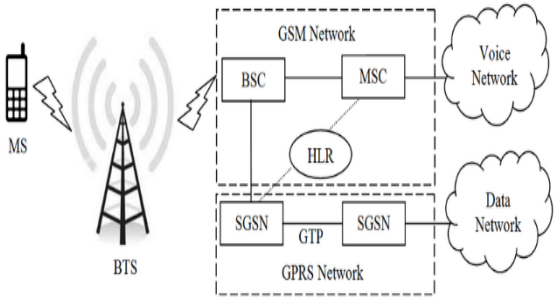

Fig 3: GPRS System

2. Globalpositioning System

The Global Positioning System (GPS) formerly NAVSTAR GPS is a radio navigation framework which is a space-based satellite framework which gives continuous area and time data to a beneficiary in wherever on or close to the Earth where there is an open view to at least four GPS Satellitesout of 33 satellites.

The GPS is based on the GPS satellite's known position and real-time. The GPS satellites hold the steady Atomic Clocks that are synchronized with each other as well as the ground clocks. Every hint changed in the ground is periodically adjusted. In addition, the satellite locations are also known to be excessively accurate. There are also chronometers for GPS receivers. But they're less stable and less accurate.

Each satellite uninterruptedly sends a signal which is a carrier wave comprising its position data and the current time. Meanwhile, the speed of the carrier wave is constant and not dependent on the intensity of the satellite, the time delay is equivalent to the distance between the satellite and the GPS receiver. A GPS receiver tracks four or more satellites to assess the receiver's precise location and its real-time eccentricity. At the lowest, the receiver must have four GPS satellites insight to measure four values (clock deviation from satellite time and three location coordinate values).

3. ZIGBEE

Zigbee is an international IEEE 802.15.4 standard designed to create high-level personal area network with tiny, low-power radios are used to automate small-scale services that require wireless communication. Zigbee is now a Wireless Ad Hoc Network that is lower data rate, lower power, and closer proximity.

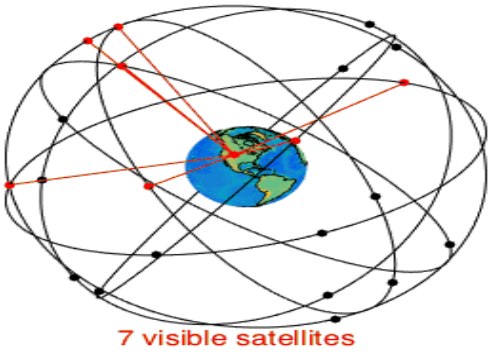

Fig 4: GPS Satellites

Zigbee is simpler than other ad-hoc network systems such as Wi-Fi and Bluetooth and operates over long distances. Zigbee-enabled devices can communicate data over long distances by sending data between source and destination through a mesh network of Zigbee-enabled devices.

Zigbee will be built for less-speed WPANs on the media access control layer and the physical layer specified in International IEEE 802.15.4. The definition of Zigbee incorporates four additional key components: Application Layer, Network Layer, Manufacturer-defined Application Objects and ZDOs. ZDOs (Zigbee Device Objects) are responsible for certain activities, including keeping track of Zigbee device functions, requests from other users to access the networks to be handled, as well as finding the other Zigbee enabled devices and their protection.

Fig 5: Zigbee Module

1. LoRa WAN

Long **Ra**nge (LoRa) is a LPWAN (Low-Power Wide Area Network) based technology. This technology works on the modulation techniques of a CSS (Chirp Spread Spectrum) derived from Spread Spectrum. LoRa enables broadcasting of long-range data (up to 10 km in rural areas) with less electricity.

There are two types of LoRa: LoRa (Physical Layer) and LoRa WAN (Upper Layer).

LoRa is a trademarked, so there is no publicly available documentation, although Semtech has provided a description of the LoRa modulation and other technical features that are relevant. Like LoRa, LoRa WAN includes the upper layer requirements. LoRa WAN is a cloud basedMAC layer protocol. LoRa WAN provides the definition for the System architecture and Communication Protocol for the network. LoRa WAN is also responsible for maintaining the frequencies for the communication, data transmission rate, and power for all the LoRa devices.

Fig 6:LoRa Module

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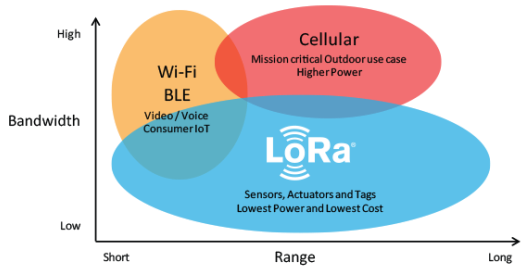

Fig 7: Comparison of the LoRa with Wifi, GPRS

2. SIM 808 MODULE

SIM808 is a module for GSM / GPRS 850/900/1800/1900 MHz. This module assimilates GPS to the device's navigation. This package contains a SIM toolkit that allows easy implantation of the SIM card. A GPRS / GSM modem with SIM808 module allows the development of data connections via a standard USB interface over the GSM network. SIM808 is based on the power-saving technique; thus, the power consumption in the sleep mode is very low as 1.0mA.

IV. ANALYSIS AND COMPARISON

Parameter	GSM	GPRS	ZigBee	LoRaWAN
Data rates	14.4 kbps	57.6 kbps	20, 40, 250 kbps	0.3 – 22 kbps
Carrier Size	200 kHz	200 kHz	868 MHz, 915 MHz, 2.4 GHz	863-870 MHz, 902-928 MHz, 779-787 MHz
Range	35 KMs	25 KM	10-100 mts	2-5 Kms (Urban), 15 Km (suburban)
Power Consumption	1 µA to 480 mA	2347 mA	50 mA	12 mA
Features	SMS	MMS	NA	NA

Findings are tabulated as above by evaluating various technologies such as GSM, GPRS, ZigBee and LoRaWAN.
Thus, monitoring is done by GSM, data transmission at a rate of 14.4kbps and carrier size is 200kHz, covering a range of 35kms with power consumption between 1uA and 480mA. The location information can be transmitted by SMS.
In the case of GPRS software, a carrier size of 200kHz can be transmitted at a rate of 57.6kbps. This technology will cover the 25kms range, but it raises the level of consumption to 2347mA. Via MMS, we can share location details.
ZigBee transmits data at 20kbps, 40kbps, 25kbps speeds and can be transmitted at 868MHz, 915MHz, 2.4GHz carrier frequency. This can cover the power consumption spectrum up to 10-100mts with 5mA.
LoRaWAN transfers data with carrier size of 863-870MHz, 902-928MHz, 779-787 MHz at a rate of 0.3-22kbps. This technology will cover up to 2-5kms in urban areas and 15kms in suburban areas with the power consumption of 12mA.

V. CONCLUSION

We also examined various types of technology in this survey that are used to monitor and communicate the position in real-time. We considered the LoRaWan module to be very useful for our work because more distance can be achieved.

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