Available online at www.elixirpublishers.com (Elixir International Journal)

Electrical Engineering

Elixir Electrical Engineering 181 (2023) 57023 - 57027

ISSN: 2229-712X

An Intelligent Child Safety System Using GPS and GSM Technology

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ARTICLE INFO

Article history:
Received: 16 August 2023;
Received in revised form:
17 September 2023;
Accepted: 30 September 2023;

Keywords
Wearable Tracking Gadget,
GSM Technology,
RFID.

ABSTRACT

Wearable tracking gadget that school-age children can wear is the topic of this paper. It doesn't need any pricy technology to operate. This technology is usable by persons of all educational levels. It has got two buttons one is alert button and another is panic button The major objective of this gadget is to ensure that the youngster may contact their parents in an emergency. The alert button allows the child to notify their parents of an emergency and provide their current location. For communication, the current technology includes Bluetooth, WI-FI, and RFID. It is hard to communicate across a great distance with these technologies because they only have a narrow range of coverage. Also they are not that accurate. This device solves the issue by utilizing GSM technology. Parents do not need to submit any special code to the device to determine the child's location's latitude and longitude. If a child is in any emergency situation and wants his/her parents to know their current exact location. If a child feels uneasy, there are two methods to let the parents know. The cell phone of the parents or guardian receives the alarm message via SMS by pressing alert button and if the child wants to communicate to parents immediately, a call can also be made via this device using the panic button and the child can talk to the parent in real time.

Introduction

The idea of a wearable device for kids or any particular age group per se is conferred in this paper. The vital factor which this device offers is it can be operated by any remote device (in most cases a basic mobile phone)(Y A Badamasi et. al, 2014). The core purpose for the gadget is to provide a service for the target audience which in most instances are the working class parents or guardians to locate the kids in any kind of disaster or emergency, whenever there is a sign of any emergency per se without any casualties. Considering the current situation in market, there are numerous devices which assist users with various functionalities which uses variety of bio-sensors. But to be very specific, the objective targets a very niche area of applications and hence can be utilized and be used with Wi-Fi and Bluetooth segments of technology which can explored in the future scope. This work attempts to tackle a societal concern that has been destroying the lives of uncountable individuals and their families. This device continuously monitors the individual wearing it, the data being accessible world over enabled by the benefits of cloud computing. The data can thus be downloaded onto any remote station for monitoring and analysis. The machine learning algorithms used make the device intelligent and the accuracy of which increases with continued use. A device like this improves the level of safety of women and girls. Accurate recognition of a dangerous situation is a complex matter, however, the scope for improved accuracy is promising.

Proposed System

The child safety wearable device is capable of acting as a smart loT device. It provides parents with the real-time location, surrounding temperature, UV radiation index and SOS light along with Distress alarm buzzer for their child's surroundings and the ability to locate their child or alert bystanders in acting to rescue or comfort the child. The smart child safety wearable can be enhanced much more in the future by using highly compact Arduino modules such as the LilyPad, Arduino which can be sewed into fabrics. Also a more power efficient model will have to be created which will be capable of holding the battery for a longer time.

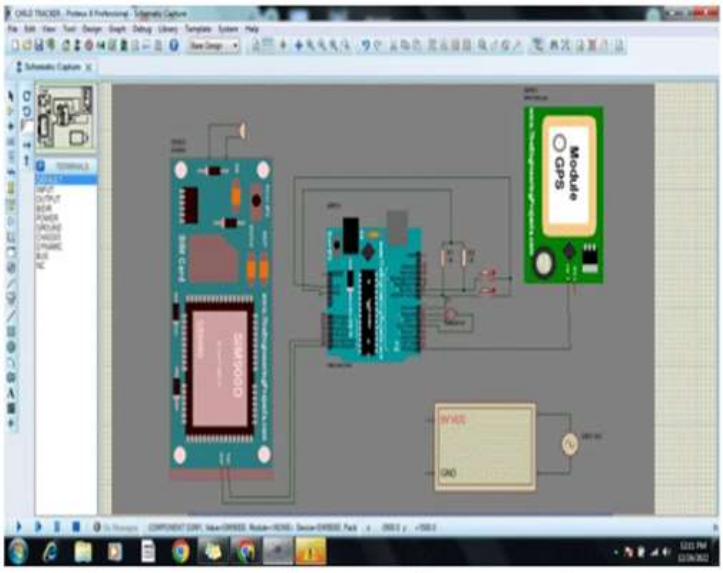
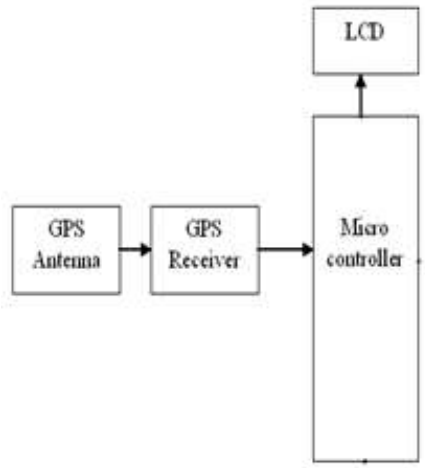


Figure 1. Circuit diagram of Proposed System

In this project GPS is used to monitor the boat position anywhere in the earth. The boat who wants to monitor has to have the GPS sensor. The GPS sensor consists of GPS antenna and GPS receiver. GPS uses satellite ranging to triangulate your position. In other words, the GPS unit simply measures the travel time of the signals transmitted from the satellites, then multiplies them by the speed of light to determine exactly how far the unit is from every satellite its sampling. By locking onto the signals from a minimum of three different satellites, a GPS receiver can calculate a 2D (two-dimensional) positional fix, consisting of your latitude and longitude. GPS receiver received vehicle position latitude and longitude from satellite through GPS antenna. The receiver sends the received signal to microcontroller. Here the microcontroller is the flash type reprogrammable microcontroller in which we have already programmed. Now the microcontroller displays the latitude and longitude on the LCD display. Then position information signal is transmitted through GSM network or mobile. The mobile is interfaced with the microcontroller through data cable. When the vehicle crosses the border the gps sends a warning to the boat using alarm hence avoiding unwanted troubles.



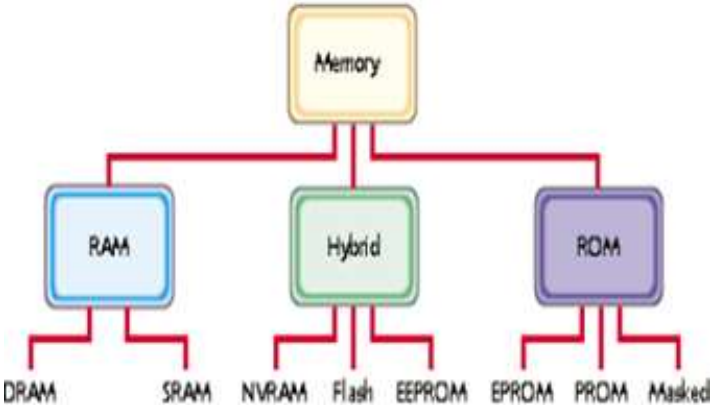
Scope

The Global Positioning System is a space age navigational system that can pinpoint your position anywhere on the globe, usually within a few yards or meters. This amazing technology is available to everyone, everywhere, day and night, and best of all, at no cost for use of the navigational data. GPS uses a constellation of 24 satellites in precise orbits approximately 11,000 miles above the earth. The satellites transmit data via high frequency radio waves back to Earth and, by locking onto these signals; a GPS receiver can process this data to triangulate its precise location on the globe.

GPS operates 24 hours a day, in all weather conditions, and can be used worldwide for precise navigation on land, on water and even in the air. Some of its many current applications include: boating, fishing, hunting, scouting on land or from the air, hiking, camping, biking, rafting, pack trips by horseback, hot air ballooning, general aviation, snowmobiling and skiing, search and rescue, emergency vehicle tracking, 4 wheeling, highway driving and a host of other outdoor activities where accurate positioning is required.

Memory Details

Many types of memory devices are available for use in modern computer systems. As an embedded software engineer, you must be aware of the differences between them and understand how to use each type effectively. In our discussion, we will approach these devices from the software developer's perspective. Keep in mind that the development of these devices took several decades and that their underlying hardware differs significantly. The names of the memory types frequently reflect the historical nature of the development process and are often more confusing than insightful. The shown figure classifies the memory devices we'll discuss as RAM, ROM, or a hybrid of the two.



GPS

The Global Positioning System (**GPS**) is the only fully functional Global Navigation Satellite System (GNSS). Utilizing a constellation of at least 24 Medium Earth Orbit satellites that transmit precise microwave signals, the system enables a GPS receiver to determine its location, speed, direction, and time. Other similar systems are the Russian GLONASS (incomplete as of 2007) and the upcoming European Galileo positioning system

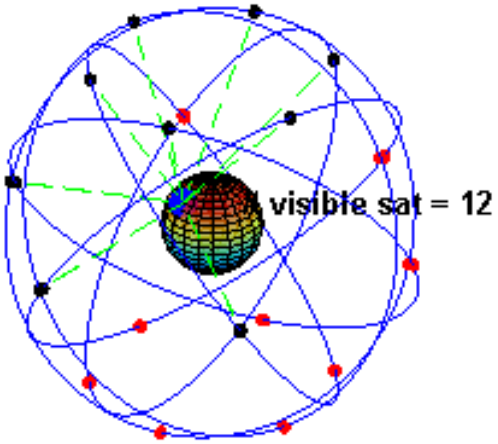
Developed by the United States Department of Defense, GPS is officially named NAVSTAR GPS (Contrary to popular belief, NAVSTAR is not an acronym, but simply a name given by Mr. John Walsh, a key decision maker when it came to the budget for the GPS program. The satellite constellation is managed by the United States Air Force 50th Space Wing. The cost of maintaining the system is approximately US$750 million per year, including the replacement of aging satellites, and research and development

Following the shootdown of Korean Air Lines Flight 007 in 1983, President Ronald Reagan issued a directive making the system available for free for civilian use as a common good. Since then, GPS has become a widely used aid to navigation worldwide, and a useful tool for map-making, land surveying, commerce, and scientific uses. GPS also provides a precise time reference used in many applications including scientific study of earthquakes, and synchronization of telecommunications networks.

GSM Module

The GSM Module used is SIM800A. It is interfaced to microcontroller via RS232 which is used to convert the serial data to TTL logic. This is needed because the microcontroller can work only with TTL logic. The primary reason for using the GSM shield as the mode of communication over Wi-Fi and Bluetooth was that this device was aimed at being accessible to any cell phone user and not necessarily an expensive Smartphone user [1]. It is user friendly so there is no need for the parent to learn about new technology

The current GPS consists of three major segments. These are the space segment (SS), a control segment (CS), and a user segment



Visual example of the GPS constellation in motion with the Earth rotating. Notice how the number of satellites in view from a given point on the Earth's surface, in this example at 45°N, changes with time.

The space segment (SS) comprises the orbiting GPS satellites, or Space Vehicles (SV) in GPS parlance. The GPS design originally called for 24 SVs, 8 each in three circular orbital planes, but this was modified to 6 planes with 4 satellites each. The orbital planes are centered on the Earth, not rotating with respect to the distant stars. The six planes have approximately 55° inclination (tilt relative to Earth's equator) and are separated by 60° right ascension of the ascending node (angle along the equator from a reference point to the orbit's intersection) The orbits are arranged so that at least six satellites are always within line of sight from almost everywhere on Earth's surface.

Orbiting at an altitude of approximately 20,200 kilometers (12,600 miles or 10,900 nautical miles; orbital radius of 26,600 km (16,500 mi or 14,400 NM)), each SV makes two complete orbits each sidereal day. The ground track of each satellite therefore repeats each (sidereal) day. This was very helpful during development, since even with just 4 satellites, correct alignment means all 4 are visible from one spot for a few hours each day. For military operations, the ground track repeat can be used to ensure good coverage in combat zones.

A child safety device based on GPS (Global Positioning System) and GSM (Global System for Mobile Communications) technology can provide parents and caregivers with real-time tracking and communication capabilities to ensure the safety and security of their children. Here's an overview of such a device:

Device Components

GPS Receiver

The GPS receiver is used to determine the precise location of the child. It communicates with a network of satellites to provide accurate geographical coordinates.

GSM Module

The GSM module is responsible for communication with the parent or caregiver's smartphone or computer. It enables two-way communication and data transfer between the child's device and the parent's device.

Microcontroller/Processor

This component manages the overall functioning of the device, including data processing, communication with GPS and GSM modules, and power management.

Battery

A rechargeable battery powers the device. Battery life is a crucial consideration, as longer battery life ensures the device remains operational throughout the day.

Sensors

Additional sensors, such as accelerometers or panic buttons, can be included for additional safety features. For instance, a panic button can allow the child to send an alert in emergency situations.

User Interface

A simple user interface, such as a button or touchscreen, is provided for the child to trigger certain actions, like sending their location or initiating communication with a parent.

Key Features

Real-time Location Tracking

The device constantly communicates with GPS satellites to provide accurate location information. Parents can view the child's location in real-time through a mobile app or web portal.

Geo-Fencing

Parents can define safe zones on a map (geo-fencing) and receive alerts when the child enters or leaves these areas. This is useful for monitoring school, home, or playground boundaries.

Two-Way Communication

The device allows voice or text communication between the child and the parent's smartphone. This feature ensures that parents can talk to their child or receive messages in case of emergencies.

SOS/Panic Button

In emergency situations, the child can press an SOS button on the device to alert their parents or caregivers and share their location.

Remote Monitoring

Parents can check the device's battery status, signal strength, and other vital information remotely.

History Tracking

The device can store location history, allowing parents to review where their child has been over a specific period.

Privacy and Security

Data encryption and user authentication mechanisms are essential to protect the child's location information from unauthorized access.

Benefits

Enhanced Safety Parents have peace of mind knowing their child's whereabouts and can respond quickly to emergencies.

Independence

Children can gain some independence while parents still have a way to stay connected and ensure their safety.

Versatility

The device can be used not only for children but also for elderly family members, pets, or valuable items like backpacks or luggage.

Easy Setup

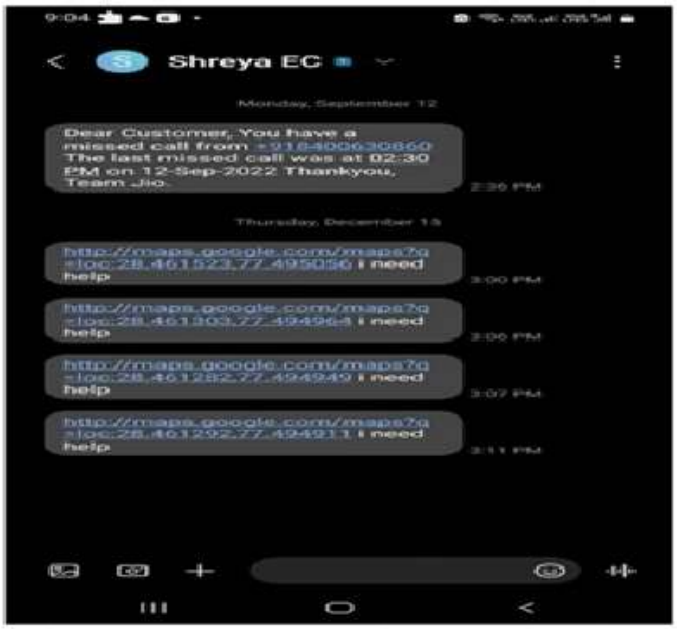
Most devices are easy to set up and configure through mobile apps or web interfaces.

While GPS and GSM-based child safety devices offer numerous benefits, it's essential to consider factors like cost, ongoing service fees, and the child's comfort with using the device. Additionally, these devices may have legal and ethical implications, particularly concerning privacy, so it's crucial to use them responsibly and within the bounds of applicable laws and regulations.

Result

The result of implementing a child safety device based on GPS and GSM technology is increased safety and security for children, along with peace of mind for parents and

caregivers. Parents can track their child's location in real-time using a mobile app or web portal, allowing them to know where their child is at any given moment. In case of emergencies or when the child needs assistance, they can use the SOS or panic button to quickly alert their parents or guardians. This can be a life-saving feature. Geofencing capabilities enable parents to set up virtual boundaries, and they receive alerts if their child enters or leaves these predefined safe zones. This feature helps parents ensure their child stays within specified areas like home or school. Two-way communication between the child and parents ensures that they can stay in touch when needed, whether through voice calls or text messages. The device stores location history, which can be useful for reviewing the child's movements and whereabouts over time. Children can have a greater sense of independence while parents have the assurance of knowing their child's location and well-being. These devices are not limited to child safety; they can also be used for tracking elderly family members, pets, or valuable items. Most devices are designed to be user-friendly, with straightforward setup and configuration through mobile apps or web interfaces. When implemented with strong security measures, these devices protect the privacy of the child and their location data from unauthorized access. The presence of such devices can encourage responsible and safe behavior in children, knowing that they are being monitored. It's important to note that while GPS and GSM-based child safety devices offer numerous benefits, they also come with considerations such as cost, ongoing service fees, and ethical concerns related to privacy and consent. Additionally, the effectiveness of these devices depends on factors like network coverage and device reliability. Overall, the result of implementing a child safety device based on GPS and GSM technology is a safer and more connected environment for children and greater peace of mind for their parents and caregivers.



Conclusion

The progress in science & technology is a non-stop process. New things and new technology are being invented. As the technology grows day by day, we can imagine about the future in which thing we may occupy every place. The proposed system based on Atmel microcontroller is found to be more compact, user friendly and less complex, which can readily be used in order to perform. Several tedious and repetitive tasks. Though it is designed keeping in mind about the need for industry, it can extended for other purposes such as commercial & research applications. Due to the probability of high technology (Atmel microcontroller) used this “GPS BASED VEHICLE TRACKING” system is fully software controlled with less hardware circuit. The feature makes this system is the base for future systems.

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