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Enhanced Life Jacket with GPS and GSM

[1] Geetha R [2] Adarsh H S, [3] S Bharath, [4] Bankim Mandal, [5] Hariharan S [6]RD Vidyarani
[1] [6] Assistant Professor, [2],[3],[4],[5] UG Scholars
Department of Electronics and Communication Engineering
Sri Sairam College of Engineering, Anekal, Bengaluru-562 106

Abstract: **This proposed work is an attempt to design a tracking unit that uses the global positioning system to determine the precise location of a, person which it is attached and using GSM modem this information can be transmit to remote user. It can provide tile-monitoring system for inter-cities transportation ships such as boats... This system contains single-board embedded system that is equipped with GPS and GSM modems along with ARM processor that is installed in the jacket. During object motion, its location can be reported by SMS message. A software package is developed to read, process, analyze and store the incoming SMS messages. The use of GSM and GPS technologies allows the system to track object and provides the most up-to-date information about ongoing trips. If a password like SMS is sent by the owner, it automatically stops the vehicle or we can use it for different other work, it can provide real time control. This system finds its application in real time traffic surveillance. It could be used as a valuable tool for real time traveler. The current system can be able to provide monitoring process from anywhere. The purpose of this system is to design and integrate a new system which is integrated with GPS- GSM to provide following feature: a) Location information, b) Real time tracking using SMS, c) Communication is instantaneous therefore we can receive running report quickly. It is completely integrated so that once it is implemented in all objects, then it is easy to track objects or person any time.**

I. INTRODUCTION

Proposed design is cost-effective, reliable and has the function of accurate tracking. When large object or vehicles were spread out over ground or water, the owner corporations often found it difficult to keep track of what was happening. They required some type of system to determine where each object was at any given time and for how long it travelled. Also the need of tracking in consumer's vehicle use to prevent any kind of theft because police can use tracking reports to locate the persons. GSM and GPS based tracking system will provide effective, real time location, and reporting. A GPS-GSM based tracking system will inform where a person is and where it has been, how long it has been. The system uses geographic position and time information from the Global Positioning Satellites. The system has an "On- Board Module" which resides in the vehicle to be tracked. The On-Board module consists of GPS receiver, a GSM modem and ARM processor. It can provide tile-monitoring and management system for inter-cities transportation vehicles such as taxis and buses and boats. [2]

During motion, its real-time parameters such as location are reported by SMS message. The system takes advantage of wireless technology in providing powerful management transportation engine. The use of GSM and GPS technologies allows the system to track object and provides the most up-to-date information about ongoing trips. This system finds its application in real time traffic surveillance. It could be used as a valuable tool for real time traveler information, congestion monitoring, and system evaluation. [4] An intelligent, automated object tracking system can resolve following problems such as, late arrivals to scheduled, improper use of company time and resources, unsafe driving habits, assigned routes, inefficient dispatching, and passenger's dissatisfaction. This can lead to better traffic flow modeling and a better understanding of driver behavior. This project includes various features like ingenuity, simplicity of design and easy implementation. It is completely integrated so that once it is implemented in all life jackets, then it is easy to track person at any time..

II. HARDWARE DESIGN

Hardware framework for tracking system is shown in Fig 1. System contains high Performance Atmega328 controller, a GPS, and GSM modem and overall system reside into a vehicle. A tracking system will provide effective real time vehicle location reporting .Tracking system will inform where your vehicle is and where it has been, how longer it has been there. The basic function of in vehicle unite is to acquire, Monitor and transmit the position latitude, longitude, time to management center either at fixed interval or on demand. Microcontroller unit form the heart of tracking unit, which acquires and process the position data from the GPS module. The GPS receiver of vehicle terminal receives and resolves the navigation message broadcasted by GPS position satellites, computes the longitude and latitude of vehicle coordinates, transforms it into the GSM message form by GSM communication controller, and sends the message to monitoring center via the GSM network.

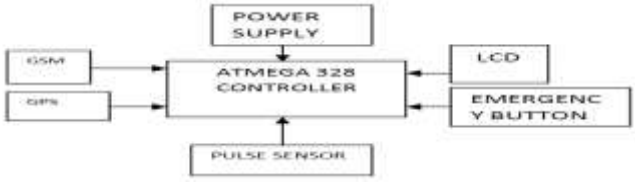

Fig1. Block diagram of tracking system

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2.1 ATMEGA328 CONTROLLER

The Atmel PicoPower ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328/P achieves throughputs close to 1MIPS per MHzthis empowers system designed to optimize the device for power consumption versus processing speed.The Atmel AVR® core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in a single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

The ATmega328/P provides the following features: 32Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 1Kbytes EEPROM, 2Kbytes SRAM, 23 general purpose I/O lines, 32 general purpose working registers, Real Time Counter (RTC), three flexible Timer/Counters with compare modes and PWM, 1 serial programmable USARTs , 1 byte-oriented 2-wire Serial Interface (I2C), a 6- channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages) , a programmable Watchdog Timer with internal Oscillator, an SPI serial port, and six software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next interrupt or hardware reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low power consumption. In Extended Standby mode, both the main oscillator and the asynchronous timer continue to run. Atmel offers the QTouch® library for embedding capacitive touch buttons, sliders and wheels functionality into AVR microcontrollers. The patented charge-transfer signal acquisition offers robust sensing and includes fully denounced reporting of touch keys and includes Adjacent Key Suppression® (AKS™) technology for unambiguous detection of key events. The easy-to-use QTouch Suite tool chain allows you to explore, develop and debug your own touch applications.

The device is manufactured using Atmel's high density non-volatile memory technology. The On-chip ISP Flash allows the program memory to be reprogrammed In-System through an SPI serial interface, by a conventional nonvolatile memory programmer, or by an On-chip Boot program running on the AVR core. The Boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash section will continue to run while the Application Flash section is updated, providing true Read-While-Write operation. By combining an 8-bit RISC CPU with In-System Self-Programmable Flash on a monolithic chip, the Atmel ATmega328/P is a powerful microcontroller that provides a highly flexible and cost effective solution to many embedded control applications.

The ATmega328/P is supported with a full suite of program and system development tools including: C Compilers, Macro Assemblers, and Program Debugger/Simulators, In-Circuit Emulators, and Evaluation kits.

2.2 GSM MODULE

Global system for mobile telecommunication (GSM) comprises the CEPT-defined standardization of the services, functional/subsystem interfaces, and protocol architecture, based on the use of worldwide standards produced by CCITT and CCIR, for a pan- European digital land mobile system primarily intend- end to serve users in motor vehicles. The digital mobile radio networks, for which GSM represents the Euro- pean standards, provide powerful message signal- ing capabilities that facilitate and enhance roaming, compared to the first generation analogue systems, through automatic network location detection and registration. GSM provides terminal mobility, with person- al mobility provided through the insertion of a subscriber identity module (SIM) into the GSM net- work (mobile station). The SIM carries the personal number assigned to the mobile user. The GSM-based cellular mobile networks are currently in widespread use in Europe. At the present time, the next gen- eration of personal communication services (PCS) beyond GSM is also being

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considered. These third generation systems, known as universal personal communication networks (PCN) will be using lower power handsets to provide personal mobility to pedestrians, as well. The PCS low-power handsets are expected to eliminate the need to have different handsets for wide-area (cellular) and local (cordless) applications. The universal PCS will also provide a higher quality of personal-service mobility across the boundaries of many different net-works (mobile and fixed, wide- and local-area). Many network capabilities, however, such as mobility management, user security protection, and resource allocation, addressed in GSM, are also some of the critical requirements and issues in UPC net- w o r k s of the future. GSM is expected to play a major role in the specification of the standards for UPC. In the United Kingdom, PCN is already being designed and deployed with close adherence to the GSM standards other than the different operating frequencies (GSM operates at 900 MHz and the United Kingdom PCN operates at 1800 MHz). Generally, GSM may be viewed as a frame- work for studying the functions and issues that are specific to cellular type personal communication networks, whatever the means of implementation might be. In applying and extending GSM to the next gen- eration personal communication networks, how-ever, one should be careful in differentiating some of the implementation specifics unique to the GSM network architecture and application from the functions and issues that would be more or less generally applicable and relevant to cellular networking. It is with this point in mind that the reader should view GSM as a framework or platform on which to build his or her vision of how GSM may be used as a guide to design and build the next generation networks. In that regard, a good understanding of the GSM standards and network functions is essential for the professional working on the next generation personal communication networks.

2.3 GPS MODEL

The Global Positioning System (GPS) is a satellite-based navigation system that consists of 24 orbiting satellites, each of which makes two circuits around the Earth every 24 hours. These satellites transmit three bits of information – the satellite's number, its position in space, and the time the information is sent. These signals are picked up by the GPS receiver, which uses this information to calculate the distance between it and the GPS satellites.With signals from three or more satellites, a GPS receiver can triangulate its location on the ground (i.e., longitude and latitude) from the known position of the satellites. With four or more satellites, a GPS receiver can determine a 3D position (i.e., latitude, longitude, and elevation). In addition, a GPS receiver can provide data on your speed and direction of travel. Anyone with a GPS receiver can access the system. Because GPS provides real-time, three-dimensional positioning, navigation, and timing 24 hours a day, 7 days a week, all over the world, it is used in numerous applications, including GIS data collection, surveying, and mapping.

The GPS system currently has 31 active satellites in orbits inclined 55 degrees to the equator. The satellites orbit about 20,000km from the earth's surface and make two orbits per day. The orbits are designed so that there are always 6 satellites in view, from most places on the earth. GPS uses a lot of complex technology, but the concept is simple. The GPS receiver gets a signal from each GPS satellite. The satellites transmit the exact time the signals are sent. By subtracting the time the signal was transmitted from the time it was received, the GPS can tell how far it is from each satellite. The GPS receiver also knows the exact position in the sky of the satellites, at the moment they sent their signals. So given the travel time of the GPS signals from three satellites and their exact position in the sky, the GPS receiver can determine your position in three dimensions - east, north and altitude.

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2.4 BATTERY

An automotive battery is a rechargeable battery that supplies electrical energy to a motor vehicle. It is also known as an SLI battery (abbreviation of starting-lighting-ignition) and its main purpose is to start the engine. Once the engine is running, power for the car is supplied by the alternate. Typically, starting discharges less than three per cent of the battery capacity. SLI batteries are designed to release a high burst of current, measured in amperes, and then be quickly recharged. They are not designed for deep discharge, and a full discharge can reduce the battery's lifespan.

As well as starting the engine an SLI battery supplies the extra power necessary when the vehicle's electrical requirements exceed the supply from the charging system. It is also a stabilizer, evening out potentially-damaging voltage spikes. While the engine is running, most of the power is provided by the alternator, which includes a voltage regulator to keep the output between 13.5 and 14.5 V.

2.5 EMERGENCY BUTTON

The emergency button will be present on the top of the life jacket in case of any emergency situation or during the time of accident person can press the button so that entire system will get activate and the rescue process will begin.

2.6 PULSE SENSOR

A pulse sensor in the system is used so that in case that the person falling from the ship fails to press the emergency button on reading the pulse rate of the person the system will get automatically turn on and the message will be sent to the rescue team .the pulse sensor will activate the system only under the given condition of pulse rate.

III. CONCLUSION

GPS tracking is not used in traditional lifejackets, which means that it could take days before a lost fisherman, ***passenger*** or crew is found out at sea and cause a great deal of anxiety for their family. With the PFD lifejackets, the tracking devices in them are activated when they hit water, which means faster recovery time and more chances of the lost fishermen passenger or crew being alive when found.