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Virtual Security Zone for Student Tracking System Using GPS Watch

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Abstract- **Security for students in the college campus, children's in the school campus has become a critical issue in these days. The school/college authority and the parents want to know whether the student is within the campus area or not. Elderly citizens also need to be monitored for confining within a zone like hospital. The proposed system is to design and develop a smart GPS watch that will track the position of the attached person, monitors for a sudden fall and alerts the authority in the event of a fall or when that person crosses a given border line of a predefined zone. It is derived from GPS satellites; the clock shows the universal time and is as accurate as an atomic clock. Integrating our system within a device like watch would make the user comfortable, for not carrying additional device like a mobile phone. This system helps school and college administration to prevent students from crossing an invisible fence that alerts school authority via SMS when they leave the zone.**

Index terms- **Central monitoring unit, Flexi force sensor, Global positioning system, GPS watch unit, GSM cellular modem, RF signaling, WPAN radio communication.**

I.INTRODUCTION

In these days security for students in college campus and children‟s in the school campus has become a critical one. Mostly this type of security alerts are performed by using RF signaling and human securities. When we going for these types of security the students cannot be properly controlled. To overcome these types of problem my proposed system uses the combination of hardware and software. It is also called as embedded systems. In this system hardware is controlled by software. Software is designed using C. The previous system uses the RF sensor for monitoring the student„s activity. It uses the RF signaling to monitor the students without going anywhere from the campus. A RF sensor is attached with the person like a minute watch in his hand. Using RF signal they monitors all the movements of the student while they crossing the campus area or not. Using a monitor we can the watch unit. If they crossing the campus area the signal gets weakens. By the range of the signal we can monitor the student while crossing the campus area. The range is measured by using monitor. This method is not accurate. If any dangerous places inside the school campus, while student is going, it cannot be determined correctly. And depend upon signal only we can make the security. To overcome these drawbacks my proposed work uses a smart GPS watch to monitor the students accurately. This smart GPS watch is attach to the person. It will monitor the students while crosses a given border line of a predefined zone using a combination of GSM and WPAN radio communication. Since it is a watch unit, the watch shows the universal time and is more accurate than the atomic clock. Integrating our system within a device like watch would make the user comfortable for not carrying additional device like mobile phone etc. A monitoring system is used to monitor the watch attached person and alerts the authority. This surveillance system helps school via SMS when they leave the zone. Alternatively the system could also be used to prevent a student from reaching into a protected or dangerous area within the campus premises. This system can also be applied in monitoring elderly and is not limited to students alone. Since this is a security system, GPS watch should be always attached to the monitored person and removing or damaging this device should be prohibited. To achieve this, a Flexi Force Sensor(FFS) is attached to the back of the device and it senses the grip force of the device with the user

skin. The device will send an SMS to the authorities if the device gets tampered or removed by any means. To disable this security lock feature an authorized user could simply press the enable-disable button in the central control unit using a keypad. Importantly when an elderly falls, a 3-axis MEMS Accelerometer sensor in the watch could sense this and alert the central unit which will send SMS about the fall location to the necessary person or to the hospital.

II. METHODOLOGY

Students tracking is mainly based on two units GPS watch unit and central monitoring unit. The GPS watch unit contains a GPS receiver, Flexi Force Sensor, MEMS accelerometer. This watch unit is attached to the hands of the person. Using the GPS receiver we can monitor the movement of the students. This GPS receiver will work under the control of GPS satellite and then if the watch unit is removed or gets tampered the Flexi Force Sensor will alert the authority. This Flexi Force is available in the bottom of the watch which makes a grip we can monitor while they removing the watch unit from the hand. MEMS accelerometer present in the watch unit is used for monitoring the sudden fall of the senior citizen. This watch unit will send the signals to the central monitoring unit WPAN (Wireless Personal Area Network) radio communication.

III.PROPOSED WORK

Security for students in Children‟s School and Colleges has become a critical issue these days. The school/college authority and the parents want to know whether the student is within the campus area or not. The main aim of this project to develop a smart GPS watch that will track the position of the attached person (ex: school children & elderly), monitors for a sudden fall and alerts the authority in the event of a fall or when that person crosses a given border line of a predefined zone using a combination of GSM and WPAN radio communication.

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During the IN mode, the system could be used to prevent a student from reaching into a protected or dangerous area within the campus premises. A signal will transmitted for each of the microchip MRF24J40MA .If the miwi is connected the security system will be activated. A GPS watch unit should be attached to the monitored person. A flexiforce sensor is attached to the back of the watch unit. If it is destroyed or tampered the device will send an sms to the authorities. In this a wireless radio communication standard, IEEE 802.15.4 is used. More than one sms have been send if the monitored person crosses the border.

A. Global System for Mobile Communication

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between

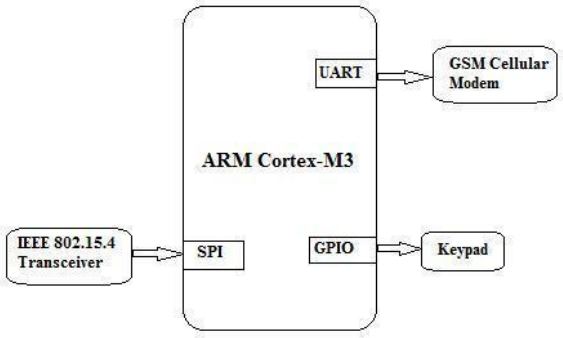

Fig. 1 Central Monitoring Unit

them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer.Both GSM modems and dial-up modems support a common set of standard AT commands. You can use a GSM modem just like a dial-up modem.

B. Global Positioning System

The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. The system provides critical capabilities to military, civil and commercial users around the world. It is maintained by the United States government and is freely accessible to anyone with a GPS receiver.Advances in technology and new demands on the existing system have now led to efforts to modernize the GPS system and implement the next generation of GPS III satellites and Next Generation Operational Control System (OCX).

GPS Tracking system:

A GPS tracking unit is a device that uses the Global Positioning System to determine the precise location of a vehicle, person, or other asset to which it is attached and to record the position of the asset at regular intervals. The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location data base, or internet-connected computer, using a cellular(GPRS or SMS), radio, or satellite modem embedded in the unit. This allows the asset's location to be displayed against a map backdrop either in real time or when analysing the track later, using GPS tracking software.

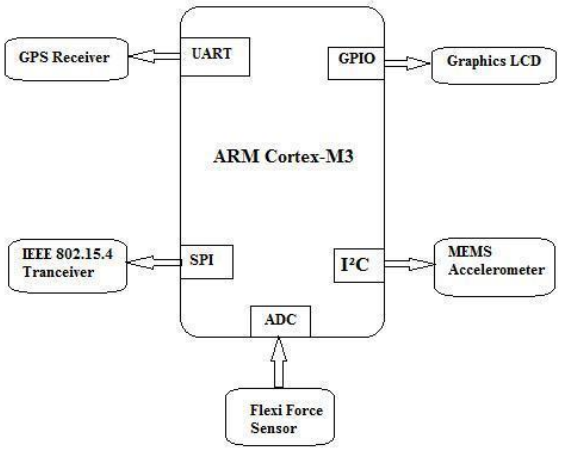

Fig. 2 GPS Watch Unit

C. Embedded processor

The ARM Cortex™-M3 processor is the industry-leading 32-bit processor for highly deterministic real-time applications and has been specifically developed to enable partners to develop high-performance low-cost platforms for a broad range of devices including microcontrollers, automotive body systems, industrial control systems and wireless networking and sensors. The processor delivers

outstanding computational performance and exceptional system response to events while meeting the challenges of low dynamic and static power constraints. The processor is highly configurable enabling a wide range of implementations from those requiring memory protection and powerful trace technology through to extremely cost sensitive devices requiring minimal area.

D. LPC1313 ARM cortex microcontroller

The LPC1311/13/42/43 are ARM Cortex-M3 based microcontrollers for embedded applications featuring a high level of integration and low power consumption. The ARM Cortex-M3 is a next generation core that offers system enhancements such as enhanced debug features and a higher level of support block integration.The LPC1311/13/42/43 operate at CPU frequencies of up to 72 MHz. The ARM Cortex-M3 CPU incorporates a 3-stage pipeline and uses a Harvard architecture with separate local instruction and data buses as well as third bus for peripherals. The ARM Cortex-M3 CPU also includes an internal prefetch unit that supports speculative branching. The peripheral complement of the LPC1311/13/42/43 includes up to 32 kB of flash memory, up to 8 kB of data memory, USB Device (LPC1342/43 only), one Fast-mode Plus I2C-bus interface, one UART, four general purpose timers, and up to 42 general purpose I/O pins.

E. Sensors Used

A FlexiForce sensor is a force-sensitive resistor (alternatively called a force-sensing resistor or simply an FSR) has a variable resistance as a function of applied pressure. In this sense, the term “force-sensitive” is misleading – a more appropriate one would be “pressure-sensitive”, since the sensor's output is dependent on the area on the sensor's surface to which force is applied.

The LIS3LV02DQ is a three axes digital output linear accelerometer that includes a sensing element and an IC interface able to take the information from the sensing element and to provide the measured acceleration signals to the external world through an I2C/SPI serial interface. The LIS3LV02DQ has a user selectable full scale of +/-2g, +/-6g and it is capable of measuring acceleration over a bandwidth

of 640 Hz for all axes.The device may be configured to generate an inertial wake-up/free-fall interrupt signal when a programmable acceleration threshold is crossed at least in one of the three axes.

F. Protocols Used

In asynchronous transmitting, teletype-style UARTs (Universal Asynchronous Receiver Transmitter)send a "start" bit, five to eight data bits, least-significant-bit first, an optional "parity" bit, and then one, one and a half, or two "stop" bits. The start bit is the opposite polarity of the data-line's idle state. The stop bit is the data-line's idle state, and provides a delay before the next character can start. (This is called asynchronous start-stop transmission). In mechanical teletypes, the "stop" bit was often stretched to two bit times to give the mechanism more time to finish printing a character. A stretched "stop" bit also helps resynchronization.A code format of UART is shown in Fig 3.

SPI is a serial bus standard established by Motorola and It is a synchronous serial data link that operates in full duplex (signals carrying data go in both directions simultaneously). Devices communicate using a master/slave relationship, in which the master initiates the data frame.

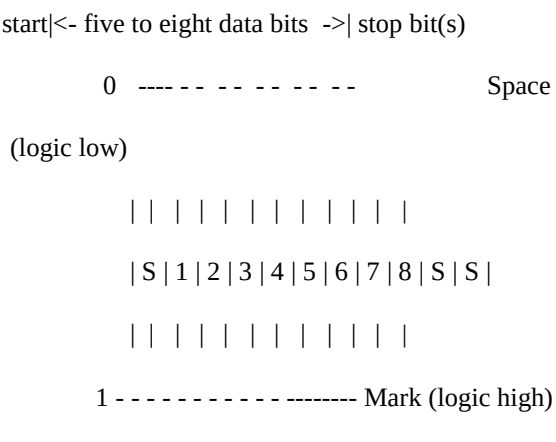

Fig. 3 Asynchronous Code Format of UART

When the master generates a clock and selects a slave device, data may be transferred in either or both directions simultaneously. In fact, as far as SPI is concerned, data are always transferred in both directions. It is up to the master and slave devices to know whether a received byte is meaningful or not. So a device must discard the received byte in a "transmit only" frame or generate a dummy byte for a "receive only" frame. A master slave action can be held by either single slave or multi slave. A single slave action of SPI is shown in Fig.4. SPI specifies four signals: clock (SCLK); master data output, slave data input (MOSI);

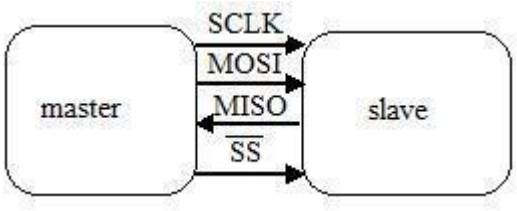

Fig. 4 Single Slave of SPI

master data input, slave data output (MISO); and slave select (ÇSS).

General-purpose input/output (GPIO) is a generic pin on an integrated circuit (commonly called a chip) whose behavior (including whether it is an input or output pin) can be controlled (programmed) by the user at run time. GPIO pins have no special purpose defined, and go unused by default. The idea is that sometimes the system integratoR building a full system that uses the chip might find it useful to have a handful of additional digital control lines, and having these available from the chip can save the hassle of having to arrange additional circuitry to provide internal speakers and external headphone jack.

GPIOs are used in devices with pin scarcity: integrated circuits such as, system-on-a-chip, embedded and custom hardware, programmable logic devices (for example, FPGAs).Multifunction chips: power managers, audio codecs, and video cards.Embedded applications (for example, Arduino, BeagleBone, and Raspberry Pi) make heavy use of GPIO for reading from various environmental sensors (IR, video, temperature, 3-axis orientation, and acceleration), and for writing output to DC motors (via PWM), or audio, LCD displays, LEDs for status.

GPIO peripherals vary quite widely. In some cases, they are very simple, a group of pins that can be switched as a group to either input or output. In others, each pin can be set up flexibly to accept or source different logic voltages, with configurable drive strengths and pull ups/downs. The input and output voltages are typically, though not universally, limited to the supply voltage of the device with the GPIOs on and may be damaged by greater voltages.Some GPIOs have 5 V tolerant inputs: even when the device has a low supply voltage (such as 2 V), the device can accept 5 V without damage.

G. Miwi p2p Wireless Protocol

The Microchip MiWi™ P2P Wireless Protocol is a variation of IEEE 802.15.4, using Microchip‟s MRF24J40MA 2.4 GHz transceiver and any Microchip 8, 16 or 32-bit microcontroller with a Inter Integrated Circuit (I^2C). The protocol provides reliable direct wireless communication via an easy-to-use programming interface. It has a rich feature set that can be compiled in and out of the stack to meet a wide range of customer needs – while minimizing the stack footprint.

The MiWi P2P protocol is a variation of IEEE 802.15.4 and supports both peer-to-peer and star topologies. It has no routing mechanism, so the wireless communication coverage is defined by the radio range.Guaranteed Time Slot (GTS) and beacon networks are not supported, so both sides of the communication cannot go to sleep at the same time. If the application requires wireless routing instead of P2P communication; or interoperability with other vendors devices; or a standard-based solution, for marketability.

IV.CONCLUSION

Virtual Security Zones for Student Tracking and Elderly Fall Alert based on GPS Watch and Skin Pressure Sensitive Lock is a security system used for security in college campus or in a school campus. By using this security system, alerts are given to the authority if the watch attached person crosses the campus area. This proposed work reduces the works of the human beings and also perfect security in college or school campus and alerts through SMS to the authority. By using this perfect security will be given to college or school campus. Elders can also be monitored easily. By learning about this type of securities, increase the number of predefined security zones within a campus area which is not feasible with human securities.

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