International Journal of Engineering In Advanced Research Science and Technology
ISSN:2278-2566

Volume3
Issue-2

MEMS BASED VEHICLE MONITORING SYSTEM USING GPS AND GSM

1. D.GEETA DEVI, 2. B.SUBHAKARA RAO
1. PG Scholar, Dept of ECE, NOVA Institute of Technology, Talgallamudi,AP
2. Associate professor, Dept of ECE, NOVA Institute of Technology, Talgallamudi,AP

ABSTRACT: The mian objective of this project is to design an innovative wireless black box using MEMS accelerometer and GPS tracking system has been developed for motorcycle accidental monitoring. The system can detect type of accident (linear and nonlinear fall) from accelerometer signal using threshold algorithm, posture after crashing of motorcycle and GPS ground speed. After accident is detected, short alarm massage data (alarm massage and position of accident) will be sent via GSM network.

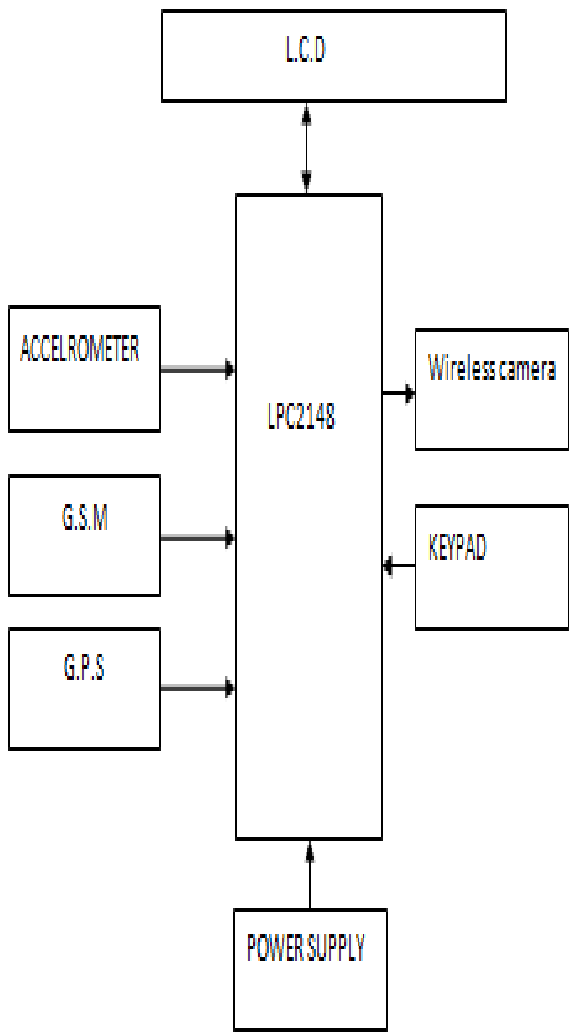
KEYWORDS: emergency medical service (EMS), Global Positioning System, GSM, Accelerometer, Subscriber Identity Module.

INTRODUCTION

THE motorcycle accident is a major public problem inmany countries, particularly Thailand. Despite awareness campaign, this problem is still increasing due to rider's poor behaviors such as speed driving, drunk driving, riding with no helmet protection, riding without sufficient sleep, etc. The numbers of death and disability are very high because of late assistance to people who got the accident. These cause huge social and economic burdens to people involved. Therefore, several research group and major motorcycle manufacturers including Honda have developed safety devices to protect riders from accidental injuries. However, good safety device for motorcycle is difficult to implement and very expensive. Alternatively, intelligence schemes such as fall or incident detection with tracking system have also recently been devised to notify the accident to related people so that quickest assistance can reach people who got the accident [1]. Presently, tracking system is only installed in some high- end motorcycles [2-4] because these systems are still too expensive for most motorcycle's riders [5-6]. Thus, fall detection and accident alarm system for motorcycle has recently gained attention because these systems are expected to save life by helping riders to get medical treatment on time. In this work, wireless black box using MEMS accelerometer and GPS tracking system is developed for accidental monitoring. In the event of accident, this wireless device will send mobile phone short massage indicating the position of vehicle by GPS system to family member, emergency medical service (EMS) and nearest hospital so that they can provide ambulance and prepare treatment for the patients. The system consists of cooperative components of an accelerometer, microcontroller unit (MCV), GPS

device and GSM module for sending a short massage. An accelerometer is applied for awareness and fall detection indicating an accident. The speed of motorcycle and threshold algorithm are used to decide a fall or accident in real-time. Mobile short massage containing position from GPS (latitude, longitude) will be sent when motorcycle accident is detected. The robust package design is implemented so that it is safe from water's spray and dust in environment. The module is aimed to be installed under the motorcycle seat.

A high performance 16 bits MCV is used to process and store real-time signal from the accelerometer. Thus, this device is analogous to a black box in airplane. The police and insurance examiner can obtain accident history to investigate accident situation from data-logger in this device. The device keeps data log of track and acceleration data for 1 minute before and after an accident. Moreover, this device can be used to track motorcycle after it was stolen but it can't operate in real-time in this case. In this case, user can send request command with alphabet "!" to device and the device will return the position with some basic information



CASE1: If the accelerometer angle is in between a1 and a2 “FIRST” message should be forwarded to stored 3 mobile numbers along with its location.

CASE2: If the accelerometer angle is in between b1 and b2 “SECOND” message should be forwarded to stored 3 mobile numbers along with its location.

ARM LPC2148:

The LPC2141/2/4/6/8 microcontrollers are based on a 32/16 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash

memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate.

Features of ARM Processor • 16/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package. • 8 to 40 kB of on-chip static RAM and 32 to 512 kB of on-chip flash program memory. 128 bit wide interface/accelerator enables high speed 60 MHz operation. • In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software. Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1 ms. • EmbeddedICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip RealMonitor software and high speed tracing of instruction execution.• Single 10-bit D/A converter provides variable analog output. • Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog • Low power real-time clock with independent power and dedicated 32 kHz clock input. • Multiple serial interfaces including two UARTs (16C550), two Fast I2C-bus (400 kbit/s), SPI and SSP with buffering and variable data length capabilities. • Power saving modes include Idle and Power-down. • Processor wake-up from Power-down mode via external interrupt, USB, Brown-Out Detect (BOD) or Real-Time Clock (RTC).• Single power supply chip with Power-On Reset (POR) and BOD circuits: – CPU operating voltage range of 3.0 V to 3.6 V (3.3 V ± 10 %) with 5 V tolerant I/O pads.

ACCELEROMETER:

An accelerometer is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant force of gravity pulling at your feet, or they could be dynamic - caused by moving or vibrating the accelerometer. An accelerometer is a device that measures the vibration, or acceleration of motion of a structure. The force caused by vibration or a change in motion (acceleration) causes the mass to "squeeze" the piezoelectric material which produces an electrical charge that is proportional to the force exerted upon it. Since the charge is proportional to the force, and the mass is a constant, then the charge is also proportional to the acceleration. There are two types of piezoelectric accelerometers (vibration sensors). The first type is a "high impedance" charge output accelerometer. In this type of accelerometer the piezoelectric crystal produces an electrical charge which is connected directly to the measurement instruments. The charge output requires special accommodations and instrumentation most commonly found in research facilities. This type of accelerometer is also used in high temperature applications (>120C) where low impedance models can not be used.

Global Positioning System: Our world depends on the Global Positioning System (GPS). With GPS – our soldiers are safer, first responders are faster, banking and investing is instantaneous, industry is more efficient and everyday living is simply easier. GPS technology is found in everything from cell phones and wristwatches, to shipping containers and ATM's. The system boosts productivity in almost every aspect of society and across a wide swath of the economy, to include farming, construction mining, surveying, supply chain management and more. Major communications networks, banking systems, financial markets, and power grids depend on GPS and the technology is embedded in virtually every component of U.S. military operations. device and GSM module for sending a short massage. An accelerometer is applied for awareness and fall detection indicating an accident. The speed of motorcycle and threshold algorithm are used to decide a fall or accident in real-time. Mobile short massage containing position from GPS (latitude, longitude) will be sent when motorcycle accident is detected. The robust package design is implemented so that it is safe from water's spray and dust in environment. The module is aimed to be installed under the motorcycle seat.

L.C.D:

Liquid Crystal Display

The LCD is used for the purpose of displaying the words which we are given in the program code. This code will be executed on microcontroller chip. By following the instructions in code the LCD display the related words

CONCLUSION: Wireless black box using MEMS accelerometer and GPS tracking system is developed for accidental monitoring. The system consists of cooperative components of an accelerometer, microcontroller unit, GPS device and GSM module. In the event of accident, this wirelessdevice will send mobile phone short massage indicating the position of vehicle by GPS system to family member, emergency medical service (EMS) and nearest hospital. The threshold algorithm and speed of motorcycle are used to determine fall or accident in real-time. The system is compact and easy to install under rider seat. The system has been tested in real world applications using bicycles.

REFERENCES

[1] M. A. D. Costa, G. H. Costa, A. S. dos Santos, L. Schuch, and J. R.Pinheiro, "A high efficiency autonomous street lighting system based on solar energy and LEDs," in *Proc. Power Electron. Conf.*, Brazil, Oct. 1, 2009, pp. 265–273.

[2] P.-Y. Chen, Y.-H. Liu, Y.-T. Yau, and H.-C. Lee, "Development of an energy efficient street light driving system," in *Proc. IEEE Int. Conf. Sustain. Energy Technol.*, Nov. 24–27, 2008, pp. 761–764.

[3] W. Yongqing, H. Chuncheng, Z. Suoliang, H. Yali, and W. Hong, "Design of solar LED street lamp automatic control circuit," in *Proc. Int. Conf. Energy Environment Technol.*, Oct. 16–18, 2009, vol. 1, pp. 90–93.

[4] W. Yue, S. Changhong, Z. Xianghong, and Y. Wei, "Design of new intelligent street light control system," in *Proc. 8th IEEE Int. Conf. Control Autom.*, Jun. 9–11, 2010, pp. 1423–1427.

[5] R. Caponetto, G. Dongola, L. Fortuna, N. Riscica, and D. Zufacchi, "Power consumption reduction in a remote controlled street lighting system," in *Proc. Int. Symp. Power Electron., Elect. Drives, Autom. Motion*, Jun. 11–13, 2008, pp. 428–433.

[6] Y. Chen and Z. Liu, "Distributed intelligent city street lampmonitoring and control system based on wireless communication chip nRF401," in *Proc. Int. Conf. Netw. Security, Wireless Commun. Trusted Comput.*, Apr. 25–26, 2009, vol. 2, pp. 278–281.

[7] L. Jianyi, J. Xiulong, and M. Qianjie, "Wireless monitoring system of street lamps based on zigbee," in *Proc. 5th Int. Conf. Wireless Commun., Netw. Mobile Comput.*, Sep. 24–26, 2009, pp. 1–3.

[8] D. Liu, S. Qi, T. Liu, S.-Z. Yu, and F. Sun, "The design and realization of communication technology for street lamps control system," in *Proc. 4th Int. Conf. Comput. Sci. Educ.*, Jul. 25–28, 2009, pp. 259–262.

[9] J. Liu, C. Feng, X. Suo, and A. Yun, "Street lamp control system based on power carrier wave," in *Proc. Int. Symp. Intell. Inf. Technol. Appl. Workshops*, Dec. 21–22, 2008, pp. 184–188.

[10] H. Tao and H. Zhang, "Forest monitoring application systems based on wireless sensor networks," in *Proc. 3rd Int. Symp. Intell. Inf. Technol. Appl. Workshops*, Nov. 21–22, 2009, pp. 227–230.

[11] D. Chen and M. Wang, "A home security zigbee network for remote monitoring application," presented at the Inst. Eng. Technol. Int. Conf.

Wireless MobileMultimediaNetw.,Hangzhou, China, Nov. 6–9, 2006.
[12] M. Xiangyin, X. Shide, X. Ying, and H. Huiping, "Zigbee based wireless networked smart transducer and its application in supervision and control system for natural gas gate station," in *Proc. 4th Int. Conf. Comput. Sci. Educ.*, Jul. 25–28, 2009, pp. 301–306.
[13] Z. Rasin, H. Hamzah, and M. S. M. Aras, "Application and evaluation of high power zigbee based wireless sensor network in water irrigation control monitoring system," in *Proc. IEEE Symp. Ind. Electron. Appl.*, Oct. 4–6, 2009, vol. 2, pp. 548–551.