

# Smart Personal Security System based on Footwear using Microcontroller

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**Abstract**—Nowadays personal security has become a sensitive issue. Women's need to have their secure against harassments. The social incidents gave us motivation to develop personal security system. Women's mostly not able to fight against criminal for self-security. Recent world is the women, who work independently to support their family. They have to work till late night. For such women, safety is the most important, so they have to come forward because of harassment. Best solution for those women is to carry a portable system using smart shoes. It will generate a shock to attack a lawbreaker, following that the message will be sent with the help of Global System for Mobile Communication (GSM) on the particular number with the location are stored of those women is traced with the help of Global Positioning System (GPS). If the message is not checked by the particular number mentioned, the system will continuously make a call until the message is checked.

**Index term:** GPS, GSM, Smart Security, Tracking System and Smart shoes

## I. INTRODUCTION

Women's work at different places like IT firms and so many places. After completion of their duty they have to go home late night so anything may happen at such timings as well as there is a chance of harassment at lonely places. Security purpose portable system is designed and it can be easily carried with the women. Communication of alarming situation & prevention of incident has achieved by GPS, GSM technology and defensive system respectively. This is the aim of our system. As a result the design is separated into two parts. The message of the offense throughout wireless and prevention of the crime. In this shocking system with automation & alarm has been used. Pulse rate sensor, pressure & manual switches contribution has been considered for alarming, defensive situation and communication. The text message will be send to the added data based on people at destination for instant help to the user. User will have freedom to add or delete their need in disaster situation. University of Wisconsin-Madison engineering researchers Tom Krupenkin and J. Ashley Taylor have developed an in shoe system that harvests the energy generated by walking, but the energy is lost as heat, it claim up to 20 watts of electricity could be generated and stored in an incorporated rechargeable battery. It converts mechanical energy to electricity via a micro fluidic device. The power density of up to one kilowatt per square meter (10.76 sq. ft.), plus it works with a wide range of mechanical forces, and is able to output a wide range of currents and voltages. Throughout a conference proceedings. Margins, column widths, line spacing, and type styles are built-in; examples of the type styles are provided throughout this document and are identified in italic type, within parentheses, following the example. The components like multi-leveled equations, tables and graphics are not prescribed, the various table text styles are provided and the formatter will need to create these components, incorporating the applicable criteria.

A wireless sensor network (WSN) sometimes called a wireless sensor and actuator network (WSAN) are distributed autonomous sensors to monitor physical or environmental conditions as temperature, sound, pressure, etc. The more recent networks are bi-directional, also enabling control of sensor activity process. The military applications are motivated the development of wireless sensor network such as battlefield surveillance and today's networks are used in many industrial and consumer applications like industrial process monitoring and control, machine health monitoring, etc., Location-based services (LBS) are a computer program-level services, it mostly use location data to control features levels. As such LBS is an information service and has a number of uses in social networking today as an entertainment service, which is accessible with mobile devices through the mobile network uses information on the geographical position. This has become more and more important with the expansion of the smart phone and tablet markets as well. The variety of contexts, such as health, indoor object search, entertainment, work, personal life, etc. The government organizations, businesses maintenance is critical to drive real insight from data tied to a specific location where activities take place.

The spatial patterns that location-related data and services can provide is one of its most powerful and useful aspect where location is a common denominator in all of these activities and can be leveraged to better understand patterns and relationships. LBS include services to identify a location of a person or object, such as discovering the nearest banking cash machine or the whereabouts of a friend or employee. LBS include parcel tracking and vehicle tracking services. LBS can include mobile commerce when taking the form of coupons or advertising directed at customers based on their current location. They include personalized weather services and even location-based games. The Internet of Things (IoT) [4] and the world of Smart Systems are ushering in an era where people, machines, devices (e.g. sensors) and processes are all interconnected and able to interact seamlessly with one another. Business and IT leaders predict they will see an increase of more than one-third (33%) in revenues from the use of smart technologies over the next five years, Smart system is the future of technology with so many different applications to it. We present in this project a system developed for a more convenient outdoor navigation. It involves the development of a power harnessing smart shoe to aid navigation and reduce the dependency of individuals on maps i.e. the need to constantly look at the maps for direction rather than focusing on the road.

## II. RELATED WORK

Pantelopoulou, [1] attempts to comprehensively review the current research and development on wearable biosensor systems for health monitoring. An emphasis is given to multiparameter physiological sensing system designs, providing reliable vital signs measurements and incorporating real-time decision support for early detection of symptoms or context awareness. The aim of this work is not to criticize, but to serve as a reference for researchers and developers in this scientific area and to provide direction for future research improvements. Bamberg, S.J.M. et al [2] describe a wireless wearable system that was developed to provide quantitative gait analysis outside the confines of the traditional motion laboratory. The sensor suite includes three orthogonal accelerometers, three orthogonal gyroscopes, four force sensors, two bidirectional bend sensors, two dynamic pressure sensors, as well as electric field height sensors. The "Gait Shoe" was built to be worn in any shoe, without interfering with gait and was designed to collect data unobtrusively.

Rocha, J.G et al [3] describes the use of piezoelectric polymers in order to harvest energy from people walking and the fabrication of a shoe capable of generating and accumulating the energy. In this scope, electroactive polyvinylidene fluoride used as energy harvesting element was introduced into a bicolor sole prepared by injection, together with the electronics needed to increase energy transfer and storage efficiency. An electrostatic generator was also included in order to increase energy harvesting. Oshin, O et al [4] uses the Arduino UNO microcontroller as the brain box of the designed system. The microcontroller was programmed to achieve the various tasks needed in this project. The smart shoe is fitted with piezo- electric crystals which are pressure sensors generating the power required for the system, a Bluetooth module to interface with the mobile application which was programmed specifically for the shoe, and also vibrator motors which act as the output signal that is felt by the user to help inform them which way to turn. This work proffers solutions to the setbacks in navigation of the user with accuracy and focus.

Auti, M.S.S.et al [5] proposed the overall framework of the necessity as a safety monitor for Alzheimer's patients. Alzheimer's patient is a person having the difficulties about memory with the concepts of place & time. Global Positioning System (GPS) locator watches for patients are essentially RT-trackers that allow the family members or caregivers to have a complete access to whereabouts of person 24hrs. The GPS technology is placed inside a cavity made from a polycarbonate material which is in the midsole of the shoe. GTX says, the normal duration of the shoe - one to three years. The design of the system gives Energy efficiency, robustness, and reliability. Patient is having a mobile sensor unit which includes a GPS chip and antennas. Mobile sends latitude, longitude, and a time stamp. A GTX tracking map gives the latitude and longitude information on a geographical information system (GIS). The developed system can be used to track a specific area of patients. The main advantage of the system is a multilingual system. This means that we store the wav file in any language and play it back.

Maksood, F.Z et al [6] proposed descriptive details about the procedure, implementation, testing and results that were obtained. It also outlines the plans regarding the future plan and its potential release in the market. The design is microcontroller oriented and uses Arduino Uno and SIM900 GSM modem as its major components.

Goudar, V et al [7] propose a novel harvesting technology to in conspicuously transduce mechanical energy from human foot-strikes and explore its configuration and control towards optimized energy output. Dielectric Elastomers (DEs) are high-energy density, soft, rubber-like material that electrostatically transduce mechanical energy. These properties enables increased energy-transduction efficiency without sacrificing on user comfort, if configured and controlled properly. This work expose key statistical properties of human gait which show that an array of miniaturized harvester's across the foot-sole will improve energy output. Further, the gait properties naturally yield a closed-loop control strategy to individually control harvesters in the array in a manner that maximizes net energy output. This work propose statistical techniques that guide the configuration and control of the harvester array, and evaluate system behavior from detailed analytical and empirical models of DE behavior. System evaluations based on experimentally collected foot pressure datasets from multiple subjects show that the proposed system can achieve up to 120mJ per foot-strike, enough to power a variety of low-power wearable devices and systems.

Nabin Sapkota et al [8] investigate complex human socio economic infrastructure interactions and in-formation on past human adverse events (AE) in an active warth

eater in order to predict future AE in a given geographical region. Human AE were defined as those security-related events that threatened human lives. Human socio economic infrastructure development data were derived by integrating three different datasets from different sources based on the United States Agency for International Development database. Using empirical data obtained from the country of Afghanistan from 2002 to 2010, we applied evolving self-organizing maps (ESOM) to forecast future patterns of such AE. Records from 2003–2009 were used as training data, while records from year 2010 were used to test the efficacy of ESOM in predicting AE. The socio economic data, dates, and geographical location information was used as input for the trained model. ESOM algorithm with supervised learning was effective in understanding future patterns of AE in a war region. The results also showed the possibility of predicting future AE based on the in complete information pertaining to the geographical location, recent history of AE in the specific region of the country, and relevant socioeconomic infrastructure development data.

Zhao, J [9] et al describes a piezoelectric energy harvester for the parasitic mechanical energy in shoes originated from human motion. The harvester is based on a specially designed sandwich structure with a thin thickness, which makes it readily compatible with a shoe. Besides, consideration is given to both high performance and excellent durability. The harvester provides an average output power of 1 mW during a walk at a frequency of roughly 1 Hz. Furthermore, a direct current (DC) power supply is built through integrating the harvester with a power management circuit. The DC power supply is tested by driving a simulated wireless transmitter, which can be activated once every 2–3 steps with an active period lasting 5 ms and a mean power of 50 mW. This work demonstrates the feasibility of applying piezoelectric energy harvesters to power wearable sensors.

### III. SYSTEM DESIGN AND IMPLEMENTATION

The system self-protection product has in build watch, mobile, and then other necessary devices. But these devices are only for safety alarm and intimate devices. These devices not uses for full self-production. Simply that device makes an alarm call, and message intimation in this system, to demonstrate a podiatric sensing shoe system that is powered completely by the movement of the wearer. Off-the-shelf electronics are used for energy harvesting capability, and to obtain distribution data of foot pressure. The proposed system is also vertically integrated, including not only the hardware, but also the coordinated visualization and database back-end. The system described in this paper combines novel energy harvesting techniques with force-based sensors to deliver an innovative solution to conventional in-lab equipment. The system is designed to be robust, mobile, and fully embedded in the patient's normal routine, allowing for podiatric analysis in a variety of environments. Due to the low-volume and low maintenance features, the device can be targeted for athletes, physical therapy patients, amputees, and those with muscular or nervous system disorders. There is no city or country in the world where women and girls live free of the fear of violence. No leader can claim: this is not happening in my backyard. Now we know that girls' safety is at prior importance in today's world. There is no such system which can provide the safety to girls and therefore the girl cannot move freely.

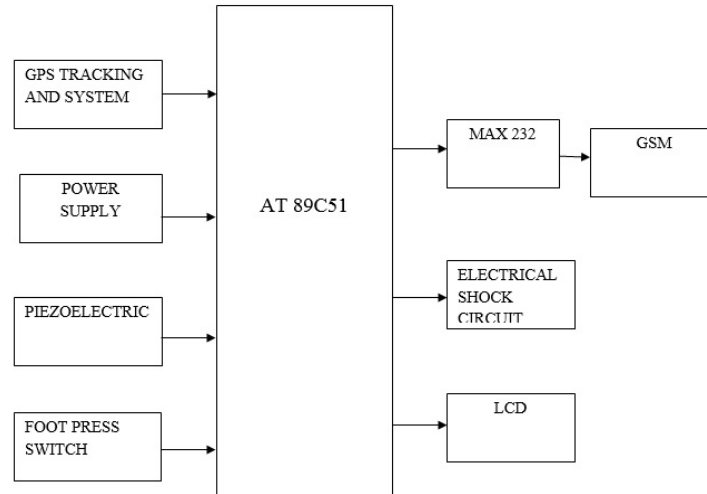


Fig 1 Block Diagram of Proposed Work

In this paper smart personal Security the shocking system with automation & alarm has been used for defense. The pressure sensor and alarming, defensive situation, as well as manual switches contribution has been considered for Communication. Fig 1 shows the overall structure of proposed work. The message will be send to the added data based people at destination for instant help to the user then will have freedom to add choice people's data base number Self-protection shoe At the first sight, the Electric shoe seems to be an (arguably) elegant pair of shoes, but they hide a very "shocking" secret: some amount of volts which the wearer can use in order to stun the possible aggressors. This shoe is used for self-protection and safety. If any problem for person means person just press the shoe that shoe produce a shock voltage. Suddenly that person stun that moment and person ran to anyplace Then again double time press mean send message to 5 person they are parents, police, closure relation, emergency rescue etc

#### A. Power supply

The operation of power supply circuits built using filters, rectifiers, and then voltage regulators. Starting with an ac voltage, a steady dc voltage is obtained by rectifying the ac voltage, then filtering to a dc level, and finally, regulating to obtain a desired fixed dc voltage. The regulation is usually obtained from an IC voltage regulator unit, which takes a dc voltage and provides a somewhat lower dc voltage, which remains the same even if the input dc voltage varies, or the output load connected to the dc voltage changes.

#### B. AT89C51 Microcontroller

AT89C51 is an 8-bit microcontroller and belongs to Atmel's 8051 family. Fig 2 show overall architecture of microcontroller. AT89C51 has 4KB of Flash programmable and erasable read only memory (PEROM) and 128 bytes of RAM. It can be erased and program to a maximum of 1000 times. In 40 pin AT89C51, there are four ports designated as P1, P2, P3 and P0. All these ports are 8-bit bi-directional ports.

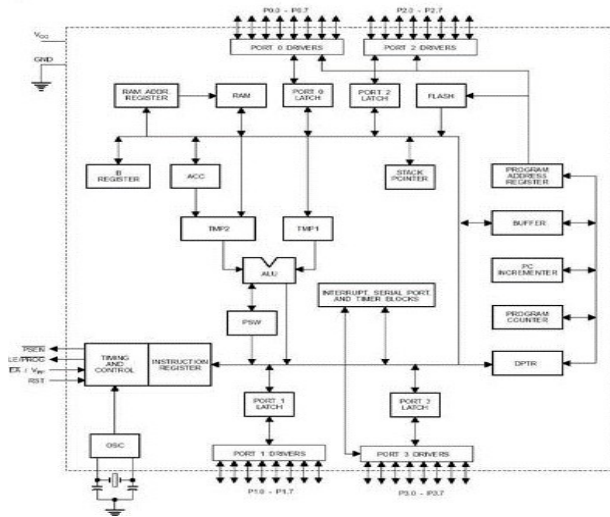


Fig 2 Architecture of ATME89C51

### C. Piezoelectricity

Piezoelectricity means electricity resulting from pressure. Fig 3 shows the clear working principles of piezo electric transducer. The piezoelectric effect is understood as the linear electromechanical interaction between the mechanical and the electrical state in crystalline materials with no inversion symmetry.

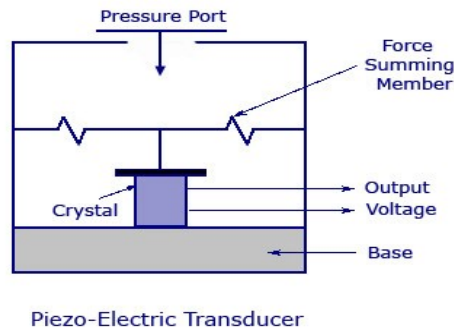


Fig 3 Piezo Electric Transducer

### D. GSM

GSM refers to second-generation wireless telecommunications standard for digital cellular services. First deployed in Europe, it is based on TDMA (Time Division Multiple Access) technology. GSM uses three frequency bands: 900 MHz, 1800 MHz and 1900 MHz. Dual-band phones operate on two out of three of these frequencies, while tri-band phones operate on all three frequencies. GSM (Global System for Mobile Communications, originally Groupe Spécial Mobile), It is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones. This was expanded over time to include data communications, first by circuit switched transport, then packet data transport via GPRS (General Packet Radio Services) and EDGE (Enhanced Data rates for GSM

Evolution or EGPRS). Further improvements were made when the 3GPP developed third generation (3G) UMTS standards followed by fourth generation (4G) LTE Advanced standards. "GSM" is a trademark owned by the GSM Association.

#### *E. GPS*

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 time, the message was transmitted to satellite position at time of message transmission Although four satellites are required for normal operation, fewer apply in special cases. If one variable is already known, a receiver can determine its position using only three satellites.

#### *F. MAX 232:*

The MAX232 is an integrated circuit, first created by Maxim Integrated Products, that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The newer MAX3232 is also backwards compatible, but operates at a broader voltage range, from 3 to 5.5 V.

#### *G. LCD*

A liquid crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. The LCD screen is more energy efficient and can be disposed of more safely than a CRT. Quartz has the further advantage that its elastic constants and its size change in such a way that the frequency dependence on temperature can be very low. The specific characteristics will depend on the mode of vibration and the angle at which the quartz is cut (relative to its crystallographic axes) Therefore, the resonant frequency of the plate, which depends on its size, will not change much, either. This means that a quartz clock, filter or oscillator will remain accurate.

#### *H. Embedded Systems Programming*

Embedded systems programming is different from developing applications on a desktop computers. Key characteristics of an embedded system, when compared to PCs, are as follows: Embedded devices have resource constraints (limited ROM, limited RAM, limited stack space, less processing power)

Components used in embedded system and PCs are different; embedded systems typically uses smaller, less power consuming components. Embedded systems are more tied to the hardware.

Two salient features of Embedded Programming are code speed and code size. Code speed is governed by the processing power, timing constraints, whereas code size is governed by available program memory and use of programming language. Goal of embedded system programming is to get maximum features in minimum space and minimum time. Embedded systems are programmed using different type of languages:

- Machine Code
- Low level language, i.e., assembly
- High level language like C, C++, Java, Ada, etc.

- Application level language like Visual Basic, scripts, Access, etc.
- Use of C in embedded systems is driven by following advantages
- It is simpler to learn, understand, program and debug.
- C Compilers are available in all embedded devices and there is a large pool of experienced C programmers.

Unlike assembly, C has advantage of processor-independence and is not specific to any particular microprocessor/ microcontroller or any system. This makes it convenient for a user to develop programs that can run on most of the systems. As C combines functionality of assembly language and features of high level languages, C is treated as a ‘middle-level computer language’ or ‘high level assembly language’ It is fairly efficient. It supports access to I/O and provides ease of management of large embedded projects.

#### IV. EXPERIMENTAL RESULT

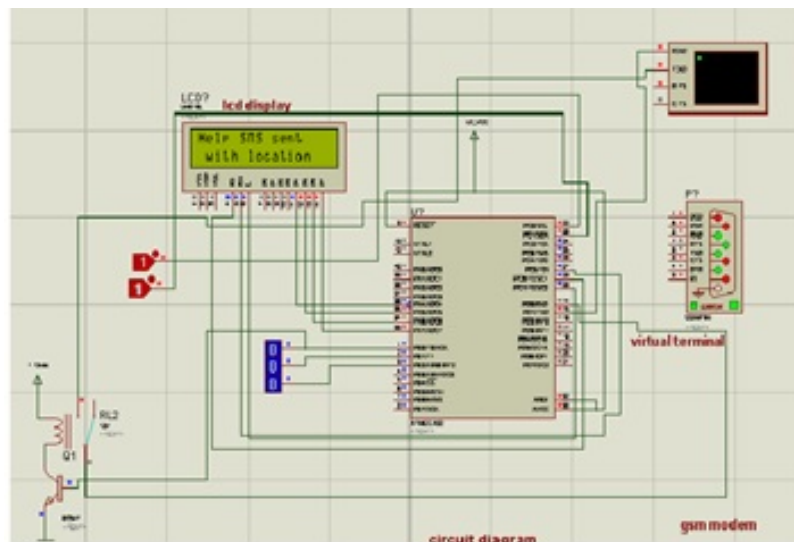


Fig 4 Circuit diagram of Proposed Work

Fig 4 shows simulation result, first the buzzer indicates shocking system, second buzzer indicates the message which send to the respected people that we have stored previously, third buzzer indicates the sharing of location. They are programed by c language and dump into the microcontroller, whereas port 2 is connected to the 16x2 LCD display to know which function is running. Input like analog signal is connected to the panic switch i.e. Buzzer. GSM is used in the virtual terminal. Virtual terminal is used for sending the message alert by the changes of 0 to 1, though which we can know the information in sending. Both the GSM and virtual terminal have TX and RX controller. They are connected to both the process as vice versa i.e. GSM's TX is connected to the virtual terminal's RX and virtual terminal's TX is connected to GSM's RX, so that only the information is transferred to virtual terminal. Then the output is viewed by the virtual terminal.



## V. CONCLUSION

Supportive device with smart system has been used to cover self-attack. There are highest chances to reduce the crimes by this system. Shock preventive tools are used for anticipation of event, alarm bell hint with the help of this security system. Message through GPS & GSM technology is used to help the individual, for immediate action against the lawbreaker, in prospect acceptable process video information can be used. Fear or anger of women has to be considered by using Camera application in future which will generate the message to the control room and an alarm will activate. The system can perform the real time monitoring of desired area and detect the violence with a good accuracy. Facial expression is one of the most realistic and immediate means for human beings to communicate their Emotions and intentions in future by using the MATLAB application, can be considered for video information. The various facial behaviors and motions can be parameterized based on muscle actions. Multistate facial component have been developed to spot & track changes in facial reading. Those who are in unapproachable area for their defense against scandalous, atmospheric problems like earthquake, flood troubles, deep rainy spell and deep fog spell etc. Refuge system is the Supportive tool.

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