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A Novel Approach for Women Security with Information Fusion for Multi-Sensory Data

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Abstract

In the modern world; technology is the asset of the development. There is demand of automation in every sector. Such type of autonomous applications requires inputs from multiple sensory resources and based on these inputs it processes and deliver intelligent decision i.e. output. The method used in proposed system focuses on collection of sensory information and few concluding parameters derivations from data which will help to decide taking best decisions for autonomous applications. Drawing conclusion based on only one aspect is not effective as compared to conclusions taken from many other heterogeneous sensors parameters. This system fulfills parameters such as accuracy, less request time and response time, performance, reliability etc. This paper explains safe and secure system which uses unsupervised algorithm that works on real time data and mixes the information from various resources. The main interest is by taking intelligent decision based on reduction of unreliability and disordered sensory data.Women being a major victim in today's world with their entry in almost each field their safety is a priority and with our concept and algorithm we have illustrated it as a system for sensory fusion with GPS enabled double security feature which will help a women when she feels insecure or harassed or in a difficult situation.System has smart feature to ensure complete safety of women even in dangerous situation where she cannot turn on the trigger. The system comprises of ATmega328P microcontroller, GPS, LCD display, fingerprint module, GPS, GSM etc. for proper and accurate working of the system to provide reliable, accurate and quickservice which efficiently work for safety of women.

Keywords- Information fusion, Autonomous applications, Sensors, Unsupervised algorithms, security, sensory fusion, Heterogeneous resources, microcontroller, GPS, GSM, Fingerprint module.

I. Introduction

The technology that uses various sources such as heterogeneous and homogeneous to take input and then it collectively mixes this data to derive any intelligent decision is known as Information fusion [17].Collection, aggregation, separation of information and creation of conclusive outcome these are the important phases considered in the implementation process.

Women Safety is still a serious issue all over the India. As the country is developing; in spite of decreasing cases of rapes, assaults these numbers are increasing. We proposed a system having GPS with the main feature of dual security that is manual and automatic approach to help in this serious matter. Manually woman can turn on the system when she feels unsafe or in any difficult situation. In automatic mode woman has to touch the scanner again and again after specific interval of time so that in case when she is not in that phase to switch on the system then after previous sensor touch it waits for 1 minute and then buzzer gets on and sends panic message to registered emergency contacts.

The further chapters in this paper are organized as section II Background and Motivation, section III is Methodology, section IV is Algorithm, section V is Proposed system architecture, section VI is Result and section VII is conclusion.

II. Background and Motivation

Objectives of proposed system are related to sensor fusion and women security as an application. Working of human brain is very interesting. To carry inputs and outputs to and from brain nervous system helps. This human system motivates because of their capacity to make proper decisions based on inputs in the form of hearing, taste, vision, touch and smell as sensory information with extraordinary capacity of sensing.

Rape cases are increasing in India. Women are facing lot of trouble in their day to day life. Numbers of reported cases in India are devastating. To provide women security is very important as these numbers are increasing day by day. Fig. [1] Portrays the quantity of reported assault cases in India (2010-2018) [18][19].

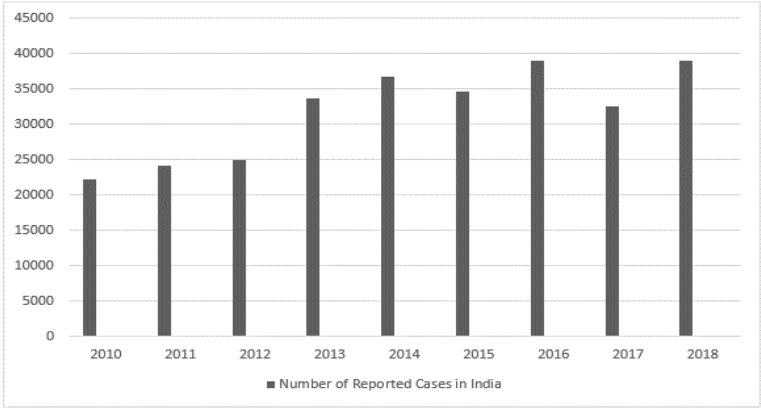


Fig. [1] The quantity of reported assault cases in India (2010-2018)

III. Methodology

The system's approach is passive so it is must to opt methodology which will generate trigger itself without user intervention. Microcontrollers are good for this task. After definite period of time microcontroller read user's fingerprint. If because of any suspicious event the user unable to scan the finger then system sense some danger because of absence of fingerprint. Microcontroller considers this as an alert and generates the trigger.

To fulfilling the security criteria and to serve guaranteed only creating trigger was not enough. So this framework proposes the triple security feature:

1. **Danger alert message to recipient no. :**

Whenever the user is in danger the endangered alert message is sent to the saved emergency contacts. And to be on more safe side if the emergency contact is not registered the last called number from the call log of the user is considered as the emergency contact.

2. **Real time location reading :**

Actually where is the user facing danger this real time location is read by the system and then sent to the registered recipient no. and as well as to the nearby police station.

3. **Buzzer:**

Buzzer creates noise and it attracts nearby people'sattention so itplays major role too in this framework.

IV. Algorithm

1. Registering by finger user creates login.
2. Turn on the feature when user feels danger. Microcontroller gets connected to the GSM module when this feature starts.
3. Scan the finger after definite interval of time (time span is editable for user) is must by the user after the feature starts.
4. Whenever the user unable to scan the finger then trigger gets generated.
5. Buzzer gets activate and endangered message is sent to the recipient no and police.
6. With the help of GPS antenna detection of exact location i.e. longitude and latitude is done and in the form of Google maps URL that detected location is sent to the recipient number.

Scenario 1

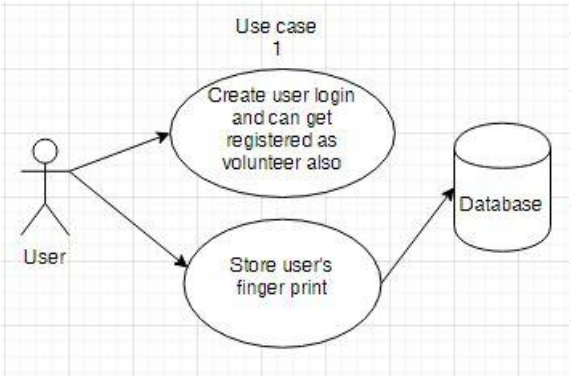


Fig. [2] Use Case 1

Scenario 2

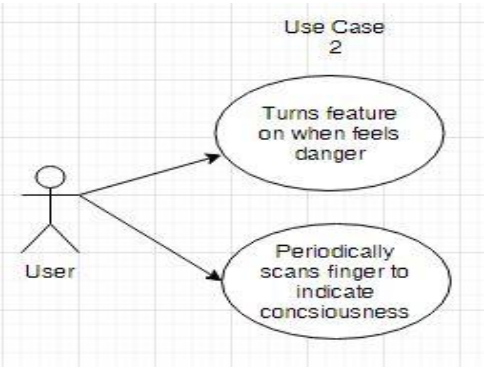
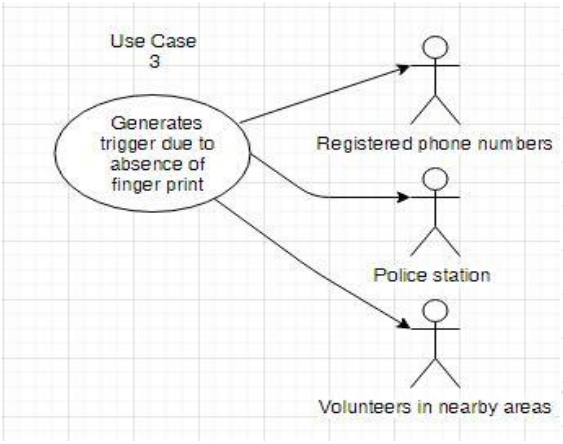


Fig. [3] Use Case 2

Scenario 3



Scenario 4

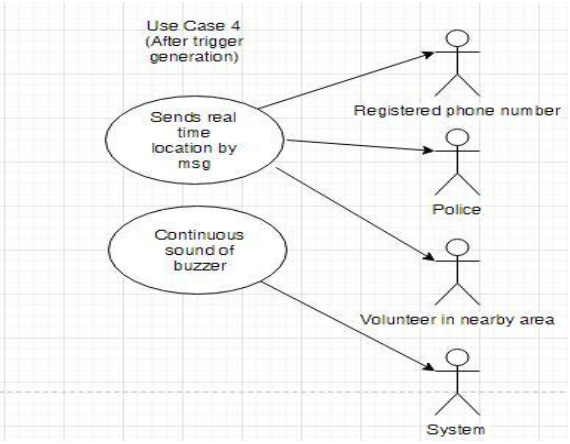


Fig. [4] Use Case 3Fig. [5] Use Case 4

V. Proposed System Architecture

When system takes input from sensory resources which is in the form of raw data the major hurdle is to convert the received input into proper knowledge and information. It can help the decision maker to take intelligent decision in sufficient time span. The proposed system architecture depicted in fig. 6 shows the various phases through which the system gives the final decision; taking sensory data as an input and using unsupervised learning approach. Fig. 7 shows block diagram of women security application.

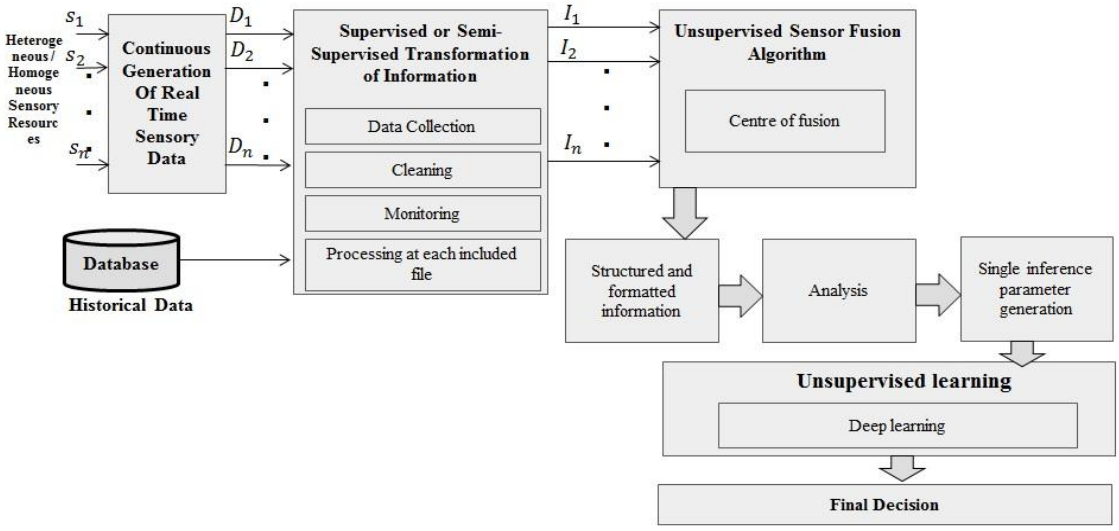


Fig. [6] Proposed system architecture

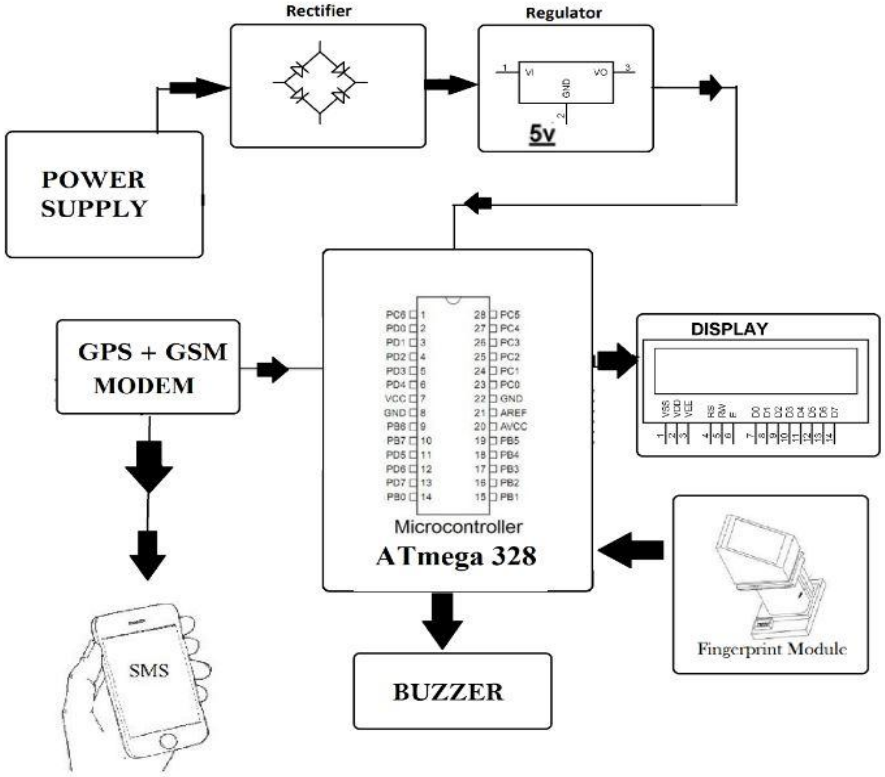


Fig. [7] Block diagram of Application

Description of each block

1. Power Supply: Conversion of electric current to accurate voltage, frequency and current is the main function of power supply. These are basically known as power converters also.

2. Microcontroller: With the Read Write feature it has 32KB flash memory. It is basically 8 bit AVR RISC- based microcontroller which is high in performance [4]. 2KB SRAM, 1KB EEPROM, 23 I/O line, SPI serial port etc.
3. LCD Display: An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16×2 /20x4 LCD display is a very basic module commonly used in DIYs and circuits [20]. Pixel matrix technique is there in LCD display. It uses command register to store the controlling measures such as clearing its display, placing the cursor position, controlling screen etc. The data register stores the data to be displayed on the LCD. The information is the ASCII value of this character to be shown on the LCD [20][4].
4. Buzzer: Buzzer is use to generate audio signal. This may be electromechanical or mechanical. In timers, alarms buzzers are used. Works after giving input to it.
5. Fingerprint Module: It is an optical finger print sensor which consist of a powerful AS601 DSP (digital signal processor) chip. The DSP chip does all the image rendering, calculation, feature finding and searching for the sensor [20]. The DSP chip also works as the form of storage device which can store up 120 fingerprints on its flash memory. The chip also has a TTL serial out in order to connect with a microcontroller or any other system.

VI. Result

1. Women's Security system which has double type alert generation mechanism with buzzer and sends panic message to registered emergency contacts when in danger.

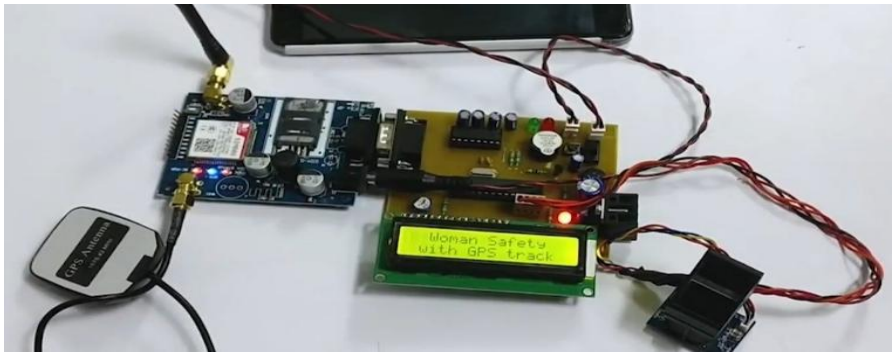


Fig. [8] Prototype of Women Security System with GPS

2. While connecting GSM.

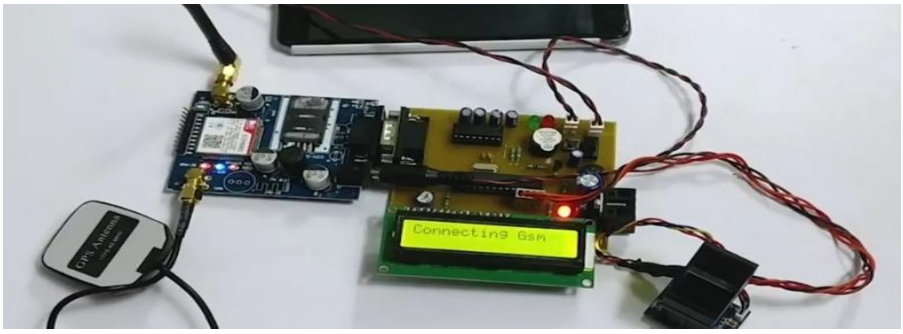


Fig. [9] ConnectingGSM

3. Confirmation of GSM connection

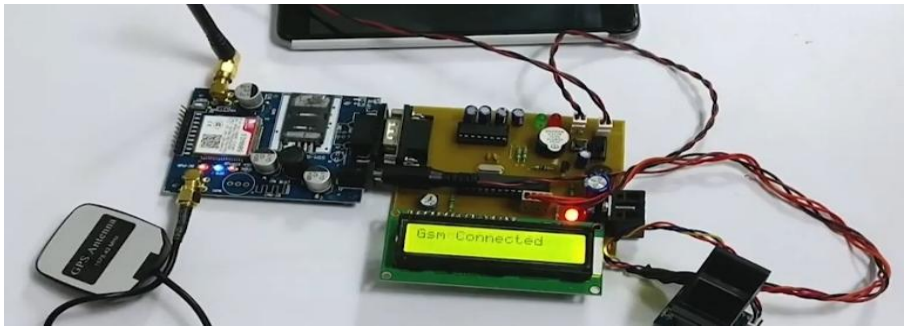


Fig. [10] Confirmed GSM

4. Call initialization request by the system

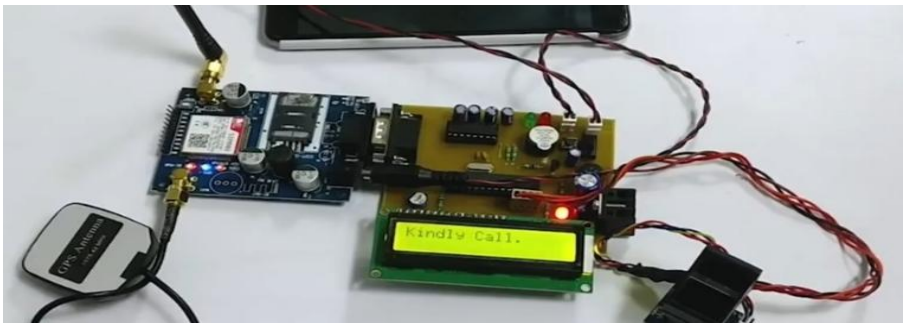


Fig. [11] System's Call request

5. Calling system to configure a mobile number of friends or family for help in case of emergency.

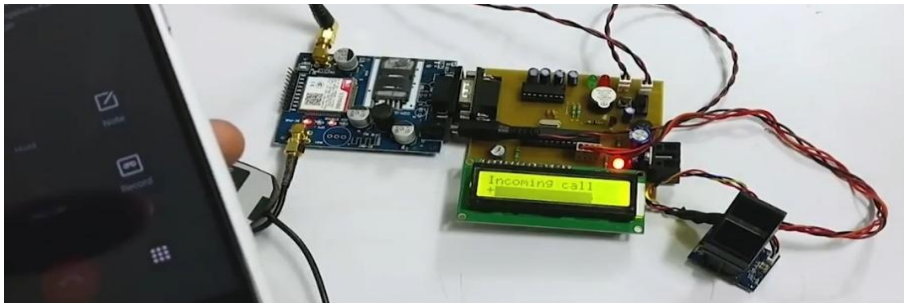


Fig. [12] Call for registering number

6. One time registration for fingerprint of the user.

Fig. [13] Fingerprint registration

7. Confirmation of user registration.

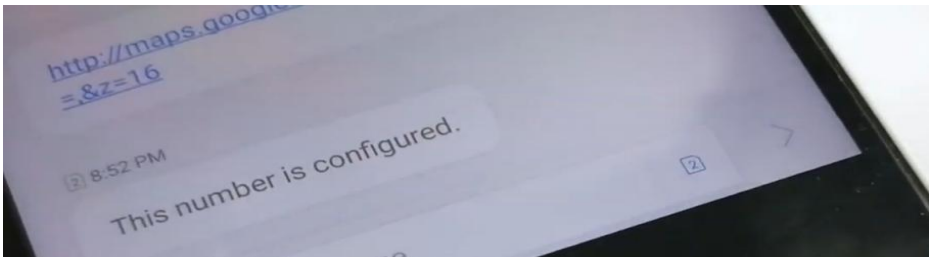


Fig. [14] Confirmed registration

8. Monitoring mode begins. System recognizes lifting of finger & placement of unrecognized finger.

Fig. [15] Monitoring mode

9. In case of prolonged absence of finger on the sensor, system considers it as an emergency situation.

Fig. [16] Tracking mode

10. During emergency situation, this system sends precise GPS location to family or friends, so necessary actions can be taken

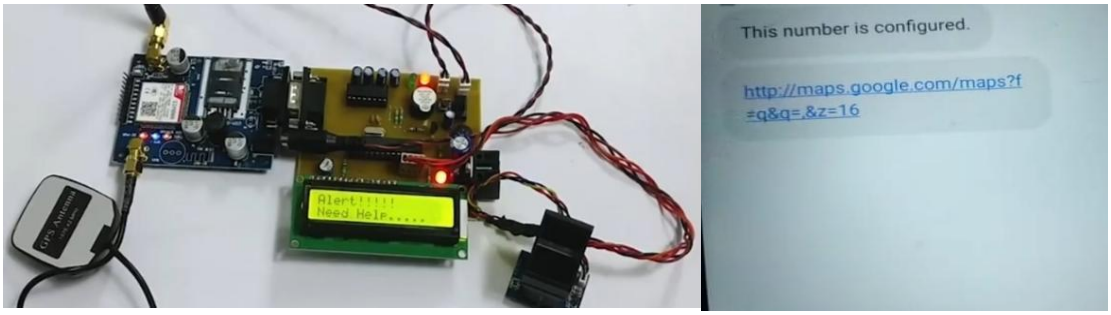


Fig. [17] Emergency message with GPS Location received by emergency contact

VII. Conclusion

This paper presents the security solution for women in difficult situations. As previously studied existing system faces false alert generation problem and it takes time to evaluate every sensor data to generate output which makes it worrisome to get help in proper time; on contrary our low cost system overcomes this problem using dual security feature with efficiency in prompt and quick request-response mechanism which is achieved using machine learning and information fusion technique. A further study on utilizing investigation on data to find close by police headquarters and volunteers in close proximity is possible using deep learning techniques.

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