International Journal of
Emerging Research in Management &Technology
ISSN: 2278-9359 (Volume-5, Issue-8)

Research Article | **August 2016**

Handheld Electronic Protection System H.EL.P

Anurag Roy, Ashin Guha Majumder, Rana Biswas, Surajit Das, Suvasish Dasgupta
Department of Computer Science, St Xavier's College,
Kolkata, India

Abstract—

Incidents of grievous crimes feature in the daily news of India. Being a rapidly developing country, India has an increasing number of cities. It is, however, overlooked that crimes occur more frequently in cities than in villages. Several incidents of rape, molestation, physical assault, battery and robbery have put women (mostly) in India in an insecure position. Astonishingly enough, these criminal incidents have often occurred when the victim was near his/her own house and family or a police station. Hence, the idea of H.EL.P(Handheld Electronic Protection System) was born, which is a portable device that can send a text message to the nearest police station or family or whenever the wearer chooses to do so, in a situation of high risk or distress right from his/her wrist. H.EL.P. was designed with the intention to find assistance in such cases. However, another section of human population that could use this device is the physically challenged and the old. Older people can face accidents or lose their way outside their home. Similarly, physically challenged people could use the device when met with an accident too. The idea is to inform close family members, friends and the police of the trouble which could be faced as quickly as possible using the help band which can be worn on the wrist / on the watch and hence be very easily accessible at the time of danger.

Keywords— Crime, crime prevention, portable device, women, physically challenged, text message, accident, wearable device, Arduino Uno, transceiver, GSM SIM300

I. INTRODUCTION

India is a rapidly developing country and its number of cities is increasing every day. Crimes, especially those against women, feature in the daily news in India. Most of these grievous crimes are more frequent in cities than in villages. Women are at the highest risk in India. Sexual crimes against women are on the rise. The National Crime Records Bureau of India [1] has revealed that crime against women has increased 6.4% during 2012, and a crime against a woman is committed every three minutes. In 2012, 244,270 criminal incidents against women were officially reported, while in 2011, there were 228,650 such reported incidents. The number of rapes that are being reported every day has also risen. It is also estimated that nearly one in three rape victims in India is under the age of 18 and that one in ten is under 14. Official statistics speculate that a woman in India is raped nearly every twenty minutes.

However, many of such criminal incidents also occur when the victim is near his/her own house and family or a police station. H.E.L.P. was designed with the intention to find assistance in such cases. The idea is to essentially develop a wearable device [2] whose primary function is communication, like a cellular phone [3]. Indeed, it has to be portable so that any wearer can use it. The task is to design a cellular phone that can **receive a physical signal from the wearer (i.e. the press of a button)** and send an **already saved text message** to one or many **predetermined recipients**.

II. SYSTEM COMPONENTS

Handheld Electronic Protection System is an electronic device. It has various components to make it perform its communicative functions efficiently. Before delving into the design of H.EL.P, it is imperative to discuss two of its most important components of this device. They are:

- ***Arduino Uno:*** The Arduino Uno [4] [FIGURE A] is an Atmega328P – based microcontroller [5]. 'Uno' means 'one' in Italian and Arduino 'Uno' marked the release of Arduino Software (IDE) [6] 1.0. The Uno board and the first version of Arduino Software (IDE) were the reference versions of Arduino that have now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and is a reference model for the Arduino platform. Uno has 14 digital input/output pins (of which six can be used as PWM outputs), a 16 MHz quartz crystal, 6 analog inputs, a power jack, a USB connection, an ICSP header and a reset button.

Figure A : ARDUINO UNO

- ***GSM SIM300:*** SIM300 [FIGURE B] [7] was designed and released for the global market as a tri-band GSM/GPRS engine that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz. It supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4 and provides GPRS multi-slot class 10 capabilities and.

SIM300 has a tiny configuration of 40 mm x 33 mm x 2.85 mm, which makes it fit almost all the space requirement in an electronic application such as smart phone, PDA phone or other mobile devices.

Figure B : GSM SIM300

III. WORKING PRINCIPLE

The SIM300 has the function of sending a text message to some pre-assigned phone numbers. However, the SIM300 is not capable of sending a message all by itself. This is the reason Arduino Uno is used. The Uno can be programmed (using the Arduino IDE) to send a definite text message to one or more cell phone numbers. The body of the text message and the phone numbers of the recipient(s) are parameters that can be included in the body of the program that is uploaded to the Uno.

The Arduino Uno, being a microcontroller, has enough storage to store at least one functional program. Hence, the program can be uploaded to the Uno so that the program can run from Uno every time. Besides, the Uno also does the job of triggering the SIM300 to send the text message.

The device is wireless, which makes it portable or easy to carry around. The idea is to create a wearable device. However, the Uno and the SIM300 deny that possibility. That is the sole reason why we decided to include a transmitter-receiver module in the whole setup. An RF Module (434 MHz) [FIGURE C] served the purpose. It was used to establish a wireless link from the first physical trigger used by the wearer to the Uno.

Figure C : RF Transceiver Module

The RF transceiver [8] module is used for high-speed data transmission. The microelectronic circuit in the digital RF architecture is capable of working at a maximum speed of 100 GHz. However, the RF module is effective in transmitting and receiving only digital signals. Analog signals would not work in this case. Thus, this necessitates the utilization of a set of digital encoder and decoder.

The HT 12E Encoder ICs [9] [FIGURE D] and HT 12D Decoder ICs [9] [FIGURE D] are a series of CMOS LSI chips, usually used for system applications that are 'Remote-Controlled'. They are capable of encoding 12 bits of information (8 address bits and 4 data bits). Each address and data input is externally programmable or is entered with the help of switches. These ICs are paired with each other. For proper operation of an RF module a pair of encoder & decoder with the same number of address and data bit formats should be selected (HT 12E is paired with HT 12D for this reason). The Decoder receives the serial address and data, transmitted by a carrier using an RF transmission medium, and produces output to the output pins after processing the data.

Figure D : HT 12E & HT 12D

IV. CIRCUIT DIAGRAM

The aim of the circuit diagrams is to help the reader better understand the working of the device [FIGURE E] and the connections between the various components. In addition, the diagrams make it easier to reproduce the device, given the components are available.

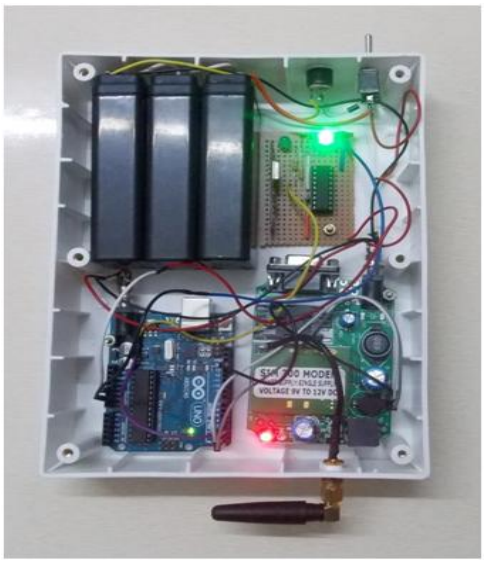

Figure E : Internal Circuit of H.EL.P

The key given below is a reference to the circuit diagrams that follows:

1 A: This is a figure showing the connections between the 12-bit Encoder IC and the digital transmitter
1 B: This shows the connections between the 12-bit Decoder and the digital receiver
1 C: The links between Arduino UNO and GSM SIM300, the two primary hardware components, are shown here.
1 D: The bulk of the device, i.e., the parts that are not wearable.

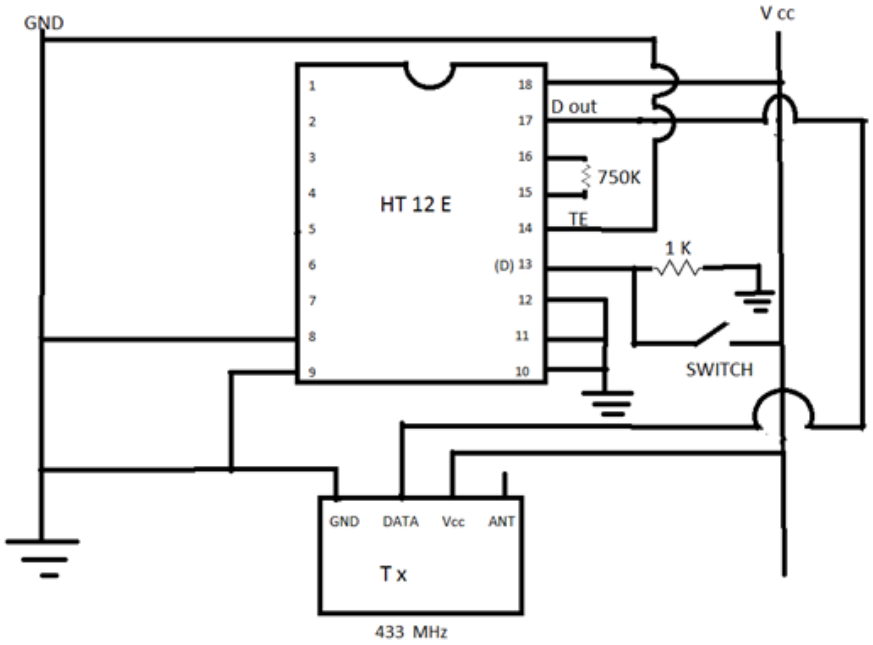

Fig 1 A

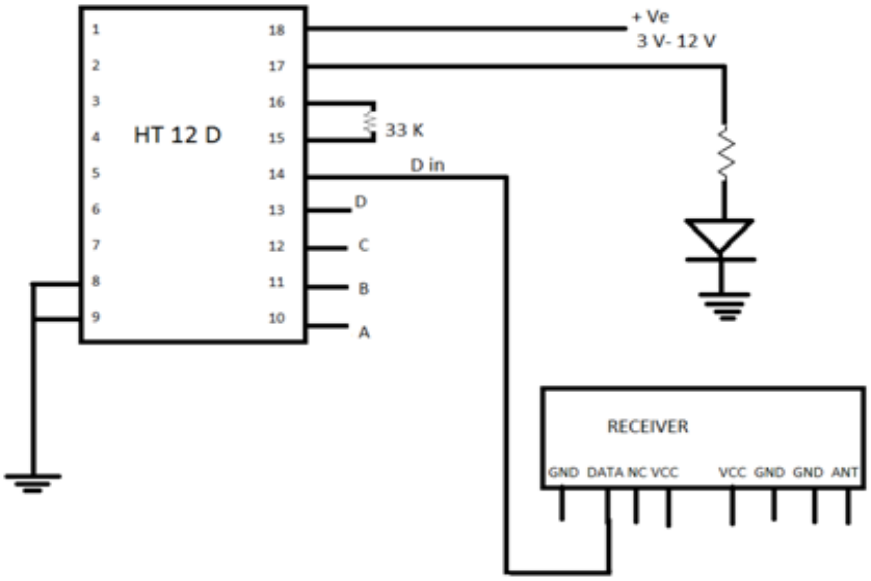

Fig 1 B

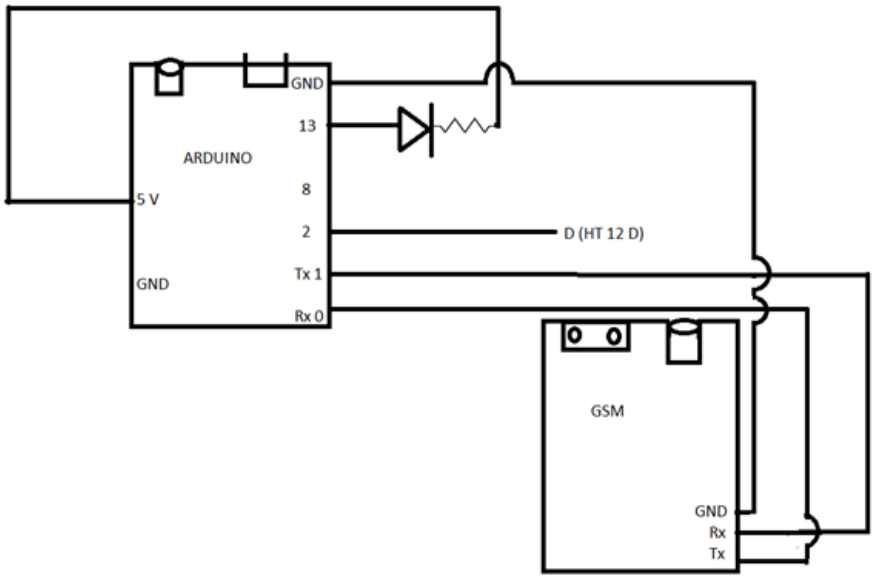

Fig 1 C

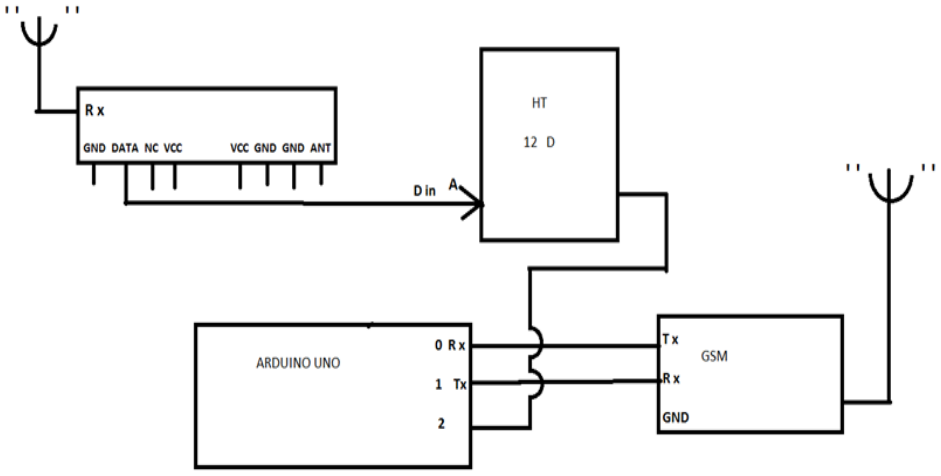

Fig 1 D

V. SYSTEM IMPLEMENTATION

A. Algorithm:

Given below is the algorithm that forms the basis of the program uploaded to the Arduino Uno microcontroller.

Step 1: start
Step 2: declare variables buttonpin(constant),buttonState,buttonPushCounter.
Step 3: initialize variables
Buttonpin <- 2
buttonState <- LOW
buttonPushCounter <- 0
Step 4:
a) initialize the pushbutton pin as an input
b) check if GSM module is working
c) set the SMS mode to text
Step 5: read the state of the pushbutton value.
Step 6: check if the pushbutton is pressed.
Step 7:
If buttonState = HIGH
buttonPushCounter <- buttonPushCounter + 1.
If buttonPushCounter%2 = 0
Send sms to the specified number
Step 8: go to step 4

B. Source Code:
The source code, written in C [10], was uploaded to the Uno microcontroller with the help of the Arduino IDE.

```
// constants won't change. They are used here to
// set pin numbers:
const int buttonPin = 2;     // the number of the pushbutton pin
// variables will change:
int buttonState =LOW;
int buttonPushCounter = 0;// variable for reading the pushbutton status

void setup() {
 // initialize the pushbutton pin as an input:
  pinMode(buttonPin, INPUT);
  Serial.begin(9600); // the GPRS baud rate
  delay(2500);
  Serial.println("AT"); //To check if GSM module is working
  delay(2000);
  Serial.println("AT+CMGF=1"); // set the SMS mode to text
  delay(1500);
}

void loop() {
  // read the state of the pushbutton value:
  buttonState = digitalRead(buttonPin);

  // check if the pushbutton is pressed.
  // if it is, the buttonState is HIGH:
  if (buttonState == HIGH) {
     delay(2000);
      buttonPushCounter++;
      Serial.println(buttonPushCounter);
      delay(50);
     if (buttonPushCounter % 2 == 0){
 delay(1500);
  Serial.println("AT+CMGS=\"+91xxxxxxxxxx\"");
   delay(1500);
  Serial.println("Hi! This is test message from H.E.L.P team by Surajit,Anurag,Suvasish,Ashin.CS 2nd Year,SXC");
  delay(1500);
  Serial.write(26); //Ascii code of ctrl+z to send the message*/
  buttonState=LOW;

  //while(1);
  }
  }
  else {
```



```
  delay(500);
 }

}
```

VI. CONCLUSION

H.EL.P is a device dedicated to the aid of human beings in distress. The first design of H.EL.P is simple in design and has a lot of advantages, such as wearability [FIGURE F], simple and easy-to-use technology and ease of use. Unlike other safety apps already available, H.EL.P takes only a little time to operate and the alerts can be sent much more quickly.

Moreover, the components of H.EL.P are easily available in the market. One can easily find the parts used for assembling H.EL.P in the market. With respect to the objective achieved, it is very economic to manufacture and can be easily made available to public.

Figure F : The Wearable 'Band' in H.EL.P

The initial design of H.E.L.P. can be improved in many ways. Firstly, the bulk of the design containing the Uno microcontroller and SIM300 can be reduced to make it portable. It is not always physically viable to carry that when going outside. Hence, we plan to use GPS (Global Positioning System) [11] instead of a SIM card and build the whole circuit using VLSI [12] design techniques to make the whole circuit as small as possible.

REFERENCES

[1] "Crimes Against Women" (PDF) ncrb.gov.in. National Crime Records Bureau 2013.
[2] MagIC System: a New Textile-Based Wearable Device for Biological Signal Monitoring. Applicability in Daily Life and Clinical Setting- M. Di Rienzo, F Rizzo, G Parati, G Brambilla. 2005 IEEE Engineering in Medicine and Biology 27th Annual Conference. ISSN: 1094-687X. Print ISBN: 0-7803-8741-4
[3] "Cellular phone" United States Patent D503699. Inventors: Lee, Min-hyouk (Suwon-Si, KR), Ahn, Chi-young (Seoul, KR) , Hwang, Chang-hwan (Goyang-Si, KR). Publication Date: 04/05/2005
[4] "Arduino: A low-cost multipurpose lab equipment"- D'Ausilio, A. Behav Res (2012) 44: 305. doi:10.3758/s13428-011-0163-z
[5] "Microcontroller Technology: The 68HC11" . Author: Peter Spasov. Prentice-Hall, Inc. Upper Saddle River, NJ, USA ©1998. ISBN: 0139012400 .
[6] "Arduino". Pragmatic Bookshelf ©2011. ISBN: 9781934356661. Author: Maik Schimdt
[7] http://www.engineersgarage.com/contribution/how-to-interfaceGSM-SIM-300-modem-with-atmega32-to-send-and-receive-SMS
[8] "Radio transmitter/receiver for digital and analog communications system". Publication Number: US4355401 A. Inventors: Masao Ikoma, Noboru Saegusa, Yoshihiko Akaiwa, Ichirou Takase
[9] "Wireless appliance control system"- Rahmat Sanudin, Yoo Tuck Mun, Wan Suhaimizan Wan Zaki, Mofd Helmy Abd Wahab. Innovative Technologies in Intelligent Systems and Industrial Applications, 2009. CITISIA 2009. Print ISBN: 978-1-4244-2886-1
[10] "The C Programming Language"- Kernighan, Brian W; Ritchie, Dennis M.
[11] "Understanding GPS: Principles and Applications"- Elliott Kaplan, Christopher Hegarty
[12] "Principles Of CMOS VLSI Design A Systems Perspective"- Neil H E Weste, Kamran Eshraghian.

