

## SMART BELT – WOMEN SAFETY WEARABLE DEVICE

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**Abstract:** Violence against women is one of the biggest problem of human society. This paper addresses the concern of women safety with the help of technology. We have built a safety device, which is beneficial not just women but for anyone and at any time or place. The device has been suitably named as "Smart Belt". The device has integration of GPS and GSM Technologies. Anyone who is facing any danger and needs help can do so by press of a button to report his location to the trusted contact list, which can be added to the device and modified as per the client needs. The smart belt can be used as a normal belt or hidden inside the clothing just like any other wearable device. As soon as the user smells any kind of danger, he can report his present location and the defined message with a push of a button. Price has been kept at a very affordable rate for use in his or her daily life. The device is targeted to anyone who is not in need of a portable safety device with a price making it suitable for mass adoption.

**Keywords:** Safety System, GPS, GSM, Embedded System.

**Introduction:** The device, named as "Smart Belt" is a security system specially designed for women in distress. It is a simple and easy to carry device with magnanimous functionality. The basic approach is to intimate instant location and a distress message to the security services and registered numbers, so that unfortunate incidents would be averted and to provide real time evidence for swift action against the perpetrators of crime against women. It can play a major role in the upcoming projects such as crime and criminal tracking network and system in which all the police records all over India are digitized and all the police station throughout the country will be integrated. This paper presents a concept, which can be commercially produced and mass adopted to enhance the security of women who are regularly faced with these situations. Not just women, elders and children can also make use of this device to stay protected and keep their trusted contacts informed of their locations.

### Existing problem:

- Crimes against women are constantly rising higher, every day there is a big percentage of news section dedicated to this problem.
- Women are regularly faced with such dangers and they have to go through the ordeal of constantly protecting themselves.
- We talk about providing equal rights to women and their empowerment in a country, where they do not actually feel safe after stepping out of their homes.

The belt has a brain in the form of microprocessor Arduino Uno board which is connected to a GPS module to provide position of the women in distress and a GSM SIM 900A module, which provides communication functionality. The Belt comes with a Distress push button, which can be pressed at any given time to record the exact location of the belt and send it to recorded mobile numbers along with a recorded text message.

**System design and implementation blocks description:** The GSM and GPS module included in the project act as a medium of gathering information, while the onboard brain in the form of Arduino Board processes the information and acts as per the instructions.



**Fig: Block Diagram of the Smart Belt Device**

*Solution to the problem:* SMART Belt is a device, which is designed to be cost-efficient in terms of mass production. The device is a wear on device for women for any time.

**About arduino board:** Arduino/Genuino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

*Easy to Use Factors:*

- An open source design – Easy to Debug Projects
- An easy USB interface.
- Very convenient power management and built-in voltage regulation
- An easy-to-find, microcontroller "brain"
- A 16mhz clock. – Fast Enough to serve purpose
- 32 KB of flash memory for storing your code.

- 13 digital pins and 6 analogpins.
- An on-boardLED
- A button to reset the program on thechip.

A. GPS MODULE CODE -

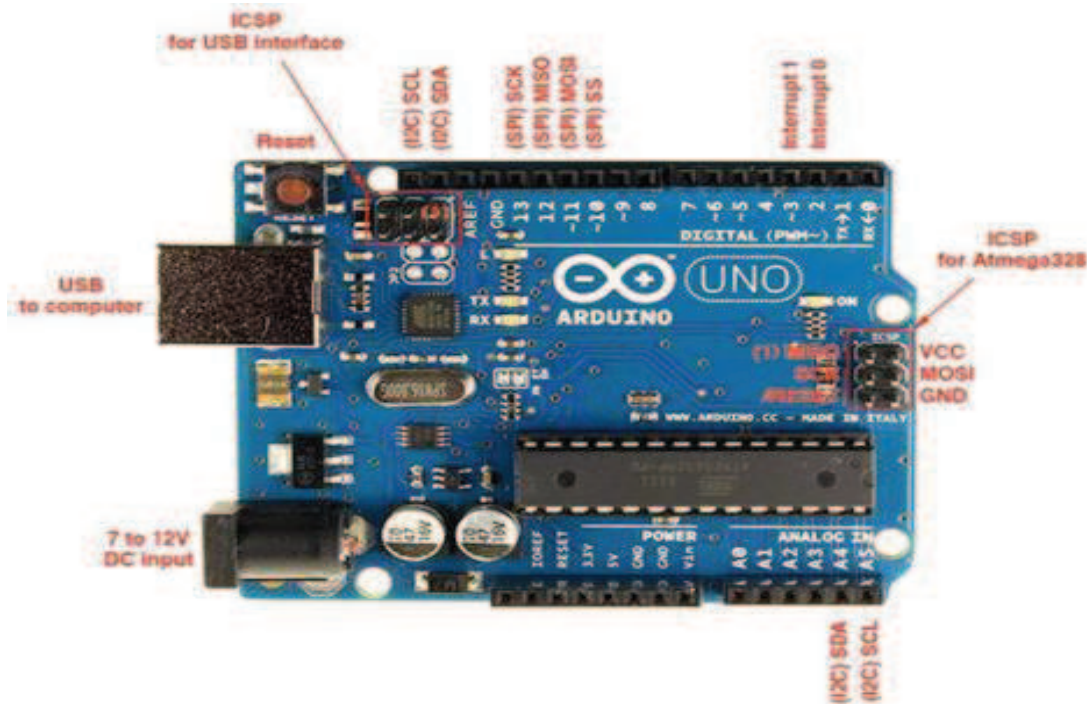


Fig2: Arduino PinDiagram

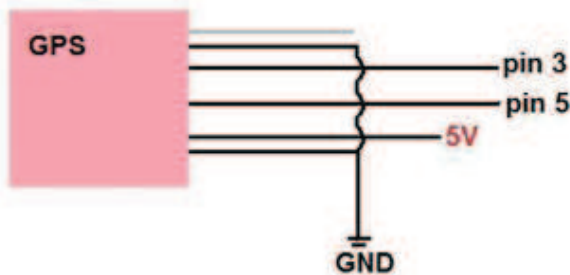


Fig3 - GPS connection diagram

**GPS MODULE - NEO-6M-0001** : The NEO-6 module series brings the high performance of the u-blox6 position engine to the miniature NEO form factor. u-blox6 has been designed with low power consumption and low costs in mind. Intelligent power management is a breakthrough for low-power applications.

These receivers combine a high level of integration capability with flexible connectivity options in a small package. This makes them perfectly suited for mass-market end products with strict size and cost requirements. The DDC interface provides connectivity and enables synergies with u-blox LEON and LISA wireless modules.

- UART, USB, DDC (I2 C compliant) and SPIinterfaces
- Available in Crystal and TCXOversions
- Onboard RTC crystal for faster warm and

```

hotstarts
• 1.8 V and 3.0 Vvariants
// Check GPS and returns string if full line
recorded, else false
String checkGPS()
{
if (serialGPS.available())
{
char c = serialGPS.read(); if (c != '\n' && c != '\r')
{
stringGPS = c;
}
}
else
{
if (stringGPS != "")
{
String tmp = stringGPS; stringGPS = "";
returntmp;
}
}
}
return false;
}
GPS Interfacing -
    
```

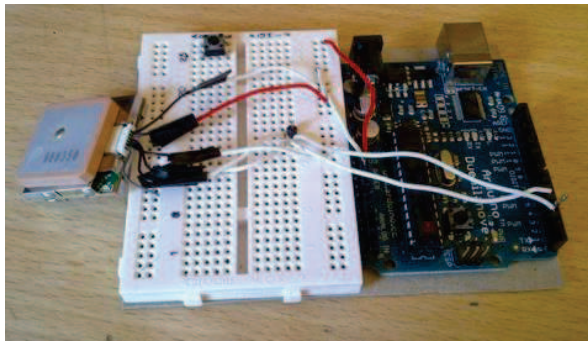


Fig4: GPS Interfacing with Arduino

*GSM - SIM 900A: The SIM900A is a complete Dual-band GSM/GPRS module in a SMT type which is designed especially for Chinese market, allowing you to benefit from small dimensions and cost-effective solutions. Featuring an industry-standard interface, the SIM900A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3 mm, SIM900A can fit almost all the space requirements in your applications, especially for slim and compact demand of design.*

GSM/GPRS Specification	
GSM/GPRS Module	SIM900
Frequency	850MHz/900MHz/1800MHz/1900MHz
Modem Interface	RS232 Serial Interface
Baud Rate(Default factory)	9600bps
Power requirement	4.5V to 12V
Current requirement	<590mA
SIM900 module operating temperature	-40°C to +85°C
Weight	40g

Fig5 - GSM / GPRS Specification

**GSM General Features**

- ☑ Dual-Band 900/ 1800 MHz
- ☑ GPRS multi-slot class 10/8
- ☑ GPRS mobile station class B
- ☑ Compliant to GSM phase 2/2+
  - P Class 4 (2 W @900 MHz)
  - P Class 1 (1 W @ 1800MHz)
- ☑ Dimensions: 24\*24\*3 mm
- ☑ Weight: 3.4g

*Selection of GSM Module -*

GSM Modem	Input Voltage	Cost	Frequency
SIM300 modem with RS232	7-15V AC or DC	Rs. 1000	300MHZ
SIM900A modem with RS232	12V DC	Rs. 900	900/1800MHZ
SIM900A modem TTL	3.6-4.5VDC	Rs. 1050	900/1800MHZ

Figure 6 - GSM module selection criteria

**GSM interfacing**

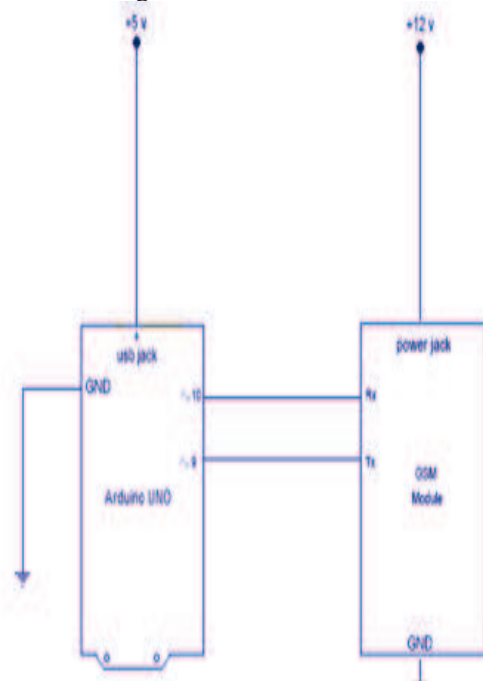


Figure 7 - interfacing diagram GSM

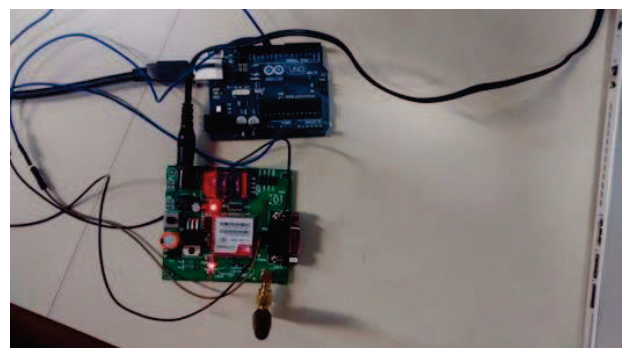


Figure 8 - Connection display

*GPS Interfacing Code-*

```
#include <SoftwareSerial.h>SoftwareSerialmySerial(9,
10); void setup()
{
mySerial.begin(9600);
//SettingthebaudrateofGSMModule
Serial.begin(9600);
// Setting the baud rateofSerialMonitor(Arduino)
delay(100);
}
void loop()
{
if (Serial.available(>0) switch(Serial.read())
{
case 's': SendMessage(); break;
case 'r': RecieveMessage();

break;
}
If
(mySerial.available(>0)Serial.write(mySerial.read());
}
voidSendMessage()
{
mySerial.println("AT+CMGF=1"); //Sets the
GSMModule in TextMode
```

```
delay(1000); // Delay of 1000 milli seconds or 1 second
mySerial.println("AT+CMGS=\"+91xxxxxxxxxx\"r");
//
Replace x with mobile number delay(1000);
mySerial.println("I am SMS from GSM Module");//
The SMS text you want to send
delay(100);
mySerial.println((char)26);// ASCII code of CTRL+Z
delay(1000);
}
voidRecieveMessage()
{
mySerial.println("AT+CNMI=2,2,0,0,0"); // AT
Command to receive a live SMS
```

**Conclusion:** The devices worked satisfactorily and can be used in any given condition, where the device is able to establish GSM connection. The device is portable enough and is easy to wear by females as well as elders and children. Further iterations of the project can revolutionize the protection of people in situations, where they feel they are under some problems. The device can also be further enhanced technologically to reduce the size of the device leading to increased portability and reduce chance of device detection by any outsider. Device can also be used if the user is traveling using any mode of transport.

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