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# Design and Implementation of Women Safety and Multipurpose System Using IoT

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***ABSTRACT***

***Today in the current global scenario, the prime question in every girl's mind, considering the ever rising increase of issues on women harassment in recent past is mostly about her safety and security. The only thought haunting every girl is when they will be able to move freely on the streets even in odd hours without worrying about their security. This paper suggests a new perspective to use technology for women safety. "848 Indian Women Are Harassed, Raped, Killed Every Day!!" That's a way beyond HUGE number! We propose an idea which changes the way everyone thinks about women safety.***

***A day when media broadcasts more of women's achievements rather than harassment, it's a feat achieved! Since we (humans) can't respond aptly in critical situations, the need for a device which automatically senses and rescues the victim is the venture of our idea in this project. We propose to have a device which is the integration of multiple devices, hardware comprises of a wearable "Smart gloves" which continuously communicates with Smart phone that has access to the internet. The application is programmed and loaded with all the required data which includes Human behavior and reactions to different situations like anger, fear and anxiety. This generates a signal which is transmitted to the smart phone. The software or application has access to GPS and Messaging services which is pre-programmed in such a way that whenever it receives emergency signal, it can send help request along with the location co-ordinates to the nearest Police station, relatives and the people in the near radius who have application. This action enables help instantaneously from the Police as well as Public in the near radius who can reach the victim with great accuracy. This implemented model can be used for the multipurpose like army, health care, emergency purposes.***

***Keywords:*** ***Design and Implementation of Women Safety, Multipurpose System using Iot.***

## Introduction

The 'Thing' in IoT can be any device with any kind of built-in-sensors with the ability to collect and transfer data over a network without manual intervention. The embedded technology in the object helps them to interact

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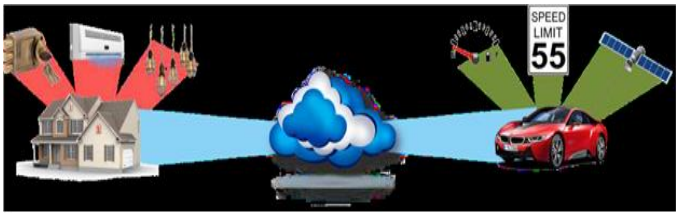
with internal states and the external environment, which in turn helps in decisions making process. In a nutshell, IoT is a concept that connects all the devices to the internet and let them communicate with each other over the internet. IoT is a giant network of connected devices all of which gather and share data about how they are used and the environments in which they are operated.


In a nutshell, IoT is a concept that connects all the devices to the internet and let them communicate with each other over the internet. IoT is a giant network of connected devices all of which gather and share data about how they are used and the environments in which they are operated. By doing so, each of your devices will be learning from the experience of other devices, as humans do. IoT is trying to expand the interdependence in human i.e interact, contribute and collaborate to things.

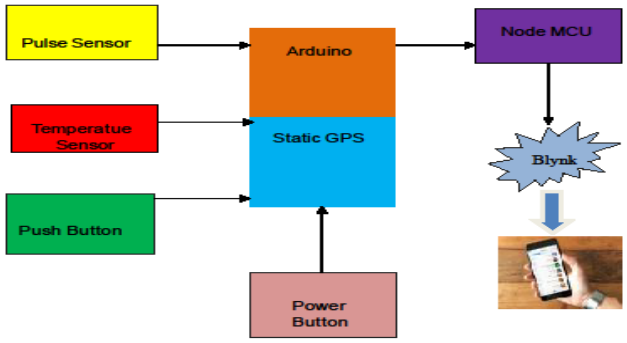
A developer submits the application with a document containing the standards, logic, errors & exceptions handled by him to the tester. Again, if there are any issues Tester communicates it back to the Developer. It takes multiple iterations & in this manner a smart application is created. Similarly, a room temperature sensor gathers the data and sends it across the network, which is then used by multiple device sensors to adjust their temperatures accordingly. For example, refrigerator's sensor can gather the data regarding the outside temperature and accordingly adjust the refrigerator's temperature. Similarly, your air conditioners can also adjust its temperature accordingly. This is how devices can interact, contribute & collaborate.




Since IoT allows devices to be controlled remotely across the internet, thus it created opportunities to directly connect & integrate the physical world to the computer-based systems using sensors and internet. The interconnection of these multiple embedded devices will be resulting in automation in nearly all fields and also enabling advanced applications.

This is resulting in improved accuracy, efficiency and economic benefit with reduced human intervention. It encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities.

## SYSTEM ARCHITECTURE




## DATA FLOW DIAGRAM

The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of input data to the system, various processing carried out on this data, and the output data is generated by this system. The data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components. These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in the system. DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the

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transformations that are applied as data moves from input to output. DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction. DFD may be partitioned into levels that represent increasing information flow and functional detail.

## UML DIAGRAMS

UML stands for Unified Modeling Language. UML is a standardized general- purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group. The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: A Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML. The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems. The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems. The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

## GOALS

The Primary goals in the design of the UML are as follows:

- Provide users a ready-to-use, expressive visual modeling Language so that they can develop and exchange meaningful models. Encourage the growth of OO tools market.
- Provide extendibility and specialization mechanisms to extend the core concepts.
- Be independent of particular programming languages and development process. Provide a formal basis for understanding the modeling language.

## IMPLEMENTATION

## MODULES

- Arduino
- NodeMCU
- Pulse Sensor
- Temperature Sensor

## MODULES DESCRIPTION

### Arduino

Any microcontroller based board which follows the standard Arduino schematic and is flashed with the Arduino boot loader can be called an Arduino board. The Arduino is referred to as open source hardware, since the standard schematic is open to everyone and anybody can make their own version of Arduino board following the standard schematic. Arduino is a single board microcontroller, intended to make the application of interactive objects or environments more accessible. The hardware consists of an open source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. Pre-programmed into the on-board microcontroller chip is a boot-loader that allows uploading programs into the microcontroller memory without needing a chip /device programmer. Arduino started in 2005 as a project for students at the Interaction Design Institute Ivrea in Italy. The core Arduino developer team is composed of Massimo Banzi, David Cuartielles, and David Mellis. Arduino family consists of UNO, LILYPAD, DIECIMILA, NANO, and DUEMILANOVE.

### Hardware

An Arduino board consists of an Atmel 8-bit microcontroller with complementary components to facilitate programming and incorporation into other circuits. Official Arduino have used the mega AVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560. Most boards include a 5 volt linear regulator and a 16 MHz crystal oscillator or ceramic resonator in some variants. An Arduino microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs

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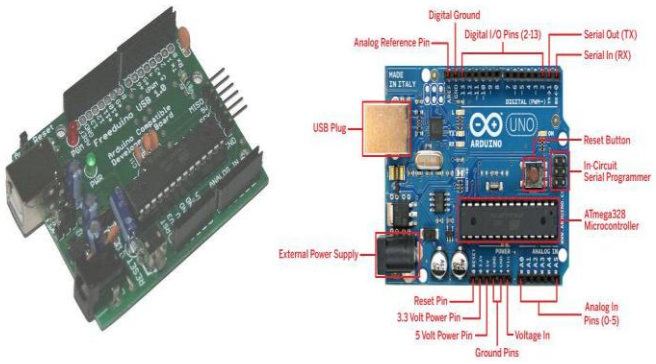
to the on-chip flash memory, compared with other devices that typically need an external programmer. This allows an Arduino to be used by novices and experts alike without having to go through the difficulties first faced by many when using electronics by allowing the use of an ordinary computer as the programmer. At a conceptual level, when using the Arduino software stack, all boards are programmed over an RS-232 serial connection, but the way this is implemented varies by hardware version.

Current Arduino boards are programmed via USB, implemented using USB-to-serial adapter chips such as the FTDI FT232. When used with traditional microcontroller tools instead of the Arduino IDE, standard AVR ISP programming is used. Arduino board provides 14 digital I/O pins, six of which can produce pulse-width modulated signals, and other six analog inputs. The output or inputs can be taken from the boards or given to the board using convenient connectors. Both digital and analog inputs and outputs are available in all arduino boards. The arduino boards can also communicate with other devices using standard communication ports like USART, IIC, and USB etc.




### Serial: 0 (RX) and 1 (TX):

Used to receive (RX) and transmit (TX) TTL serial data. On the Arduino Diecimila, these pins are connected to the corresponding pins of the FTDI USB-to-TTL Serial chip. On the Arduino BT, they are connected to the corresponding pins of the WT11 Bluetooth module. On the Arduino Mini and LilyPad Arduino, they are intended for use with an external TTL serial module.

### Digital pins:

In addition to the specific functions listed below, the digital pins on an Arduino board can be used for general purpose input and output via the pinMode(), digitalRead() and digital Write() commands. Each pin has an internal pull-up resistor which can be turned on and off using digitalWrite(). When the pin is configured as an input. The maximum current per pin is 40 mA.

### Communication

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL 5V serial communication, which is available on digital pins 0 for RX and 1 for TX. An ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '8U2 firmware uses the standard USB COM drivers, and no external driver is needed.

However, on Windows, an *.inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to serial chip and USB connection to the computer but not for serial communication on pins 0 and 1. A Software Serial library allows for serial communication on any of the Uno's digital pins.

### Table-1 Features

| | |
|---|---|
| Microcontroller | ATmega328 |
| Operating Voltage | 5V |
| Input Voltage (recommended) | 7-12V |
| Input Voltage (limits) | 6-20V |
| Digital I/O Pins | 14 (of which 6 provide PWM output) |
| Analog Input Pins | 6 |
| DC Current per I/O Pin | 40 Ma |
| DC Current for 3.3V Pin | 50 Ma |
| Flash Memory | 32 KB (ATmega328) of which 0.5 KB used by bootloader |
| SRAM | 2 KB (ATmega328) |
| EEPROM | 1 KB (ATmega328) |

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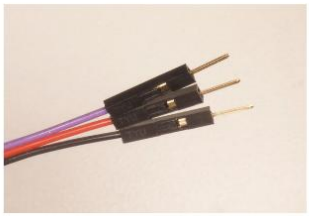
### Node MCU

Nodemcu is not just a WiFi module, it also has a decent micro-controller in built. Nodemcu comes with 32-bit Tensilica Processor, Power-Saving Architecture, Compactness, High Durability. In this small tutorial, I will show you how easy it is to add Arduino Support.






### Pulse Sensor (ESP826 -V10)

Pulse Sensor is a well-designed plug-and-play heart-rate sensor for Arduino. It can be used by students, artists, athletes, makers, and game & mobile developers who want to easily incorporate live heartrate data into their projects. The sensor clips onto a fingertip or earlobe and plugs right into Arduino. It also includes an open-source monitoring app that graphs your pulse in real time. If you want to power Pulse Sensor Amped with low voltage (3.3V for example), make sure you have this line of code in the setup() analog Reference (EXTERNAL); Also, make sure that you apply the lower voltageto the Arduino Aref pin (next to pin 13). RED wire = +3V to +5V, BLACK wire = GND and PURPLE wire = Signal

### Temperature Sensor (lm35)

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the water level. The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 µA from the supply, it has very low self-heating of less than 0.1°C in still air.

### TEST CASES

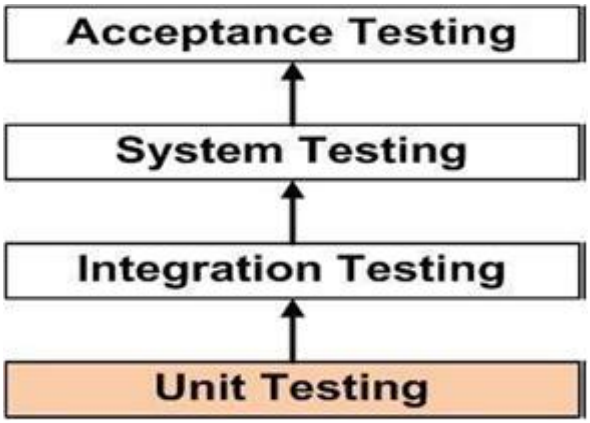



Fig : Software testing stages

### Test Cases

### Temperature Based Testing

Temperature based testing is used to evaluate the behavior of a human body when exposed to different temperatures. It is measured in scales such as Celsius and Fahrenheit according to this we can easily calculate temperature of a human body. Human body temperature is a variable and dependent upon one's age, health status, time of day, exertion level. The subject state of consciousness as well as emotional state. High temperature shows a difference in human body due to the hypertension of a particular person. This testing is done in order to get the temperature of victim based on various situation based on anxiety, fear and gives the reading according to that.

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### Pulse Based Testing

This pulse based testing gives the heart rate or the number of times your heart beats in one minute. Pulse rate vary from person to person. A pulse can be felt by applying firm fingerprint pressure to the skin at sites where the arteries travel near skin's surface. Pulse rate, strength, and rhythm all provide valuable diagnostic information; for example, the regular alteration between strong and weak pulses may indicate heart failure. In the project if rapid pulse may occur then it indicates serious cardiac issue and can be passed the result to the doctor if required. The BPM (Beat per minute) shows the count as 1 and 0 i.e. when breathe in it indicates 1 and when breathe out it indicates 0 and that gives the heart rate of a person. If anyone is effected with high heart beat it displays an hypertension occurred.

### ARDUINO TO NODEMCU

Arduino is a platform on which we can mount sensors and fetch the sensors data from it. It is a designs use a variety of microprocessors and controllers. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers can be programmed using C and C++ programming languages. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project. The output of the pulse, temperature, is received by Arduino and that again sends the entire data to the Node MCU.

This Node Mcu act as a slave and Arduino act as master. Simply called as an Master Slave Communication.

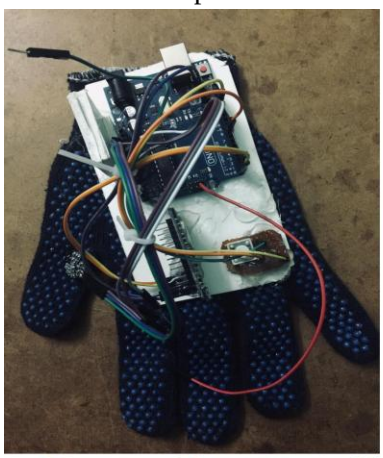
### NODEMCU TO IOT:

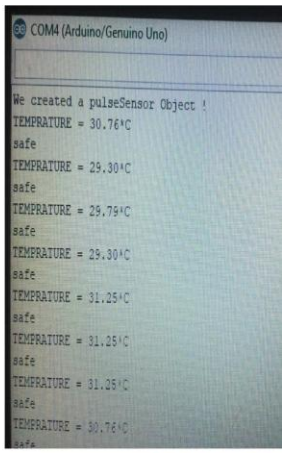
The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source. The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The Node MCU is connected to the arduino and receives the entire output and passes that to the IoT device which is nothing but a blynk server and the entire details were received in one particular mobile. This makes a victim to get helped by police, relatives or their family members very fast. This main theme achieves the entire safety of women and multipurpose systems.

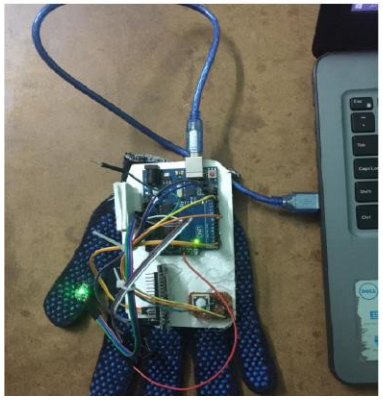
All the test cases mentioned above passed successfully. No defects encountered. Programming of Digital execute according to code it will run.

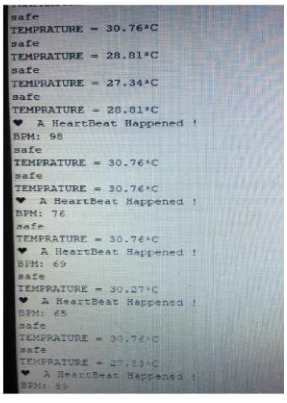
### MAIN DESIGN

- Connection of Devices and Sensors Connected and Active
- Output for Temperature Pulse and Push Button and Output for Heartbeat







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**PRESSING OF PUSH (EMERGENCY HELP) BUTTON and OUTPUT OF PUSH (EMERGENCY HELP) BUTTON**


## CONCLUSION

This type of an idea being the first of its kind plays a crucial role towards ensuring Women Safety in the fastest way possible automatically. The proposed design will deal with critical issues faced by women in the recent past and will help solve them through technologically sound gadgets. With further research and innovation, this project can be implemented in different areas of security and surveillance, emergency, army. The system can perform the real time monitoring of desired position and detect the violence with a good accuracy and produce an alert warning message to the family members, nearest police station.

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