LOCATION BASED NAVIGATION AND OBSTACLE DETECTION SYSTEM WITH VOICE ALERTS FOR VISUALLY IMPAIRED

Mini project report submitted in partial fulfillment of the

requirements for the award of degree of

BACHELOR OF TECHNOLOGY

In

COMPUTER SCIENCE AND ENGINEERING

By

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HYDERABAD CAMPUS NOVEMBER-2021

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DECLARATION

We, hereby declare that the mini project report entitled "**LOCATION BASED NAVIGATION AND OBSTACLE DETECTION SYSTEM WITH VOICE ALERTS FOR VISUALLY IMPAIRED**" is an original work done in the Department of Computer Science and Engineering, GITAM School of Technology, GITAM (Deemed to be University) submitted in partial fulfillment of the requirements for the award of the degree of "Bachelor of Technology" in Computer Science and Engineering. The work had not been submitted to any other college or University for the award of any degree or diploma.

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CERTIFICATE

This is to certify that the mini project entitled "**LOCATION BASED NAVIGATION AND OBSTACLE DETECTION SYSTEM WITH VOICE ALERTS FOR VISUALLY IMPAIRED**" is the bonafide done by **GUNNAM RISHITHA (221810303018), SREEMAN RAGHAVA PODICHETI (221810303053), BURRA ARAVIND (221810303008), DONDA GANGADHAR RAJU (221810303015)**. In the Department of "**COMPUTER SCIENCE ENGINEERING**" at GITAM University, Hyderabad. It is faithful record work carried out by batch at the **Computer Science Engineering Department**, GITAM School of Technology, GITAM Deemed to be University, Hyderabad Campus under my guidance and supervision.

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ACKNOWLEDGEMENT

This mini project would not have been successful without the help of several people. We would like to thank the personalities who were part of the project in numerous ways, those who gave us outstanding support from the birth of the reviews.

We are extremely thankful to our honorable **Pro-Vice Chancellor, Prof. Siva Prasad** for providing necessary infrastructure and resources for the accomplishment of this seminar.

We are very much obliged to our beloved **Prof. S. Phani Kumar**, Head of the Department of Computer Science and Engineering for providing the opportunity to undertake this project and encouragement in completion of this seminar.

We hereby wish to express a deep sense of gratitude to **Mr.Jethwa Roopavath**, Assistant Professor, Department of Computer Science and Engineering, for their esteemed guidance, moral support and invaluable advice provided by them for the success of this internship.

We are also thankful to all the staff members of the Computer Science and Engineering department who have cooperated in making this project a success. We would like to thank my parents and friends who extended their help, encouragement and moral support either directly or indirectly in this seminar.

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ABSTRACT

In the present scenario, a blind person is compelled to rely on another person and cannot travel independently to any place without the help of others. This project aims to develop a smart stick for the visually impaired people. The smart stick will include a GPS/GSM system and obstacle detection mechanism. The GPS system is used by the user to know the current location and also to notify his friend or relative about the current location. This could result in a better movement of the user. A voice module will be attached so that the stick can alert the user about the obstacles and the current location name whenever necessary. GSM is used to send the message about the current location to his friend or relative and the current location announcement which involves text to speech conversion is given to the user by the system.

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LIST OF ACRONYMS

GSM – Global System for Mobile communication

GPS – Global Positioning System

IOT – Internet of things

API – Application programming interface

HTTP – Hypertext Transfer Protocol

MATLAB – MATrix LABoratory

PIC – Programmable Intelligent Computer

IDE – Integrated development environment

TDMA – Time Division Multiple Access

CDMA – Code-Division Multiple Access

GPRS – General Packet Radio Service

SMS – short message service

GNSS – Global navigation satellite system

WAAS – Wide Area Augmentation Systems

LAAS – Local Area Augmentation Systems

RAIM – Receiver Autonomous Integrity Monitoring

CHAPTER 1

INTRODUCTION

1.1 OBJECTIVE OF THE PROJECT:

A survey by WHO (World Health Organization) carried out in 2011 estimates that in the world, about 1% of the human population is visually impaired (about 70 million people) and amongst them, about 10% are fully blind (about 7 million people) and 90% (about 63 million people) with low vision. The main problem with blind people is how to navigate their way to wherever they want to go. Such people need assistance from others with good eyesight. As described by WHO, 10% of the visually impaired have no functional eyesight at all to help them move around without assistance and safely. This study proposes a new technique for designing a smart stick to help visually impaired people that will provide them navigation. The conventional and archaic navigation aids for persons with visual impairments are the walking cane (also called white cane or stick) and guide dogs which are characterized by many imperfections. The most critical shortcomings of these aids include: essential skills and training phase, range of motion, and very insignificant information being communicated. Our approach modified this cane with some electronics components and sensors, the electronic aiding devices are designed to solve such issues. The ultrasonic sensor, water sensor, buzzer, GPS and GSM are used to record information about the presence of obstacles on the road. Ultrasonic sensors have the capacity to detect any obstacle within the distance range of 2 cm-450 cm. Therefore whenever there is an obstacle in this range it will alert the user. Water sensor is used to detect if there is water in the path of the user. Most blind guidance systems use ultrasound because of its immunity to the environmental noise. With the rapid advances of modern technology both in hardware and software it has become easier to provide intelligent navigation systems to the visually impaired. Also, high-end technological solutions have been introduced recently to help blind persons navigate independently. Whenever the user wants to locate it, such a person will press a button on the remote control and buzzer will ring, then the person can get the idea of where the stick is placed. Vision is the most important part of human physiology as 83% of information human beings get from the environment is via sight. The 2011 statistics by the World Health Organization (WHO) estimates that there are 70 million people in the world living with visual impairment, 7 million of which are blind and 63 million with low vision. The conventional and oldest mobility aids for persons with visual impairments are characterized with many limitations. Some inventions also require a separate power supply or navigator which makes the user carry it in a bag every time they travel outdoors. These bulky designs will definitely make the user exhausted. Walking safely and confidently without any human assistance in urban or unknown environments is a difficult task for blind people. Visually impaired people generally use either the typical white cane or the guide dog to travel independently. Although the white stick gives a warning about 1 m before the obstacle, for a normal walking speed of 1.2 m/s, the time to react is very short (only 1 s). The stick scans the floor and consequently cannot detect certain obstacles (rears of trucks, low branches, etc.). Safety and confidence could be increased using devices that give a signal to find the direction of an obstacle-free path in unfamiliar or changing environments. Electronic travel aids (ETAs) are devices that give off a warning by auditory or/and tactile signals when an obstacle is in the way and allow the user to avoid it. Several devices have been developed to improve the mobility of blind people talking GPS, devices for landmark identification, ultrasonic obstacle detectors (sensors). In indoor or outdoor crowded environments, ultrasonic devices are limited due to multiple reflections. These devices cannot find openings that are wide enough for a human being to go through, with anticipation of a few meters (4–6 m). So in order to remove the above difficulties and inform the blind person about the obstacle well in advance is the main aim of the project. In this project we are going to use an obstacle detection sensor as the heart of the project. In this module we are going to interface an obstacle sensor that will keep on emitting a signal generated by the Microcontroller. This signal after hitting the obstacle will be received back. This echo signal is collected by the sensor receiver and based on a computing signal thus alerting the person well in advance about the obstacle. Fig 1: Audio device with the Microcontroller. In this project we are going to interface an obstacle sensor and an Audio device with the Microcontroller and the complete module will be attached with the blind person’s stick (see fig 1). So whenever the blind reason will detect any obstacle up to a distance of 1 meter automatically a Audio device will indicate about it to the blind person and an announcement will be generated through headphones as Object Detected. And in this project we are going to interface GSM and GPS to detect the blind person's location. The proposed architecture consists of a GPS signal receiver and GSM connected to ARM7. This complete setup will be fixed to stick. The GPS will be sending the location information to the controller continuously. The same will be routed to the GSM modem through the controller. GSM will forward this information to the pre fed mobile no's i.e; the user.

1.2 LITERATURE REVIEW:

Assorted activities can be prepared in the common civic to support the visually impair. "Venture Prakash " is a helpful mission to help the visually impaired youngsters particularly via preparing them to use their minds to get familiar with a lot of articles around them. In, the bond has a ping sonar sensor to identify the detached items. It additionally has a wet finder to recognize the water. The microcontroller utilized is PIC microcontroller. The microcontroller circuit is outwardly of the bond yet is ensured through a code so its protection can't be wrecked. The major input specified to the consumer is throughout the trembling engine. In, three sensors are utilized viz. ultrasonic, pit sensor as well as the water sensor. Certainly, yet this is a PIC base structure. The input agreed is throughout the trembling just as the speaker/earphones. There is a GPS structure where-in the consumer wants to encourage his region. In, the creator has made a separable unit consisting of an ultrasonic sensor and a vibration engine. It may very well fit on any stick. It identifies snags up to 3m. The vibration input fluctuates in the force as the obstruction comes closer. Various methodologies have been taken with the basic role of making an innovation to help the outwardly hindered. The needs set by various creators are diverse leaving an extent of progress in each application.

CHAPTER 2

IMPLEMENTATION OF IOT BASED OBSTACLE DETECTION SYSTEM WITH VOICE ALERTS

2.1 BLOCK DIAGRAM:

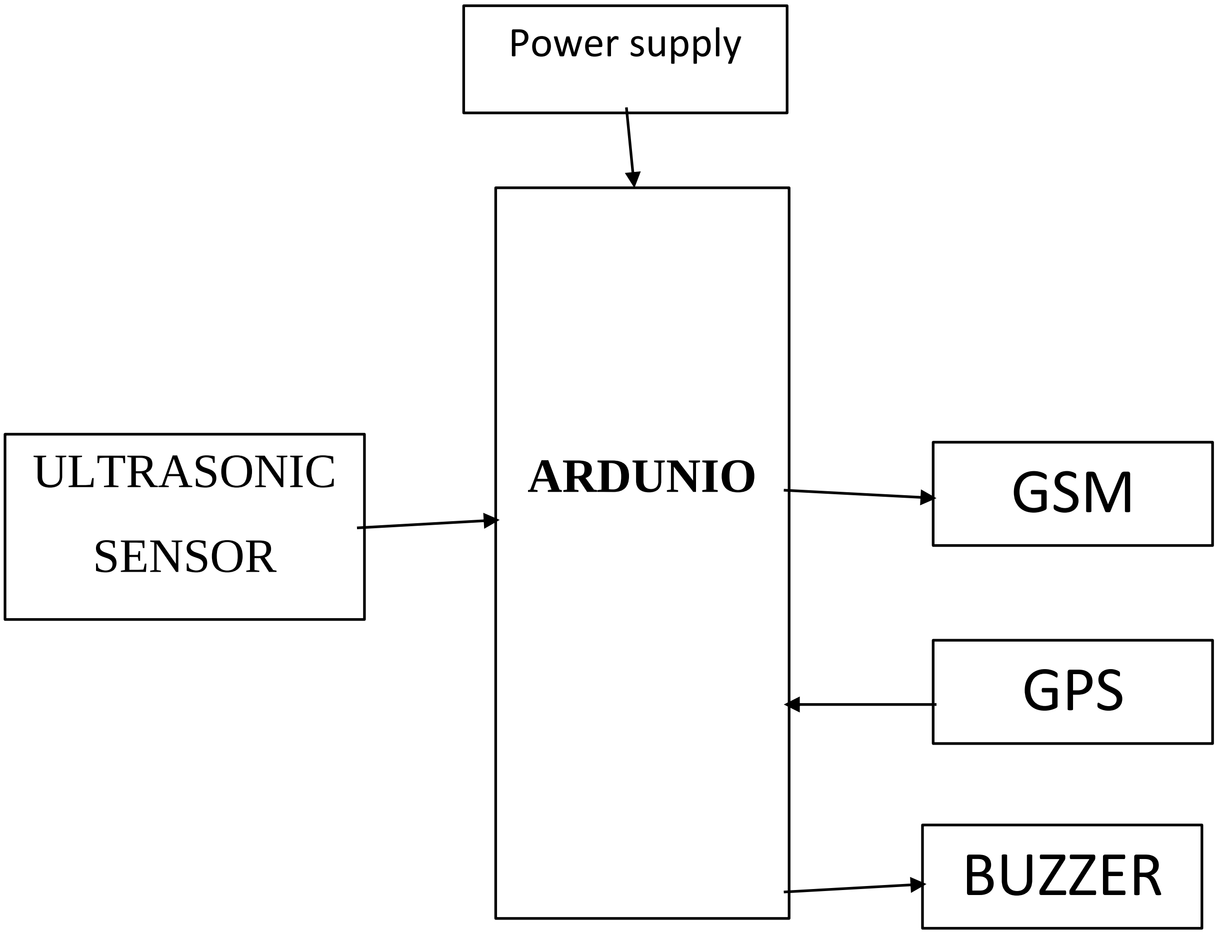


Figure 2.1: Block diagram of the project

2.2 DESCRIPTION OF THE BLOCK DIAGRAM:

The ARDUINO ships as a bare circuit board with standard connections Ultrasonic sensor, Gsm and buzzer with power supply.

2.3 AVR MICROCONTROLLER

2.31 Arduino:

Introduction:

Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. 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 are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

The Arduino project started in 2005 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and
Professionals create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.

The name **Arduino** comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduin of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.

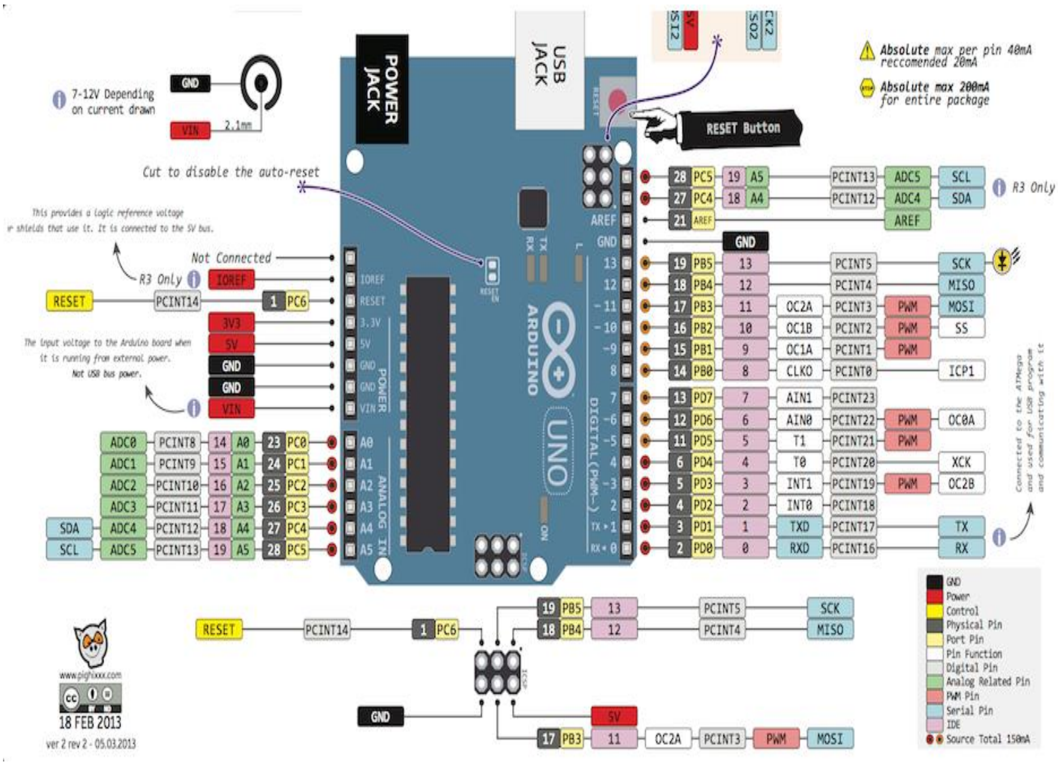


Fig: Arduino

History:

The origin of the Arduino project started at the Interaction Design Institute Ivrea (IDII) in Ivrea, Italy. At that time, the students used a BASIC Stamp microcontroller at a cost of $100, a considerable expense for many students. In 2004, Colombian student Hernando Barragán created the development platform Wiring as a Master's thesis project at IDII, under the supervision of Massimo Banzi and Casey Reas, who are known for work on the Processing language. The project goal was to create simple, low cost tools for creating digital projects by non-engineers. The Wiring platform consisted of a printed circuit board (PCB) with an ATmega168 microcontroller, an IDE based on Processing and library functions to easily program the microcontroller.

In 2005, Massimo Banzi, with David Mellis, another IDII student, and David Cuartielles, added support for the cheaper ATmega8 microcontroller to Wiring. But instead of continuing the work on Wiring, they copied the Wiring source code and renamed it as a separate project, called Arduino. The initial Arduino core team consisted of Massimo Banzi, David Cuartielles, Tom Igoe, Gianluca Martino, and David Mellis, but Barragán was not invited to participate.

Following the completion of the Wiring platform, lighter and less-expensive versions were distributed in the open-source community.

Adafruit Industries, a New York City supplier of Arduino boards, parts, and assemblies, estimated in mid-2011 that over 300,000 official Arduinos had been commercially produced, and in 2013 that 700,000 official boards were in users' hands.

2.32 Hardware:

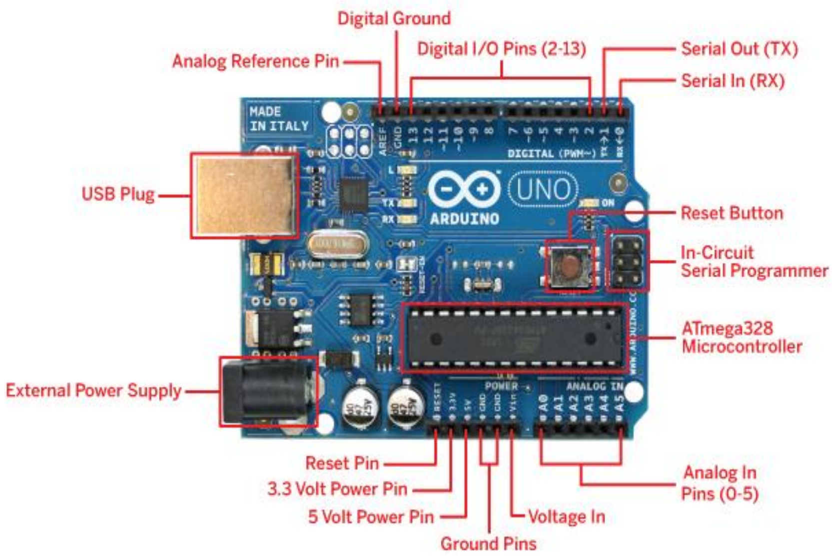


Fig: Arduino

Arduino is open-source hardware. The hardware reference designs are distributed under a Creative Commons Attribution Share-Alike 2.5 license and are available on the Arduino website. Layout and production files for some versions of the hardware are also available. The source code for the IDE is released under the GNU General Public License,

Version-2. Nevertheless, an official Bill of Materials of Arduino boards has never been released by Arduino staff.

Although the hardware and software designs are freely available under copyleft licenses, the developers have requested that the name Arduino be exclusive to the official product and not be used for derived works without permission. The official policy document on use of the Arduino name emphasizes that the project is open to incorporating work by others into the official product. Several Arduino-compatible products commercially released have avoided the project name by using various names ending in -duino.

An Arduino board consists of an Atmel 8-, 16- or 32-bit AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560), but other makers' microcontrollers have been used since 2015. The boards use single-row pins or female headers that facilitate connections for programming and incorporation into other circuits. These may connect with add-on modules termed shields. Multiple, and possibly stacked shields may be individually addressable via an I²C serial bus. Most boards include a 5 V linear regulator and a 16 MHz crystal oscillator or ceramic resonator. Some designs, such as the LilyPad, run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions.

Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default bootloader of the Aduino UNO is the optiboot bootloader. Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS-232 logic levels and transistor–transistor logic (TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is reprogrammable via its own ICSP header. Other variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board orcable, Bluetooth or other methods, when used with traditional microcontroller tools instead of the ArduinoIDE, standard AVR in-system programming (ISP) programming is used.

The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The Diecimila, Duemilanove, and current Uno provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. These pins are on the top of the board, via female 0.1-inch (2.54 mm) headers. Several plug-in application shields are also commercially available. The ArduinoNano, and Arduino-compatible Bare Bones Board and Boarduino boards may provide male header pins on the underside of the board that can plug into solderless breadboards.

Many Arduino-compatible and Arduino-derived boards exist. Some are functionally equivalent to an Arduino and can be used interchangeably. Many enhance the basic Arduino by adding output drivers, often for use in school-level education, to simplify making buggies and small robots. Others are electrically equivalent but change the form factor, sometimes retaining compatibility with shields, sometimes not. Some variants use different processors, of varying compatibility.

Official boards:

The original Arduino hardware was produced by the Italian company Smart Projects. Some Arduino-branded boards have been designed by the American companies SparkFun Electronics and Adafruit Industries. As of 2016, 17 versions of the Arduino hardware have been commercially produced.

Software development:

A program for Arduino may be written in any programming language for a compiler that produces binary machine code for the target processor. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio.

The Arduino project provides the Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus.

A program written with the IDE for Arduino is called a sketch. Sketches are saved on the development computer as text files with the file extension .ino. Arduino Software (IDE) pre-1.0 saved sketches with the extension .pde.

The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

Applications:

- Xoscillo, an open-source oscilloscope.
- Arduinome, a MIDI controller device that mimics the Monome.
- OBDuino, a trip computer that uses the on-board diagnostics interface found in most modern cars.
- Ardupilot, drone software and hardware.
- Gameduino, an Arduino shield to create retro 2D video games.
- ArduinoPhone, a do-it-yourself cell phone.
- Water quality testing platform.
- Automatic titration system based on Arduino and stepper motor.
- Low cost data glove for virtual reality applications.
- Impedance sensor system to detect bovine milk adulteration.
- Homemade CNC using Arduino and DC motors with close loop control by Homofaciens.
- DC motor control using Arduino and H-Bridge.

Technical specs:

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Table: Technical specs

Programming:

The Arduino/Genuino Uno can be programmed with the (Arduino Software (IDE)). Select "Arduino/Genuino Uno" from the Tools > Board menu (according to the microcontroller on your board). For details, see the reference and tutorials.The ATmega328 on the Arduino/Genuino Uno comes pre programmed with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol.The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available in the Arduino repository. The ATmega16U2/8U2 is loaded with a DFU bootloader, which can be activated by:

- On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then reading the 8U2.
- On Rev2 or later boards: there is a resistor that pulls the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.

You can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU bootloader). See this user-contributed tutorial for more information.

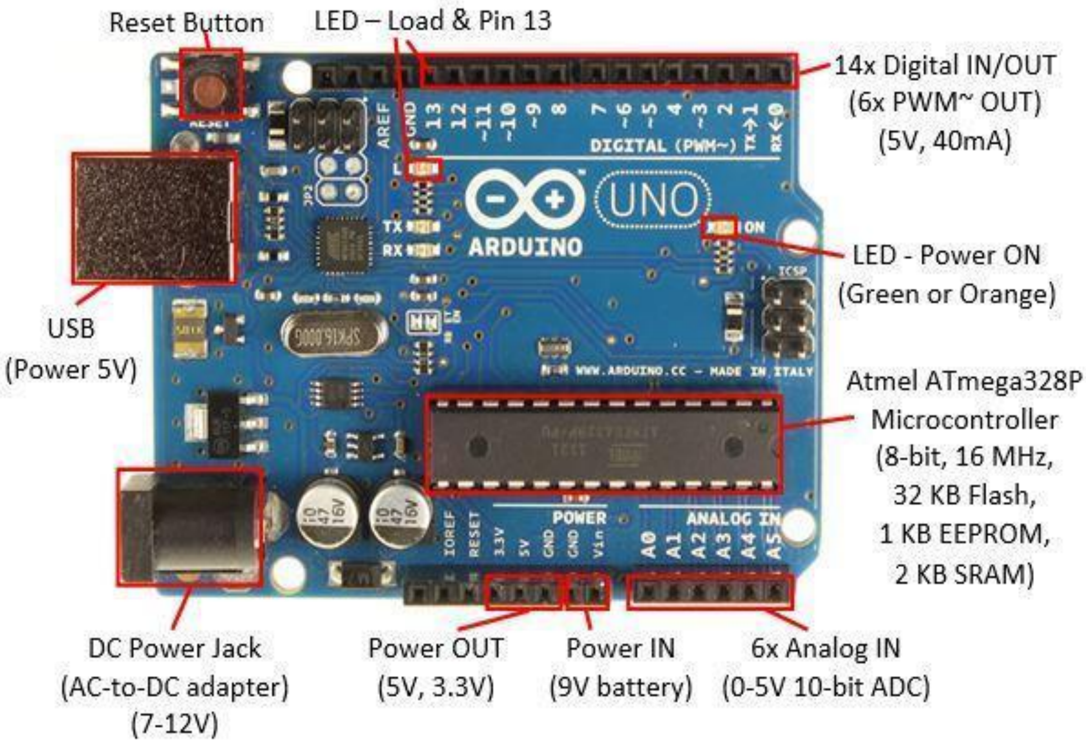


Fig: Arduino

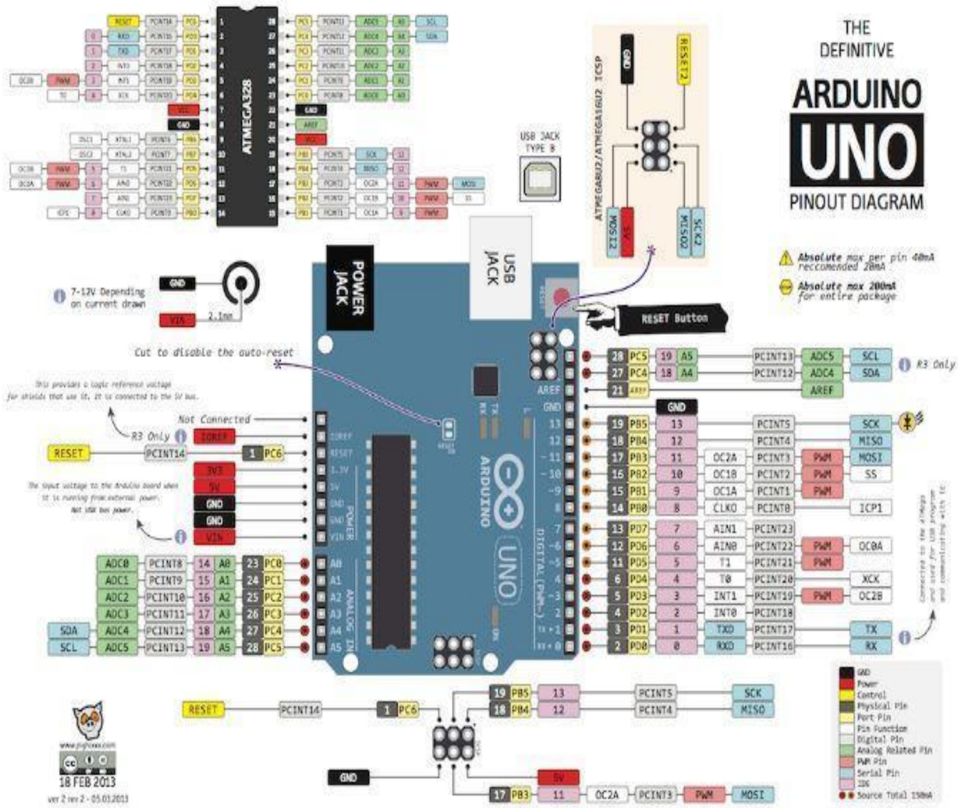
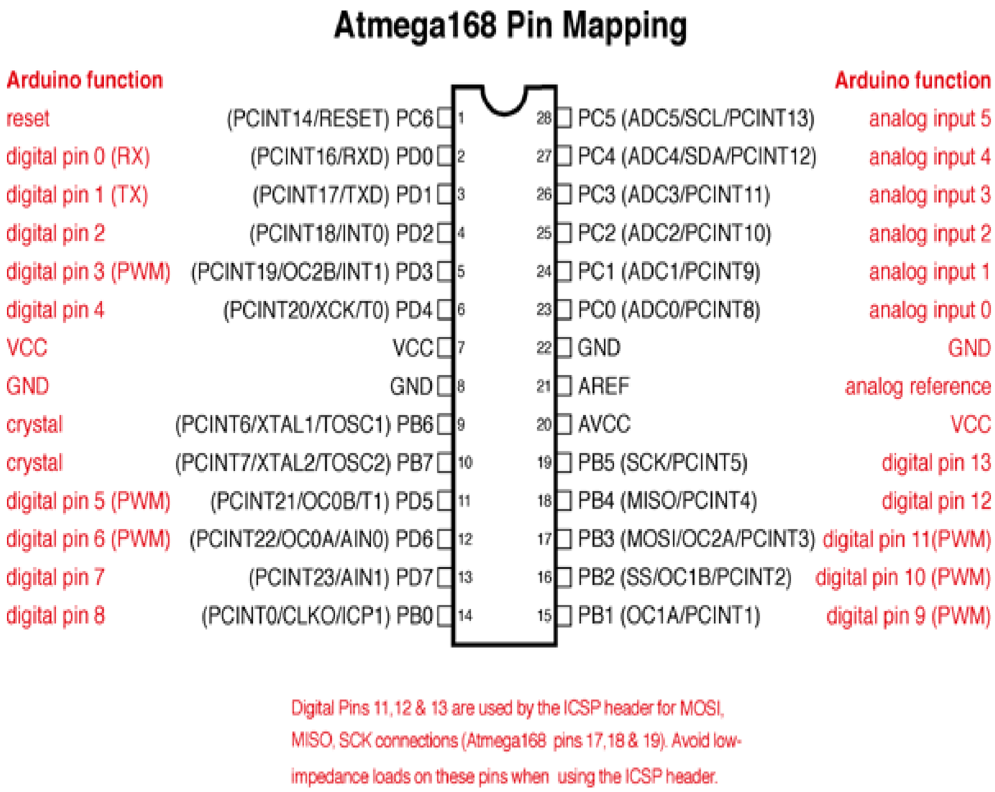

THE
DEFINITIVE
ARDUINO
UNO
PINOUT DIAGRAM
POWER JACK
USB JACK
RESET Button
18 FEB 2013

Fig: Arduino



The Arduino/Genuino Uno has a resettable polyfuse that protects your computer's USB ports from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

Power:

The Arduino/Genuino Uno board can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the GND and Vin pin headers of the POWER connector.

The board can operate on an external supply from 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may become unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

- Vin. The input voltage to the Arduino/Genuino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V.This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it.
- 3V3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND. Ground pins.
- IOREF. This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

Memory:

The ATmega328 has 32 KB (with 0.5 KB occupied by the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).
See the mapping between Arduino pins and ATmega328P ports. The mapping for the Atmega8, 168, and 328 is identical.
Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller.
In addition, some pins have specialized functions:

- Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

- External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.
- PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite() function.
- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- LED: 13. There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
- TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.

The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analogReference() function.

There are a couple of other pins on the board:

- AREF. Reference voltage for the analog inputs. Used with analogReference().
- Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

Communication:

Arduino/Genuino Uno has a number of facilities for communicating with a computer, another Arduino/Genuino board, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the 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 SoftwareSerial library allows serial communication on any of the Uno's digital pins.

The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino Software (IDE) includes a Wire library to simplify use of the I2C bus; see the documentation for details. For SPI communication, use the SPI library.

The Uno board contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labeled"RESET-EN". You may also be able to disable the auto-reset by connecting a 110 ohm resistor from 5V to the reset line; see this forum thread for details.

Revisions:

Revision 3 of the board has the following new features:

- 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible with both the board that uses the AVR, which operates with 5V and with the Arduino Due that operates with 3.3V. The second one is a not connected pin that is reserved for future purposes.
- Stronger RESET circuit.
- Atmega 16U2 replace the 8U2.

CHAPTER 3

FUNCTIONAL MODULES & SOFTWARE MODULES DESCRIPTION

3.1 ULTRASONIC SENSOR:

Ultrasonic transducers and ultrasonic sensors are devices that generate or sense ultrasound energy. They can be divided into three broad categories: transmitters, receivers and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound.

In a similar way to radar and sonar, ultrasonic transducers are used in systems which evaluate targets by interpreting the reflected signals. For example, by measuring the time between sending a signal and receiving an echo the distance of an object can be calculated. Passive ultrasonic sensors are basically microphones that detect ultrasonic noise that is present under certain conditions.

The design of transducer can vary greatly depending on its use: those used for medical diagnostic purposes, for example the range-finding applications listed above, are generally lower power than those used for the purpose of changing the properties of the liquid medium, or targets immersed in the liquid medium, through chemical, biological or physical (e.g. erosive) effects. The latter class include ultrasonic probes and ultrasonic baths, which apply ultrasonic energy to agitate particles, clean, erode, or disrupt biological cells, in a wide range of materials; see Sonication.

The ultrasonic sensor emits short bursts of sound and listens for this sound to echo off of nearby objects. The frequency of the sound is too high for humans to hear (it is ultrasonic). The ultrasonic sensor measures the time of flight of the sound burst. A user then computes the distance to an object using this time of flight and the speed of sound (1,126 ft/s).

This sensor uses ultrasonic sound to measure distance just like bats and dolphins do. Ultrasonic sound has such a high pitch that humans cannot hear it. This particular sensor sends out an ultrasonic sound that has a frequency of about 40kHz.

The sensor has two main parts:

A transducer that creates an ultrasonic sound and another listens to it's echo.To use this sensor to measure distance, the robot's brain must measure the amount of time it takes for the ultrasonic sound to travel.Sound travels at approximately 340 meters per second. This corresponds to about 29.412us (microseconds) per centimeter.

To measure the distance the sound has travelled we use the formula:

Distance = (Time x Speed of Sound) / 2.

The "2" is in the formula because the sound has to travel back and forth. First the sound travels away from the sensor, then it bounces off of a surface and returns back.

The easy way to read the distance as centimeters is use the formula:

Centimeters = ((Microseconds / 2) / 29).

For example, if it takes 100us (microseconds) for the ultrasonic sound to bounce back, then the distance is ((100 / 2) / 29) centimeters or about 1.7 centimeters.

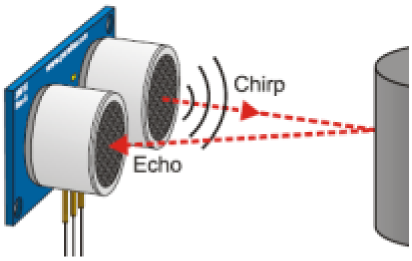


Fig: Ultrasonic Sensor

Application Ideas:

- Security systems
- Interactive animated exhibits
- Parking assistant systems
- Robotic navigation

3.2 BUZZER:

When mounting and handling

a. To prevent malfunctions, install the piezoelectric buzzer or sounder so that it does not come into contact with other components on its side or top surface.

b. Do not block the sound release hole of the piezoelectric buzzer or sounder. Maintain a distance of at least 10mm between the sound release hole and any surrounding object.Also, do not cover the sound release hole with an adhesive tape or the like. If the sound hole is blocked or covered, the piezoelectric buzzer or sounder may exhibit abnormal oscillation or stop functioning.

c. The sound pressure of the piezoelectric buzzer or sounder may be measured after, but not before, it is installed in the host equipment.When determining the installation position, make sure that adverse acoustic impedance does not exist in the installation area. If acoustic impedance exists, the piezoelectric buzzer or sounder may exhibit abnormal oscillation or stop functioning.

d. When screwing down the piezoelectric buzzer or sounder, tighten the screws within the specified torque range. Use pan-headed screws and washers not to deform the casing. A deformed casing may cause the piezoelectric buzzer or sounder to exhibit abnormal oscillation or stop functioning.

e. When stripping a lead wire, do not cut the conductive line inside the coating, thereby ensuring the sound will be properly generated. Use a stripper suitable for the diameter of the lead wire.

f. Do not apply strong force to the pins before they are soldered. If the pins are bent or cut due to excessive force, the piezoelectric buzzer or sounder may not generate sound.

g. Do not connect the piezoelectric buzzer or sounder improperly, otherwise the internal circuit may break down when electricity is applied.

h. Use the piezoelectric buzzer or sounder within the designated operation voltage range. A higher voltage may damage the diaphragm and other components or cause a fire. With a lower voltage, the sound may not be generated.

i. Do not apply DC voltage to the piezoelectric sounder. Otherwise, silver migration may occur, which will lower the insulation resistance and cause the sounder to stop functioning.

j. Use a low-impedance (not more than 100Ω) power supply for the piezoelectric buzzer;

otherwise, the piezoelectric buzzer may exhibit abnormal oscillation or stop functioning.

k. Do not interpose a resistance in series between the piezoelectric buzzer and the power supply, otherwise the piezoelectric buzzer may exhibit abnormal oscillation or stop functioning. If the interposition of a resistance (3kΩ Max.) is necessary to adjust the sound volume, insert a capacitor of approximately 1 μF in parallel, not in series.(Fig.1)
l. Do not use the piezoelectric buzzer or sounder where any corrosive gas, such as H2S, etc. Otherwise, a normal sound may not be generated due to corrosion of the components and diaphragm.
m. Do not wash the piezoelectric buzzer or sounder with solvent or allow solvent vapor to enter them while washing. Any solvent trapped inside the casing may damage the piezoelectric buzzer or sounder.
n. Do not drop the piezoelectric buzzer or sounder. With a mechanical shock, the piezoelectric sounder may accumulate a high voltage inside its piezoelectric elements, resulting in an electric shock to anyone who touches it. Also if such sounder is connected to a circuit, it may damage transistors and/or other electronic components. Sounders which have accidentally gotten a mechanical shock can be made safe by shorting them between the poles. Then check the sound pressure, tone and appearance before use.
o. Taking special protective measures is required to prevent deterioration and malfunction, whenever the piezoelectric buzzers or sounders are stored in the following unfriendly areas.
    - Dusty places
    - Hot or frosty places
    - Areas exposed to sunlight
    - Places with leaking or infiltrating water
    - Humid places
    - Areas exposed to solvents or their vapor
p. When operating the piezoelectric buzzer or sounder outdoors, protect it from moisture to ensure normal operation.

3.3 POWER SUPPLY:

The input to the circuit is applied from the regulated power supply. The a.c. input i.e230V from the mains supply is stepped down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. So in order to get a pure d.c voltage, the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage. The block diagram of regulated power supply is shown in the figure 3.2

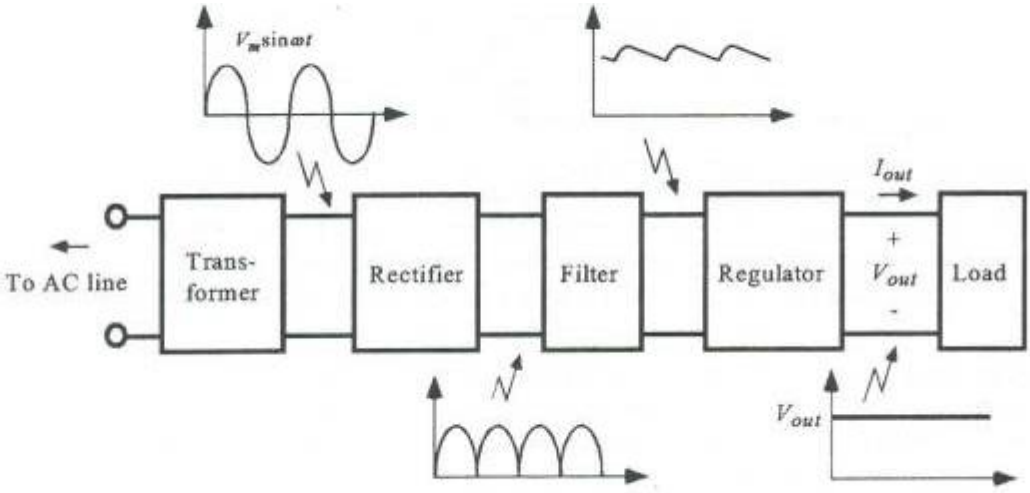


Fig 3.1 components of power supply

Transformer: Usually, DC voltages are required to operate various electronic equipment and these voltages are 5V, 9V or 12V. But these voltages cannot be obtained directly. Thus the a.c input available at the mains supply i.e., 230V is to be brought down to the required voltage level. This is done by a transformer. Thus, a step down transformer is employed to decrease the voltage to a required level.

Rectifier: The output from the transformer is fed to the rectifier. It converts A.C. into pulsating D.C. The rectifier may be a half wave or a full wave rectifier. In this project, a bridge rectifier is used because of its merits like good stability and full wave rectification.

Filter: Capacitive filter is used in this project. It removes the ripples from the output of the rectifier and smoothens the D.C. Output received from this filter is constant until the mains voltage and load is maintained constant. However, if either of the two is varied, D.C. voltage received at this point changes. Therefore a regulator is applied at the output stage.

Voltage regulator: As the name itself implies, it regulates the input applied to it. A voltage regulator is an electrical regulator designed to automatically maintain a constant voltage level. In this project, power supply of 5V and 12V are required. In order to obtain these voltage levels, 7805 and 7812 voltage regulators are to be used. The first number 78 represents positive supply and the numbers 05, 12 represent the required output voltage levels.

3.4 GSM TECHNOLOGY:

Fig: GSM

Introduction:

Time-Division Multiple Access (TDMA):

TDMA (time division multiple access) is a technology used in digital cellular telephone communication to divide each cellular channel into three time slots in order to increase the amount of data that can be carried.

Code Division Multiple Access (CDMA):

The term CDMA refers to any of several protocols used in so-called second-generation (2G) and third-generation (3G) wireless communications. As the term implies, CDMA is a form of multiplexing, which allows numerous signals to occupy a single transmission channel, optimizing the use of available bandwidth. The technology is used in ultra-high-frequency (UHF) cellular telephone systems in the 800-MHz and 1.9-GHz bands. CDMA employs analog-to-digital conversion (ADC) in combination with spread spectrum technology.

Global System for Mobile communication (GSM):

The Global System for Mobile communication, usually called GSM, Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones. The GSM standard was developed as a replacement for first generation (1G) analog cellular networks, and originally described a digital, circuit switched network optimized for full duplex voice telephony. 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. 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. GSM is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity.

GSM together with other technologies is part of an evolution of wireless mobile telecommunication that includes High-Speed Circuit-Switched Data (High-Speed Circuit-Switched Data), General Packet Radio System (General Packet Radio Services), Enhanced Data GSM Environment (Enhanced Data GSM Environment), and Universal Mobile Telecommunications Service (Universal Mobile Telecommunications System).

The Generations of Mobile Networks

The idea of cell-based mobile radio systems appeared at Bell Laboratories in the United States in the early 1970s. However, mobile cellular systems were not introduced for commercial use until a decade later. During the early 1980's, analog cellular telephone systems experienced very rapid growth in Europe, particularly in Scandinavia and the United Kingdom. During development, numerous problems arose as each country developed its own system, producing equipment limited to operate only within the boundaries of respective countries, thus limiting the markets in which services could be sold.

To a certain extent, the late 1980’s and early 1990’s were characterized by the perception that a complete migration to digital cellular would take many years, and that digital systems would suffer from a number of technical difficulties (i.e., handset technology). However, second-generation equipment has since proven to offer many advantages over analog systems, including efficient use of radio-magnetic spectrum, enhanced security, extended battery life, and data transmission capabilities. There are four main standards for 2G networks: Time Division Multiple Access (TDMA), Global System for Mobile Communications (GSM) and Code Division Multiple Access (CDMA); there is also Personal Digital Cellular (PDC), which is used exclusively in Japan.In the meantime, a variety of 2.5G standards have been developed. ‘Going digital’ has led to the emergence of several major 2G mobile wireless systems.

History of GSM:

Early European analog cellular networks consisted of a mix of technologies and protocols that varied from country to country, meaning that phones did not necessarily work on different networks. In addition, manufacturers had to produce different equipment to meet various standards across the markets.

In 1982, work began to develop a European standard for digital cellular voice telephony when the European Conference of Postal and Telecommunications Administrations (CEPT) created the Groupe Spécial Mobile committee and provided a permanent group of technical support personnel, based in Paris. Five years later in 1987, 15 representatives from 13 European countries signed a memorandum of understanding in Copenhagen to develop and deploy a common cellular telephone system across Europe, and European Union rules were passed to make GSM a mandatory standard. In 1989, the Groupe Spécial Mobile committee was transferred from CEPT to the European Telecommunications Standards Institute(ETSI).

Work began in 1991 to expand the GSM standard to the 1800 MHz frequency band and the first 1800 MHz network became operational in the UK by 1993. Also that year, Telecom Australia became the first network operator to deploy a GSM network outside Europe and the first practical hand-held GSM mobile phone became available.

By 2005, GSM networks accounted for more than 75% of the worldwide cellular network market, serving 1.5 billion subscribers. In 2005, the first HSDPA capable network also became operational. The first HSUPA network was launched in 2007 and worldwide GSM subscribers exceeded two billion in 2008.

Macau phased out their GSM network in January 2013 (except for roaming services), making it the first region to decommission a GSM network.

Architecture of the GSM network:

A GSM network is composed of several functional entities, whose functions and interfaces are specified. Figure 1 shows the layout of a generic GSM network. The GSM network can be divided into three broad parts. The Mobile Station is carried by the subscriber. The Base Station Subsystem controls the radio link with the Mobile Station. The Network Subsystem, the main part of which is the Mobile services Switching Center (MSC), performs the switching of calls between the mobile users, and between mobile and fixed network users. The MSC also handles the mobility management operations. The Mobile Station and the Base Station Subsystem communicate across the Um interface, also known as the air interface or radio link. The Base Station Subsystem communicates with the Mobile services Switching Center across the A interface.

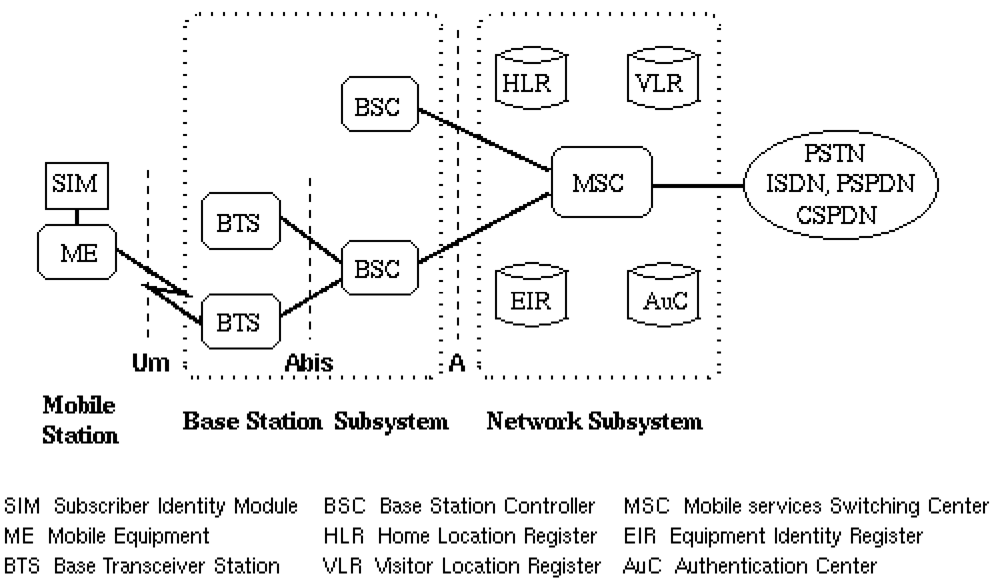


Figure 3.2 : General architecture of a GSM network

Mobile Station

The mobile station (MS) consists of the mobile equipment (the terminal) and a smart card called the Subscriber Identity Module (SIM). The SIM provides personal mobility, so that the user can have access to subscribed services irrespective of a specific terminal. By inserting the SIM card into another GSM terminal, the user is able to receive calls at that terminal, make calls from that terminal, and receive other subscribed services.

Base Station Subsystem

The Base Station Subsystem is composed of two parts, the Base Transceiver Station (BTS) and the Base Station Controller (BSC). These communicate across the standardized Abis interface, allowing (as in the rest of the system) operation between components made by different suppliers.

Network Subsystem

The central component of the Network Subsystem is the Mobile services Switching Center (MSC). It acts like a normal switching node of the PSTN or ISDN, and additionally provides all the functionality needed to handle a mobile subscriber, such as registration, authentication, location updating, handovers, and call routing to a roaming subscriber. The MSC provides the connection to the fixed networks (such as the PSTN or ISDN).

GSM SECURITY:

The security features in the GSM network can be divided into three sub parts: subscriber identity authentication, user and signaling data confidentiality, and subscriber identity confidentiality. The security mechanisms include secret keys, algorithms and computed numbers.

Some definitions:

- Authentication – any technique that enables the receiver to automatically identify and reject messages that have been altered deliberately or by channel errors
- Confidentiality – only the sender and intended receiver should be able to understand the contents of the transmitted message.
- Ciphertext – plaintext is encrypted to cipher text with the help of a key and an encryption algorithm
- Key – a string of numbers or characters as input to the encryption algorithm

The base mechanism shows where the different keys and algorithms are stored. The secret key Ki is used to authenticate the identity of a subscriber. The key Ki is given to the subscriber when he opens a new network account. Only the network operator knows the key. The Ki is stored in the subscribers SIM card and the authentication center (AuC) of the subscribers home network. The Ki is never transmitted over the network.

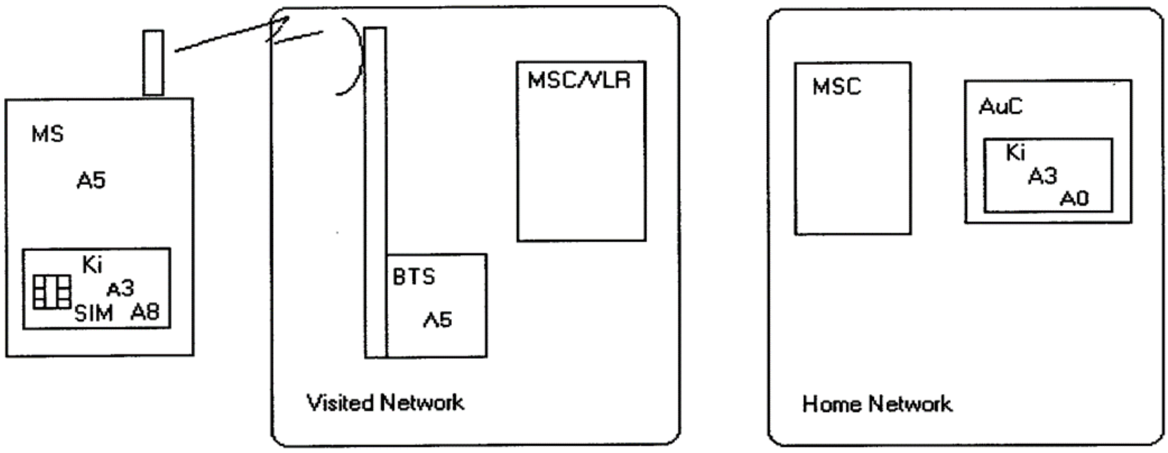


Figure 3.3: Base of the security mechanism.

A3 is the algorithm used to authenticate the subscriber. Data transmitted between the MS (Mobile Station) and the BTS (Base Transceiver Station) is encrypted by the A5 algorithm. The A8 algorithm generates the needed ciphering key Kc used by A5.

Subscriber Identity Authentication. The procedure consists of three phases, (1) the network must identify the subscriber, (2) needed security parameters from the home network are asked for and (3) the actual authentication is taking place.

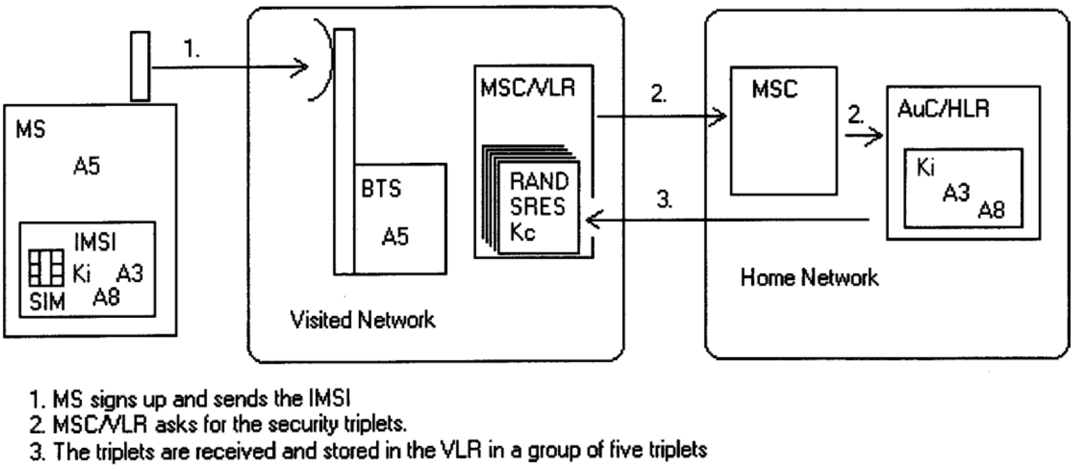


Figure 3.4 : Subscriber identification process.

In order to identify the subscriber the MS sends the IMSI (International Mobile Subscriber Identity) to the visited network. With the IMSI the subscriber is identified to the system. The IMSI is up to 15 digits and comprises the following parts:

- A 3-digit Mobile Country Code (MCC). This identifies the country where the GSM system operates. Finland has number 244.
- A 2-digit Mobile Network Code (MNC). This uniquely identifies each cellular provider. Sonera has number 91.
- The Mobile Subscriber Identification Code (MSIC).This uniquely identifies each customer of the provider. The length is 10 digits.

So called security triplets are calculated in the AuC. The triplets consist of a random number (RAND), a signed response (SRES) and a ciphering key (Kc). The SRES is used to authenticate the subscriber and Kc is used as input by the ciphering algorithm A5.

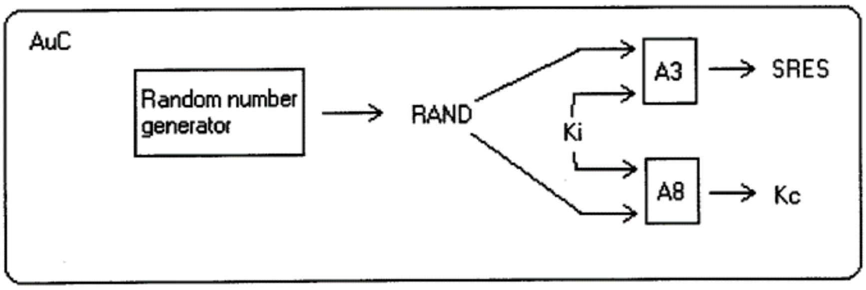


Figure 3.5: Calculating the security triplets.

As the visited network has received the security triplets the actual authentication can take place (see Figure 5). If the number sent by the MS to the BTS is the same as the one calculated by the AuC, the subscriber is authenticated.

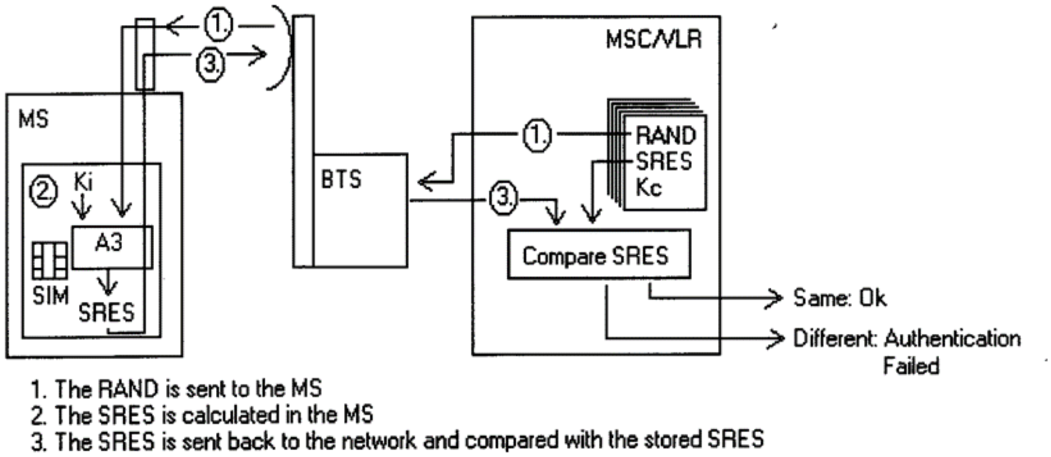


Figure 3.6: Authentication the subscriber

User and Signaling Data Confidentiality: The Ciphering key (Kc) is used for the final encryption of the radio link. One copy of the needed Kc is stored in the VLR and another copy is calculated in the MS by the A8 algorithm. The same Ki and RAND numbers are used as in the authentication process. The A5 algorithm creates a 114-bit sequence. This sequence is then XORed with every 114 user data bits and the resulting bit streams are sent over the two 57 bit parts of every GSM slot. All traffic between the MS and the BTS is then secured.

Subscriber Identity Confidentiality: The IMSI is the primary key for subscriber identification. However a temporary identity, TMSI (Temporary Mobile Subscriber Identity) can be given to a subscriber for identification. After initial registration is done with the IMSI, the serving network stores the IMSI in the VLR and generates a TMSI for the subscriber. The TMSI is then transmitted back to the MS and it will be used for identification as long as the subscriber is registered in that specific network.

Solutions to Current Security Issues

A corrected version of the COMP 128 has been developed; however, the cost to replace all SIM chips and include the new algorithm is too costly to cellular phone companies. The new release of 3GSM will include a stronger version of the COMP 128 algorithm and a new A5 algorithm implementation. The A5/3 is expected to solve current confidentiality and integrity problems. Fixed network transmission could be fixed by simply applying some type of encryption to any data transferred on the fixed network.

Channel structure:

Depending on the kind of information transmitted (user data and control signaling), we refer to different logical channels which are mapped under physical channels (slots). Digital speech is sent on a logical channel named TCH, which during the transmission can be allocated to a certain physical channel. In a GSM system no RF channel and no slot is dedicated a priori to the exclusive use of anything (any RF channel can be used for a number of different uses).

Logical channels are divided into two categories:

i. Traffic Channels
ii. Control Channels

Traffic Channels :

A traffic channel (TCH) is used to carry speech and data traffic. Traffic channels are defined using a 26-frame multiform, or group of 26 TDMA frames. The length of a 26-frame multiform is 120 ms, which is how the length of a burst period is defined (120 ms divided by 26 frames divided by 8 burst periods per frame). Out of the 26 frames, 24 are used for traffic, 1 is used for the Slow Associated Control Channel (SACCH) and 1 is currently unused. TCHs for the uplink and downlink are separated in time by 3 burst periods, so that the mobile station does not have to transmit and receive simultaneously, thus simplifying the electronics. TCHs carry either encoded speech or user data in both up and down directions in a point to point communication.There are two types of TCHs that are differentiated by their traffic rates. They are:

i. Full Rate TCH : It carries information at a gross rate of 22.82 Kbps.
ii. Half Rate TCH : It carries information with half of full rate channels.

Control Channels:

1	2	3	4	.	.	.	.	.	10	11	.	.	.	.	.					21						26

F	S	x	X	X	X	X	X	X	X	F	S	X	X	X	X	X	X	X	X	F	S	X	X	X	X	X

Actually in the above diagram S will be at slot 1 of next frame, F is frequency correction channel which occurs every 10th burst. The next frame to S contains the service operator’s information.

Logical Control Channel (LCC) s are of three types

They are of the following types:

i. Broadcast Control Channel(BCCH)
ii. Common Control Channel(CCCH)
iii. Dedicated Control Channel(DCCH)

Broadcast Control Channel (BCCH)

The BCCH is a point-to-multipoint unidirectional control channel from the fixed subsystem to MS that is intended to broadcast a variety of information to MSs, including information necessary for the MS to register in the system. BCCH has 51 bursts. BCCH is dedicated to slot1 and repeats after every 51 bursts. This channel is never kept idle-either the relevant messages are sent or a dummy burst is sent.

Common Control Channel (CCCH)

A CCCH is a point-to-multipoint (bi-directional control channel) channel that is primarily intended to carry signaling information necessary for access management functions (e.g., allocation of dedicated control channels).

Dedicated Control Channel (DCCH)

A DCCH is a point to point, directional control channel.Two types of DCCHs used are:

- Standalone DCCH (SDCCH) is used for system signaling during idle periods and call setup before allocating a TCH, for example MS registration, authentication and location updates through this channel. The channel is used for uplink and downlink and is meant for point-to-point usage.
- Associated Control Channel (ACCH) is a DCCH whose allocation is linked to the allocation of a CCH. A FACCH or burst stealing is a DCCH obtained by pre-emptive dynamic multiplexing on a TCH.

Data Transmission:

The GSM standard also provides separate facilities for transmitting digital data. This allows a mobile phone to act like any other computer on the Internet, sending and receiving data via the Internet Protocol. The mobile may also be connected to a desktop computer, laptop, or PDA, for use as a network. The AT commands can control anything from ringtones to data compression algorithms. In addition to general Internet access, other special services may be provided by the mobile phone operator, such as SMS.

Circuit-switched data protocols

A circuit-switched data connection reserves a certain amount of bandwidth between two points for the life of a connection, just as a traditional phone call allocates an audio channel of a certain quality between two phones for the duration of the call. Two circuit-switched data protocols are defined in the GSM standard: Circuit Switched Data (CSD) and High-Speed Circuit-Switched Data (HSCSD). These types of connections are typically charged on a per-second basis, regardless of the amount of data sent over the link. This is because a certain amount of bandwidth is dedicated to the connection regardless of whether or not it is needed. Circuit-switched connections do have the advantage of providing a constant, guaranteed quality of service, which is useful for real-time applications like video conferencing.

General Packet Radio Service (GPRS)

The General Packet Radio Service (GPRS) is a packet-switched data transmission protocol, which was incorporated into the GSM standard in 1997. It is backwards-compatible with systems that use pre-1997 versions of the standard. GPRS does this by sending packets to the local mobile phone mast (BTS) on channels not being used by circuit-switched voice calls or data connections. Multiple GPRS users can share a single unused channel because each of them uses it only for occasional short bursts. The advantage of packet-switched connections is that bandwidth is only used when there is actually data to transmit. This type of connection is thus generally billed by the kilobyte instead of by the second, and is usually a cheaper alternative for applications that only need to send and receive data sporadically, like instant messaging.

Short Message Service (SMS)

Short Message Service (more commonly known as text messaging) has become the most used data application on mobile phones, with 74% of all mobile phone users worldwide already as active users of SMS, or 2.4 billion people by the end of 2007. SMS text messages may be sent by mobile phone users to other mobile users or external services that accept SMS. The messages are usually sent from mobile devices via theShort Message Service Centre using the MAP protocol. The SMSC is a central routing hub for Short Messages. Many mobile service operators use their SMSCs as gateways to external systems, including the Internet, incoming SMS news feeds, and other mobile operators (often using the de facto SMPP standard for SMS exchange).

STRUCTURE OF TDMA SLOT WITH A FRAME:

There are five different kinds of bursts in the GSM system.They are:

- Normal Burst
- Synchronization Burst
- Frequency Correction Burst
- Access Burst
- Dummy Burst

Conclusion

GSM has many benefits over current cellular systems. The main problem now involves the COMP 128 algorithm problem. This problem will be solved as newer technology gets phased in. The lack of extra encryption on the telecommunications network doesn’t pose a major problem because any data transfer on there will have the same security as the current public switched telephone networks. Despite the current problems more and more cellular companies will switch to GSM based standards. An estimated one billion subscribers are expected by the end of 2003. As GSM slowly moves towards 3GSM, more problems and security issues will be resolved.

3.5 GPS Technology

What is GPS?

The **Global Positioning System**, usually called **GPS**, and originally named **NAVSTAR**, is a satellite navigation system used for determining one's precise location almost anywhere on Earth . A GPS unit receives time signal transmissions from multiple satellites, and calculates its position by triangulating this data. The GPS was designed by and is controlled by the United States Department of Defence and can be used by anybody for free. The cost of maintaining the system is approximately $400 million per year.

Measurement uncertainty of the majority of commercial GPS receivers varies from 10^{-11} to 10^{-13} by the frequency scale, and from 100 ns to 50 ns by the time scale, being dependent on the receiver design. The main sources of uncertainty in GPS measurements are the GPS receiver position error, the orbital error, the satellite and receiver clock errors, the ionosphere and the troposphere delays, the receiver internal delay, the satellite antenna and cable delay, the receiver noise, and the multipath error. The frequency uncertainty for a GPS receiver is larger than that for Cs-standard by 2-3 orders within a short-time interval (1 – 1000 s), and by one order within a long-term interval of about one week

GPS is a system of satellites, ground control stations, and receivers that allows users to determine their position. By capturing and storing that position, GPS receivers ``digitize” spatial data as they walk, drive, or otherwise traverse the land. For this reason the term “rover” receiver unit is often used to describe a GPS field receiver. For the sake of consistency, the term “GPS receiver” or “receiver” will be used to identify the GPS ``rover” receiver from this point forward. Perhaps the most important characteristic that GIS data developers need to realize about GPS is that it is a highly dynamic system with new satellites being launched and old ones being retired. The constellation of satellites available to users throughout the day is constantly changing as the satellites move through their orbits. Occasionally, satellites are shifted into new orbits. Collecting GPS data in Vermont often adds the complications of vegetative cover, topography, and relatively northern latitude to the inherent variability in the system. Receivers differ in their ability to receive and process GPS signals and users can have a huge effect on accuracy depending on the methods used to collect and process data.

It may help to think of a GPS receiver as similar to a standard radio. Like the radio in your car, a GPS receiver is collecting radio signals from the “ether” and magically turning these signals into information we can use. In the case of a GPS receiver the “stations” are satellites broadcasting 11,000 miles away in space and the music is a binary code, but the antenna and radio hardware are subject to similar kinds of interference that affect your car radio’s ability to produce a clear sound. In your car speaker we hear this interference as “static”; in your GPS receiver the interference may result in positional “static”, i.e., degradation of accuracy. A better radio receiver and antenna system, fewer terrain obstructions, a stronger connection to the broadcasting station all result in better sound quality for your car radio and better positional quality for your GPS radio. A GPS receiver derives its location or positional “fix” with distance measurements (called pseudo ranges) from multiple satellites at precisely the same time, a “measurement epoch”. Attributes collected and stored with the position for each feature can be used in GIS map making and analysis. While there are only so many things you can do to improve your car radio’s performance, by contrast there are many more things users can do to influence GPS positional quality.

How does GPS work?

Satellites

The United States **Global Positioning System** (GPS) is the first fully operational **Global Navigation Satellite System** (GNSS). Each satellite broadcasts a signal that is used by receivers to determine precise position anywhere in the world. The receiver tracks multiple satellites and determines a pseudo range measurement (a range measurement based on time) that is then used to determine the user location. A minimum of four satellites is necessary to establish an accurate three-dimensional position.

The **Department of Defense** (DOD) is responsible for operating the GPS satellite constellation and monitors the GPS satellites to ensure proper operation. Every satellite's orbital parameters (ephemeris data) are sent to each satellite for broadcast as part of the data message embedded in the GPS signal. The GPS coordinate system is the Cartesian earth-centered earth-fixed coordinates as specified in the World Geodetic System reference system 1984 (WGS-84).24 GPS satellites are currently in orbit around the earth. The first was launched in 1972 and the latest satellite was launched in 2012. The maximum available at any time from a point in Oregon is generally between 4 to 11. The satellites send out radio signals that are collected and read by the GPS receiver.

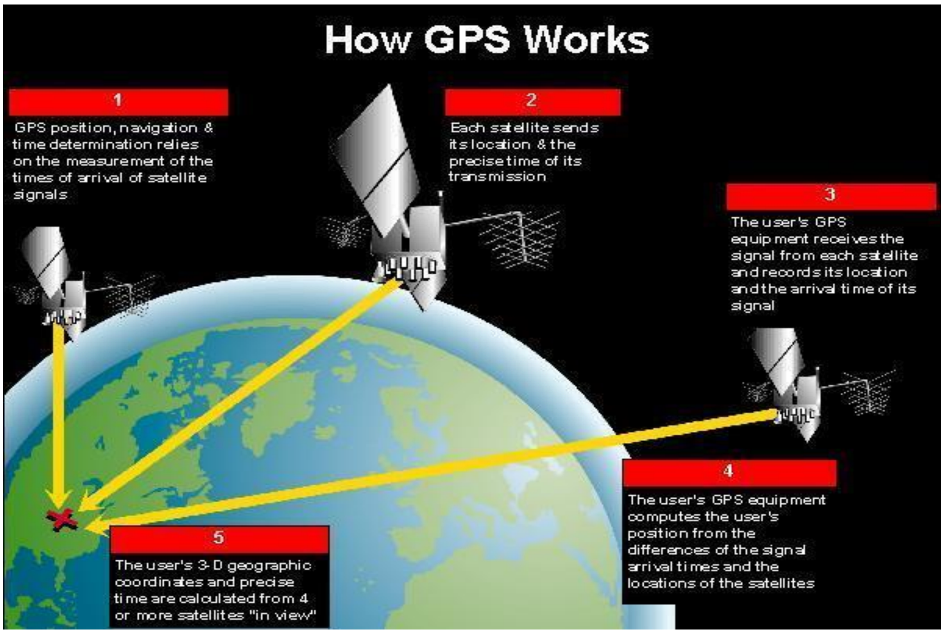
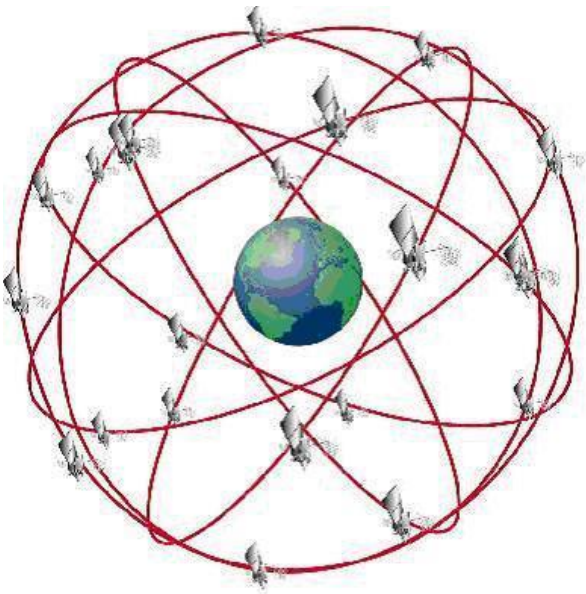


Fig: How GPS Works

GPS Receivers

GPS receivers can calculate a position on the earth by measuring the travel time of radio signals from the satellites to the receiver. The calculations depend on highly accurate clocks. The satellites have atomic clocks that are accurate to a nanosecond but due to cost, the clocks in most GPS receivers are not that accurate. Using three satellites, each measurement of time generates a sphere. Where these three spheres intersect is a point that indicates a place on the earth. The fourth satellite can then be used to eliminate any clock errors in the ground-based receiver. Even a small clock error can create a large error in location.



When Global Navigation Satellite System (GNSS) equipment is not using integrity information from Wide Area Augmentation Systems (WAAS) or Local Area Augmentation Systems (LAAS), the GPS navigation receiver using Receiver Autonomous Integrity Monitoring (RAIM) provides GPS signal integrity monitoring. RAIM is necessary since delays of up to two hours can occur before an erroneous satellite transmission can be detected and corrected by the satellite control segment. The RAIM function is also referred to as fault detection. Another capability, fault exclusion, refers to the ability of the receiver to exclude a failed satellite from the position solution and is provided by some GPS receivers and by WAAS receivers.

The GPS receiver verifies the integrity (usability) of the signals received from the GPS constellation through **Receiver Autonomous Integrity Monitoring** (RAIM) to determine if a satellite is providing corrupted information. At least one satellite, in addition to those required for navigation, must be in view for the receiver to perform the RAIM function; thus, RAIM needs a minimum of five satellites in view, or four satellites and a barometric altimeter (baro-aiding) to detect an integrity anomaly.

RAIM messages vary somewhat between receivers; however, generally there are two types. One type indicates that there are not enough satellites available to provide RAIM integrity monitoring and another type indicates that the RAIM integrity monitor has detected a potential error that exceeds the limit for the current phase of flight. Without RAIM capability, the pilot has no assurance of the accuracy of the GPS position.

RAIM Capability

Many VFR GPS receivers and all hand-held units have no RAIM alerting capability. Loss of the required number of satellites in view, or the detection of a position error, cannot be displayed to the pilot by such receivers. In receivers with no RAIM capability, no alert would be provided to the pilot that the navigation solution had deteriorated, and an undetected navigation error could occur. Only a systematic cross-check with other navigation techniques would identify this failure, and prevent a serious deviation.

Classes Of Receivers

GPS receivers and software can be used to obtain positions with accuracies from centimeters to tens of meters. The mapping/resource grade receivers that are the focus of this document are generally able to obtain positions with accuracies from five decimeters to ten meters. Some mapping/resource grade receivers can also be used as remote base stations. There are estimated to be over 500 GPS receiver models available from over 100 different manufacturers around the world. Competition has improved the products and reduced the cost, but has also confused the buyer. The table, illustrated in Part D below, is offered as a generic guideline to available GPS products.

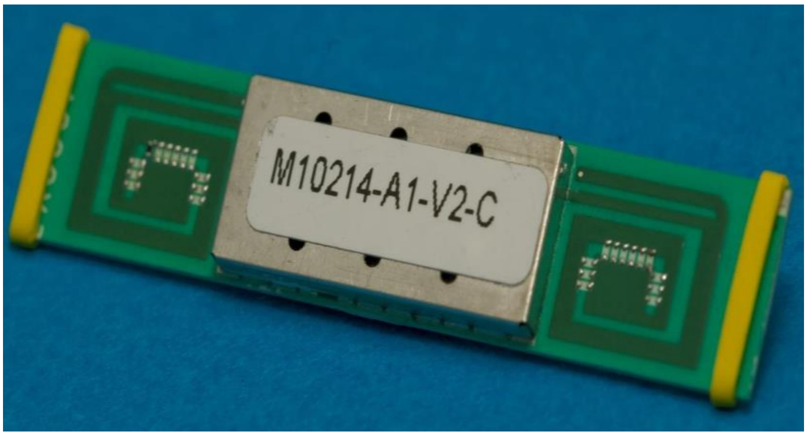


Fig: Receiver

A civilian GPS receiver is generally categorized as (1) recreational grade, (2) mapping/resource grade, or (3) survey grade, based on its functionality. The characteristics of each of these GPS "grades" are briefly described below, and then listed in a table for easier comparison.

Recreational Grade GPS

Recreational grade GPS receivers are the least expensive and the simplest to use, because they have less functionality (and less associated software and hardware) than the other grades. As the name implies, these "handheld" GPS receivers are intended primarily for recreational purposes. These are useful for general navigation and surveillance purposes because they can quickly collect the x-y coordinates of point features, and can be used to pre-plan routes and/or navigate to specific locations using waypoints. This fact not only limits the accuracy of features collected but also prevents the user from downloading captured features digitally. The only recourse to creating spatial data with these receivers is to manually transcribe feature coordinates into a format that can be imported into a GIS.

Popular recreational receivers can be expected to produce horizontal positions with an accuracy of approximately 10 meters under clear tracking conditions. Positioning under canopy can reduce this accuracy to approximately 30 meters, or worse, depending on tracking conditions.

Mapping/Resource Grade GPS

This guideline recommends that GPS data being collected for GIS utilize mapping/resource grade receivers. Mapping/resource GPS tools capture data of higher positional accuracy than recreational receivers, and all have post-processing differential correction capabilities. Unlike recreational GPS, these receivers also collect locations for features represented as points (e.g., sample point), lines (e.g., trail), and areas (e.g., field boundary), complimenting GIS database organization schemes. Mapping/resource GPS equipment required in the field ranges from "handheld" to "backpack" systems. The more expensive mapping/resource grade GPS receivers are designed to: (1) collect and store large volumes of data, (2) be used in extreme environmental conditions, (3) perform real-time differential correction of data; and 4) act as a field reference base station. The average accuracy for this grade of GPS receivers varies and changes as technology develops, but at this time accuracy is generally between .5-5 meters when data is "post-processed" or acquired "real time", under typical data collection constraints.

Survey Grade GPS

This document does not address survey grade activities. Survey grade GPS tools are only used for surveying-related activities requiring a high degree of accuracy. For example, licensed land surveyors use these GPS tools for geodetic surveys, and to measure elevations. These systems produce data of the highest horizontal and vertical positional accuracy, but are very expensive and complex. The use of a survey grade system requires specialized training, and one or more dedicated staff to oversee its use and maintenance. Survey grade GPS data are almost always post-processed to increase their accuracy.

Structure

The current GPS consists of three major segments. These are the space segment (SS), a control segment (CS), and a user segment (US). The U.S. Air Force develops, maintains, and operates the space and control segments. GPS satellites broadcast signals from space, and each GPS receiver uses these signals to calculate its three-dimensional location (latitude, longitude, and altitude) and the current time.

The space segment is composed of 24 to 32 satellites in medium Earth orbit and also includes the payload adapters to the boosters required to launch them into orbit. The control segment is composed of a master control station, an alternate master control station, and a host of dedicated and shared ground antennas and monitor stations. The user segment is composed of hundreds of thousands of U.S. and allied military users of the secure GPS Precise Positioning Service, and tens of millions of civil, commercial, and scientific users of the Standard Positioning Service (see GPS navigation devices).

Space segment

The space segment (SS) is composed of the orbiting GPS satellites or Space Vehicles (SV) in GPS parlance. The GPS design originally called for 24 SVs, eight each in three approximately circular orbits, but this was modified to six orbital planes with four satellites each. The orbits are centered on the Earth, not rotating with the Earth, but instead fixed with respect to the distant stars. The six orbit planes have approximately 55° inclination (tilt relative to Earth's equator) and are separated by 60° right ascension of the ascending node (angle along the equator from a reference point to the orbit's intersection). The orbital period is one-half a sidereal day, i.e., 11 hours and 58 minutes. The orbits are arranged so that at least six satellites are always within line of sight from almost everywhere on Earth's surface.The result of this objective is that the four satellites are not evenly spaced (90 degrees) apart within each orbit. In general terms, the angular difference between satellites in each orbit is 30, 105, 120, and 105 degrees apart which, of course, sum to 360 degrees.

Control segment

The control segment is composed of

- a master control station (MCS),
- an alternate master control station,
- four dedicated ground antennas and
- six dedicated monitor stations

User segment

The user segment is composed of hundreds of thousands of U.S. and allied military users of the secure GPS Precise Positioning Service, and tens of millions of civil, commercial and scientific users of the Standard Positioning Service. In general, GPS receivers are composed of an antenna, tuned to the frequencies transmitted by the satellites, receiver-processors, and a highly stable clock (often a crystal oscillator). They may also include a display for providing location and speed information to the user. A receiver is often described by its number of channels: this signifies how many satellites it can monitor simultaneously. Originally limited to four or five, this has progressively increased over the years so that, as of 2007, receivers typically have between 12 and 20 channels.

A typical OEM GPS receiver module measuring 15×17 mm.

GPS receivers may include an input for differential corrections, using the RTCM SC-104 format. This is typically in the form of an RS-232port at 4,800 bit/s speed. Data is actually sent at a much lower rate, which limits the accuracy of the signal sent using RTCM Receivers with internal DGPS receivers that can outperform those using external RTCM data. As of 2006, even low-cost units commonly include Wide Area Augmentation System (WAAS) receivers.

Factors that affect data quality:

- Satellite geometry and PDOP
- Signal to Noise Ratio (SNR)
- Multipath
- Accuracy of the data under different conditions (PDOP and SNR)
- Ability to "turn off" data collection when predicted error is high

Recommendations for GPS data collection:

- Data to be used outside GIS
- Data to be incorporated into GIS

Project layers

For data that is not used in conjunction with any other corporate data, is used only at a very small scale, or is very time-sensitive, you may use whatever method will give you an acceptable accuracy. This would include things such as firelines, points for a small-scale map (such as the location of a timber sale on a forest-wide map), or for a personal project such as tracking your path of travel during a survey.

Corporate layers

Landlines or legal boundaries must be GPSed with survey-grade GPS units. For other corporate layers, if recreational grade GPS data is all that's available, it may be incorporated into the corporate data, but must be designated as ">5 meter accuracy" in the metadata for the features you GPSed (see below). This will allow us to exclude this data from applications requiring highly accurate features, like PBS updates. If more accurate data is available from another source it should be used instead.

Metadata for GSPed features

Metadata is necessary to identify the source and accuracy of the data you are adding to GIS. Any GPS data that may eventually be added to a Primary Base Series quad map must have metadata attached. In addition, some GPS data, such as public land survey and ownership boundaries, must meet survey-grade requirements and have metadata to back it up.

National Map Accuracy Standards

The 2003 GIS Data Dictionary requires the horizontal accuracy of most layers to meet the National Standard for Spatial Data Accuracy. At the scale of 1:24,000, this standard is 40 feet or 12.2 meters.

Source Codes for GPS Data

Three source codes for GPS data have been specified in the Guidelines for Digital Base Map Updates. The Draft GPS Data Accuracy Standard (USFS) also refers to these same codes to use for GPS accuracy. CSA 2 has added a fourth code to address greater than 5 meter accuracy (such as data collected with a Garmin). A detailed description of the codes is attached to this document in Appendix A.

How to Record the Metadata

Record the source of your GPS data, using the codes from Appendix A, in the item listed in the table below. The item should be added to the coverage if it is not already there. You will need to coordinate this with a GIS person on your district or Forest (item_width 2, output width 2, item type C.) In addition, an item called source_code_memo can be added to record additional information or explanatory notes about the data, such as the model of the receiver used.

Applications:

While originally a military project, GPS is considered a dual-use technology, meaning it has significant military and civilian applications. GPS has become a widely deployed and useful tool for commerce, scientific uses, tracking, and surveillance. GPS's accurate time facilitates everyday activities such as banking, mobile phone operations, and even the control of power grids by allowing well synchronized hand-off switching

Conclusions:

Due to performance differences, two user’s GPS receivers can yield different frequency results even when connected to the same antenna at the same location. The frequency uncertainty for a user's GPS receiver is larger than that for Cs-standard by 2-3 orders for a short-time interval (1 – 1000 s), and by one order for a long-term interval of about two weeks.

The user's GPS receiver time scale bias from the Universal Coordinated Time can be in order of microseconds. It depends on the time delay in GPS receiver, satellite antenna, antenna's cable, ionosphere correction error, and software errors.

Commercial GPS receiver calibration service provided by INPL ensures measurement uncertainty of about 10^{-14} in the frequency scale, of about 5 ns in the time scale, as well as traceability to the Universal Coordinated Time.

3.6 AUDIO RECORDER AND PLAY BACK

In order to save any voice and play the same voice back again we have AUDIO RECORDER AND PLAY BACK module. For saving any audio signals i.e., analog in nature we are using a Re-Recording voice IC called ARP9600.

Voice recorder and play back module which uses ARP9600 is shown below:

Fig: Voice Module

General Description of ARP9600:

The APR9600 device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. The device supports both random and sequential access of multiple messages. Sample rates are user-selectable, allowing designers to customize their design for unique quality and storage time needs. Integrated output amplifier, microphone amplifier, and AGC circuits greatly simplify system design. The device is ideal for use in portable voice recorders, toys, and many other consumer and industrial applications.

APLUS integrated achieves these high levels of storage capability by using its proprietary Analog/multilevel storage technology implemented in an advanced Flash non-volatile memory process, where each memory cell can store 256 voltage levels. This technology enables the

APR9600 device to reproduce voice signals in their natural form. It eliminates the need for encoding and compression, which often introduce distortion.

Features:

Single-chip, high-quality voice recording & playback solution

- No external ICs required
- Minimum external components
- Non-volatile Flash memory technology
- No battery backup required
- User-Selectable messaging options
- Random access of multiple fixed-duration messages
- Sequential access of multiple variable-duration messages
- User-friendly, easy-to-use operation
- Programming & development systems not required
- Level-activated recording & edge-activated play back switches
- Low power consumption
- Operating current: 25 mA typical
- Standby current: 1 uA typical
- Automatic power-down
- Chip Enable pin for simple message expansion

PIN DIAGRAM OF ARP9600:

Fig: Pin Diagrams of ARP9600

FUNCTIONAL DESCRIPTION:

APR9600 block diagram is included in order to describe the device's internal architecture. At the left hand side of the diagram are the analog inputs. A differential microphone amplifier, including integrated AGC, is included on-chip for applications requiring use. The amplified microphone signals fed into the device by connecting the ANA_OUT pin to the ANA_IN pin through an external DC blocking capacitor. Recording can be fed directly into the ANA_IN pin through a DC blocking capacitor, however, the connection between ANA_IN and ANA_OUT is still required for playback. The next block encountered by the input signal is the internal anti-aliasing filter. The filter automatically adjusts its response according to the sampling frequency selected so Shannon's Sampling Theorem is satisfied. After anti-aliasing filtering is accomplished the signal is ready to be clocked into the memory array. This storage is accomplished through a combination of the Sample and Hold circuit and the Analog Write/Read circuit. These circuits are clocked by either the Internal Oscillator or an external clock source. When playback is desired the previously stored recording is retrieved from memory, low pass filtered, and amplified as shown on the right hand side of the diagram. Thesignal can be heard by connecting a speaker to the SP+ and SP- pins. Chip-wide management is accomplished through the device control block shown in the upper right hand corner. Message management is provided through the message control block represented in the lower center of the block diagram.

ARP9600 BLOCK DIAGRAM:

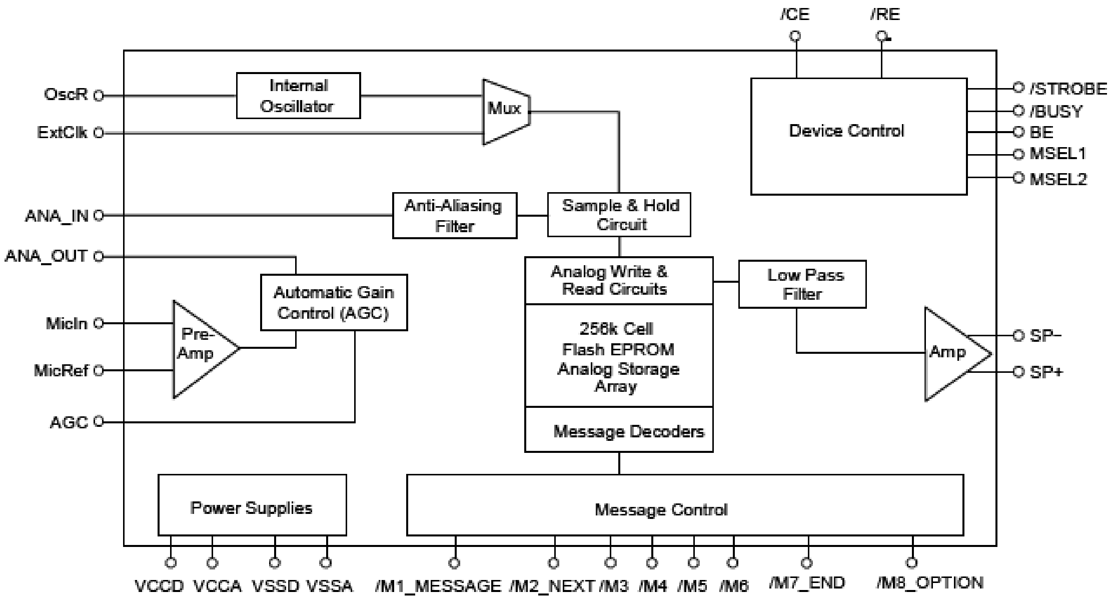


Fig: Block Diagram of APR9600

Message Management:

Message Management General Description:

Playback and record operations are managed by on-chip circuitry. There are several available messaging modes depending upon desired operation. These message modes determine message management style, message length, and external parts count. Therefore, the designer must select the appropriate operating mode before beginning the design. Operating modes do not affect voice quality; for information on factors affecting quality refer to the Sampling Rate &

Voice Quality section. The device supports five message management modes (defined by the MSEL1, MSEL2 and /M8_OPTION pins shown in above two figures.

Random access mode with 2, 4, or 8 fixed-duration messages Tape mode, with multiple

Variable-duration messages, provides two options:

- Auto rewind
- Normal

Table 1

Mode	MSEL1	MSEL2	/M8_OPTION
Random Access 2 fixed duration messages	0	1	Pull this pin to VCC through I00K resistor
Random Access 4 fixed duration messages	1	0	Pull this pin to VCC through I00K resistor
Random Access 8 fixed duration messages	1	1	The /M8 message trigger becomes input pin
Tape mode, Auto rewind operation	0	0	0
Tape mode, Normal operation	0	0	1

Random Access Mode:

Random access mode supports 2, 4, or 8 Message segments of fixed duration. As suggested recording or playback can be made randomly in any of the selected messages. The length of each message segment is the total recording length available (as defined by the selected sampling rate) divided by the total number of segments enabled (as decoded in Table1). Random access mode provides easy indexing to message segments.

Functional Description of Recording in Random Access Mode:

On power up, the device is ready to record or playback in any of the enabled message segments. To record, /CE must be set low to enable the device and /RE must be set low to enable recording. You initiate recording by applying a low level on the message trigger pin that represents the message segment you intend to use. The message trigger pins are labeled /M1_MESSAGE - /M8_OPTION on pins 1-9 (excluding pin 7) for message segments 1-8 respectively.

Functional Description of Playback Random Access Mode:

On power up, the device is ready to record or playback, in any of the enabled message segments. To playback,/CE must be set low to enable the device and /RE must be set high to disable recording & enable playback.You initiate playback by applying a high to low edge on the message trigger pin that represents the message segment you intend to playback. Playback will continue until the end of the message is reached. If a high to low edge occurs on the same message trigger pin during playback, playback of the current message stops immediately. If a different message trigger pin pulses during playback, playback of the current message stops immediately (indicated by one beep) and playback of the new message segment begins. A delay equal to 8,400 cycles of the sample clock will be encountered before the device starts playing the new message. If a message trigger pin is held low, the selected message is played back repeatedly as long as the trigger pin stays low. A period of silence, of a duration equal to 8,400 cycles of the sampling clock, will be inserted during looping as an indicator to the user of the transition between the end and the beginning of the message.

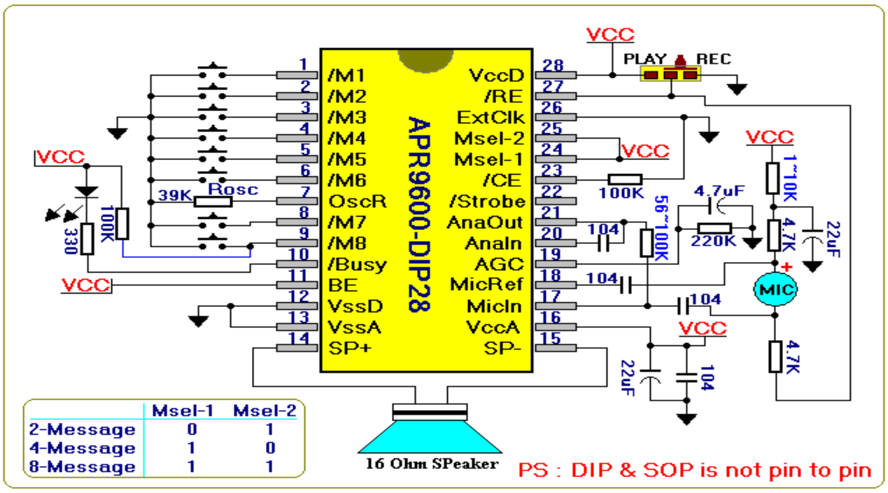
Sampling Rate & Voice Quality:

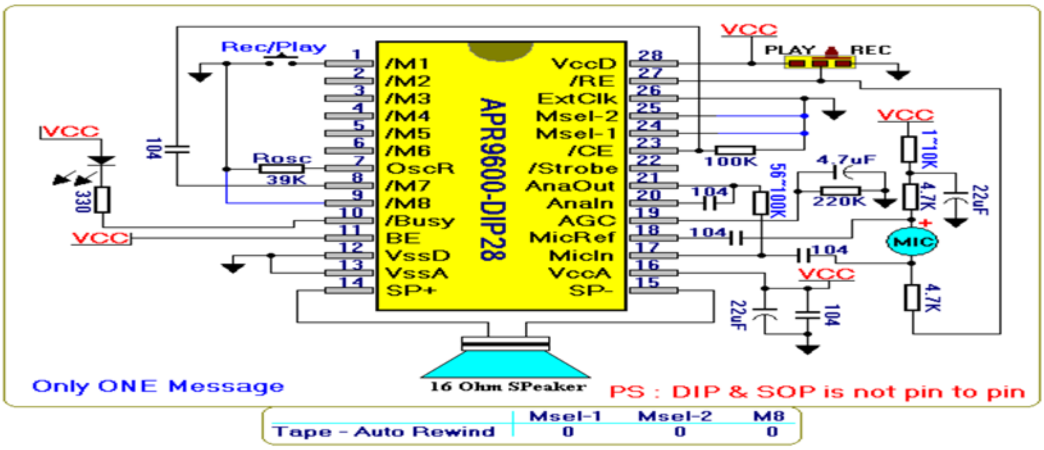
According to Shannon's sampling theorem, the highest possible frequency component introduced to the input of a sampling system must be equal to or less than half the sampling frequency if aliasing errors are to be eliminated. The APR9600 automatically filters its input, based on the selected sampling frequency, to meet this requirement. Higher sampling rates increase the bandwidth and hence the voice quality, but they also use more memory cells for the same length of recording time. Lower sampling rates use fewer memory cells and effectively increase the duration capabilities of the device, but they also reduce incoming signal bandwidth. The APR9600 accommodates sampling rates as high as 8 kHz and as low a 4 kHz. You can control the quality/duration trade off by controlling the sampling frequency. An internal oscillator provides the APR9600 sampling clock. Oscillator frequency can be changed by changing the resistance from the OscR pin to GND. Table 2 summarizes resistance values and the corresponding sampling frequencies, as well as the resulting input bandwidth and duration.

Table 2: Resistance Values & Sampling Frequencies

Resistance	Sampling Frequency	Input Bandwidth	Duration
84 K	4.2 kHz	2.1 kHz	60 sec
38 K	6.4 kHz	3.2 kHz	40 sec
24 K	8.0 kHz	4.0 kHz	32 sec

Random Access Mode: 2 / 4 / 8 Message





3.7 THING SPEAK

According to its developers, "ThingSpeak is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP and MQTT protocol over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates".ThingSpeak was originally launched by ioBridge in 2010 as a service in support of IoT applications.

ThingSpeak has integrated support from the numerical computing software MATLAB from MathWorks, allowing ThingSpeak users to analyze and visualize uploaded data using Matlab without requiring the purchase of a Matlab license from Mathworks.

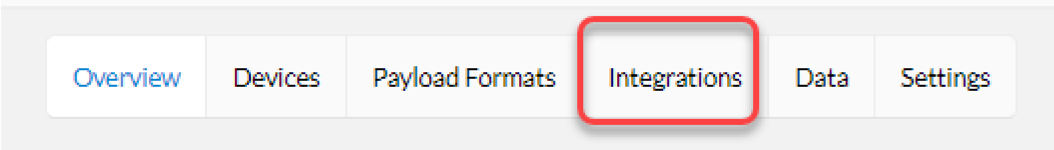
ThingSpeak has a close relationship with Mathworks, Inc. In fact, all of the ThingSpeak documentation is incorporated into the Mathworks' Matlab documentation site and even enabling registered Mathworks user accounts as valid login credentials on the ThingSpeak website. The terms of service and privacy policy of ThingSpeak.com are between the agreeing user and Mathworks, Inc.

ThingSpeak has been the subject of articles in specialized "Maker" websites like Instructables, Codeproject, and Channel 9.

To forward data to ThingSpeak, you must have an application on the Things Network with a registered device and a payload formatter. Create a ThingSpeak integration to forward the data.

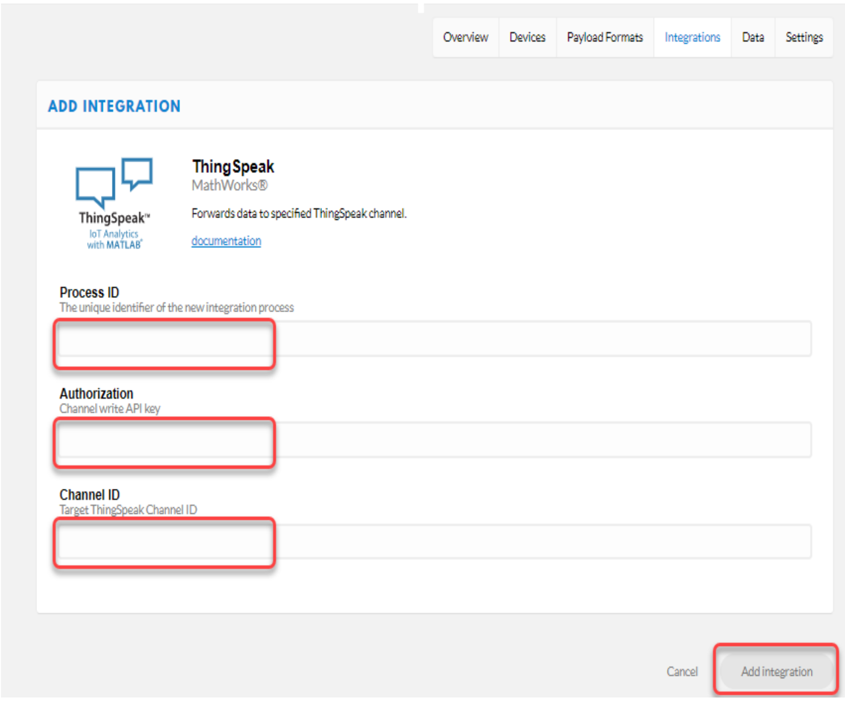
1. Log in to The Things Network Console.
2. Select Applications, and then select the application you want to forward data to ThingSpeak from.

3. Click the Integrations tab.



4. Select ThingSpeak.

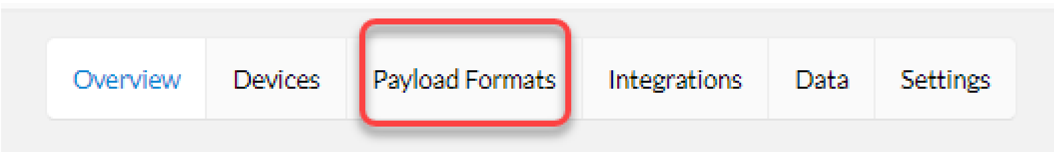
5. In the Process ID field, name your integration.
6. In the Authorization field, enter the write API key for the channel that you want to store your data in. The API key is available from the 'API keys' tab of your ThingSpeak channel.
7. In the Channel ID field, enter the channel ID for the ThingSpeak channel you want to forward data into. The channel ID is available on your ThingSpeak channel's page.



Payload Format

Next, set up the payload formatter. The payload formatter converts bytes sent from your device into a data format that can be stored and visualized on ThingSpeak. The example payload format is for a payload of 20 bytes where the output variables are one, two, or three bytes. For an example of how to send a particular payload from a device and format it for the ThingSpeak integration, see Collect Agricultural Data over The Things Network.

1. Click Payload Formats.



3.8 SOFTWARE MODULES DESCRIPTION

ARDUNIO INSTALLATION:

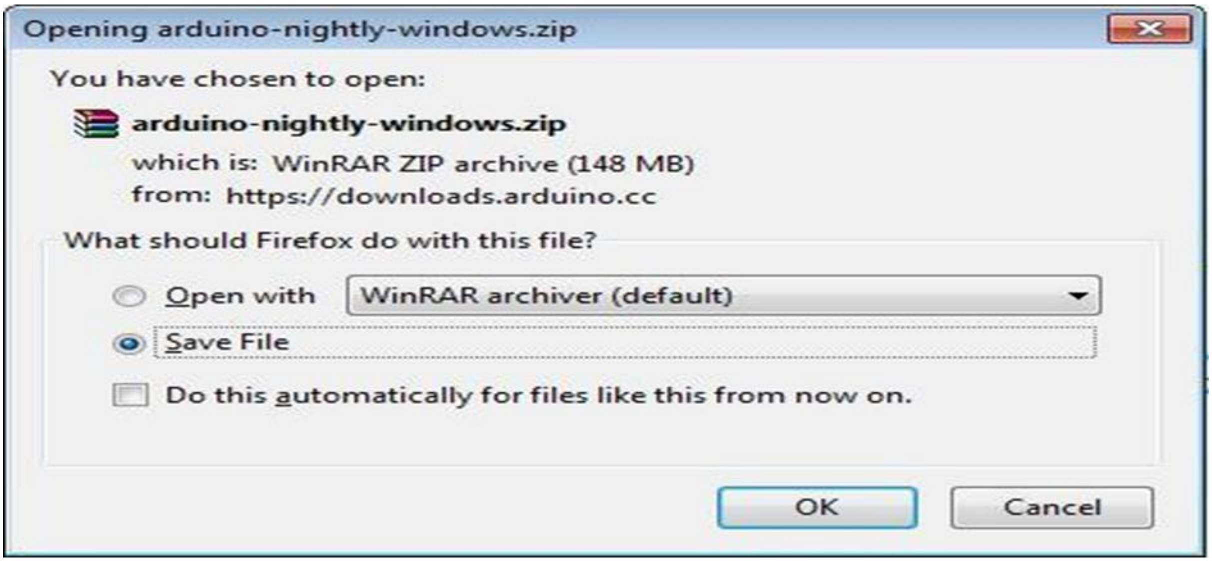
After learning about the main parts of the Arduino UNO board, we are ready to learn how to set up the Arduino IDE. Once we learn this, we will be ready to upload our program on the Arduino board.

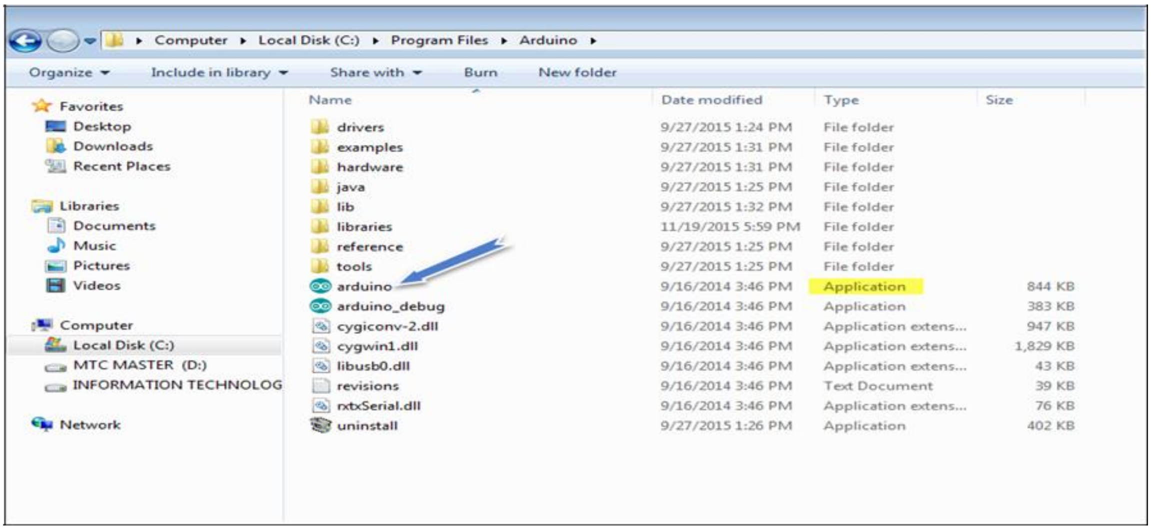
In this section, we will learn in easy steps, how to set up the Arduino IDE on our computer and prepare the board to receive the program via USB cable.

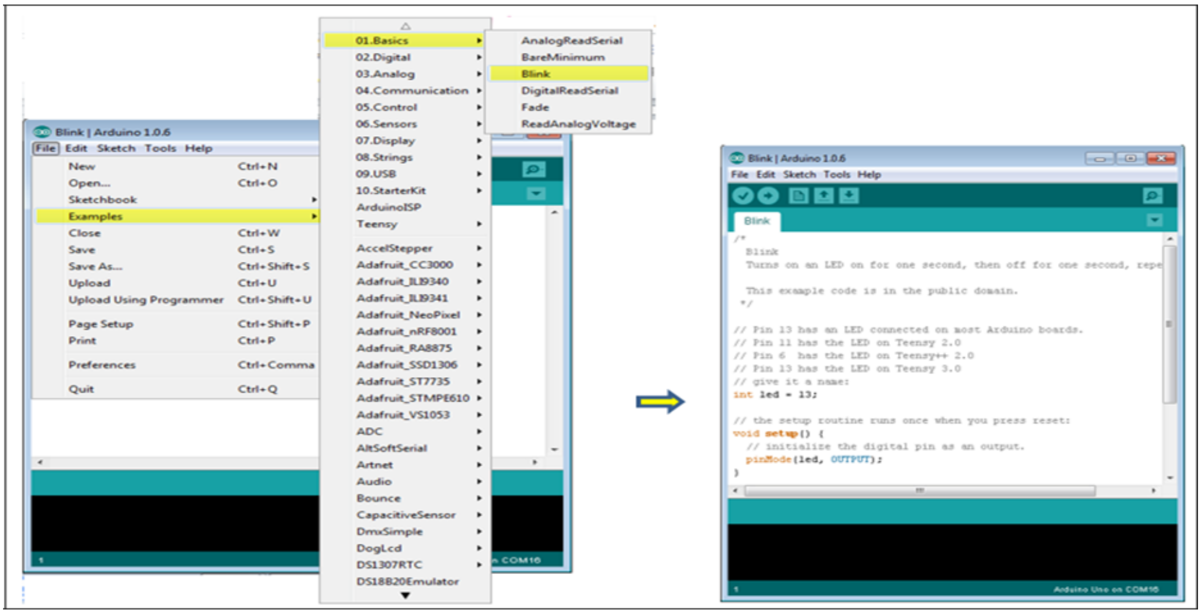
Step 1: First you must have your Arduino board (you can choose your favorite board) and aUSB cable. In case you use Arduino UNO, ArduinoDuemilanove, Nano, Arduino Mega 2560, or Diecimila, you will need a standard USB cable (A plug to B plug), the kind you would connect to a USB printer as shown in the following image.

Step 2: Download Arduino IDE Software.

You can get different versions of Arduino IDE from the Download page on the Arduino Official website. You must select your software, which is compatible with your operating system (Windows, IOS, or Linux). After your file download is complete, unzip the file.





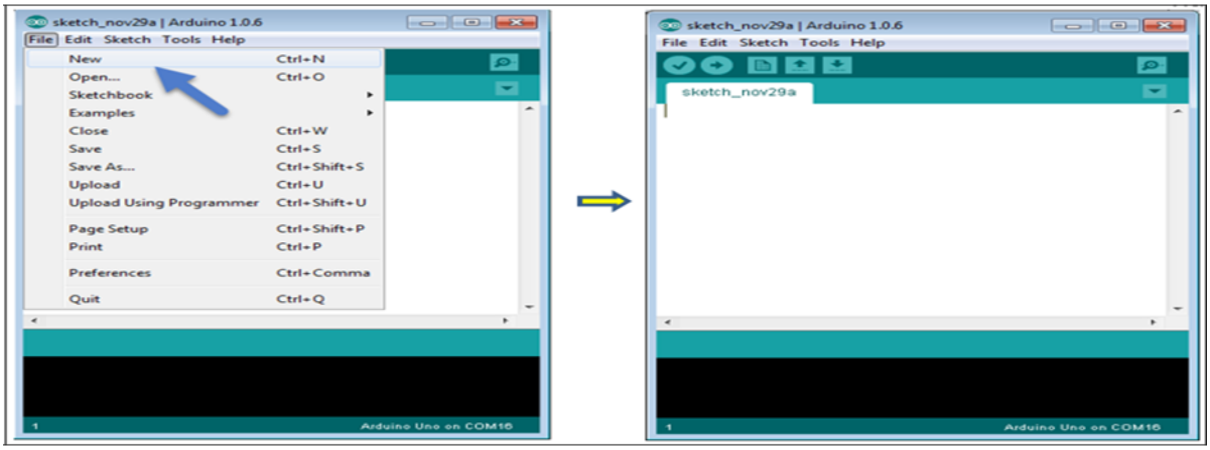


Step 3: Power up your board.TheArduino Uno, Mega, Duemilanove and ArduinoNano automatically draw power from either, the USB connection to the computer or an external power supply. If you are using an ArduinoDiecimila, you have to make sure that the board is configured to draw power from the USB connection. The power source is selected with a jumper, a small piece of plastic that fits onto two of the three pins between the USB and power jacks. Check that it is on the two pins closest to the USB port.Connect the Arduino board to your computer using the USB cable. The green power LED (labeled PWR) should glow.

Step 4: Launch Arduino IDE. After your Arduino IDE software is downloaded, you need to unzip the folder. Inside the folder, you can find the application icon with an infinity label (application.exe). Double-click the icon to start the IDE.

Step 5: Open your first project.

- Once the software starts, you have two options:
- Create a new project.
- Open an existing project example.
- To create a new project, select File --> New



To open an existing project example, select File -> Example -> Basics -> Blink.

Here, we are selecting just one of the examples with the name **Blink**. It turns the LED on and off with some time delay. You can select any other example from the list.

Step 6: Select your Arduino board.

To avoid any error while uploading your program to the board, you must select the correct Arduino board name, which matches with the board connected to your computer.

Go to Tools -> Board and select your board

CHAPTER 4

PROJECT IMPLEMENTATION

4.1 DESIGN AND IMPLEMENTATION:

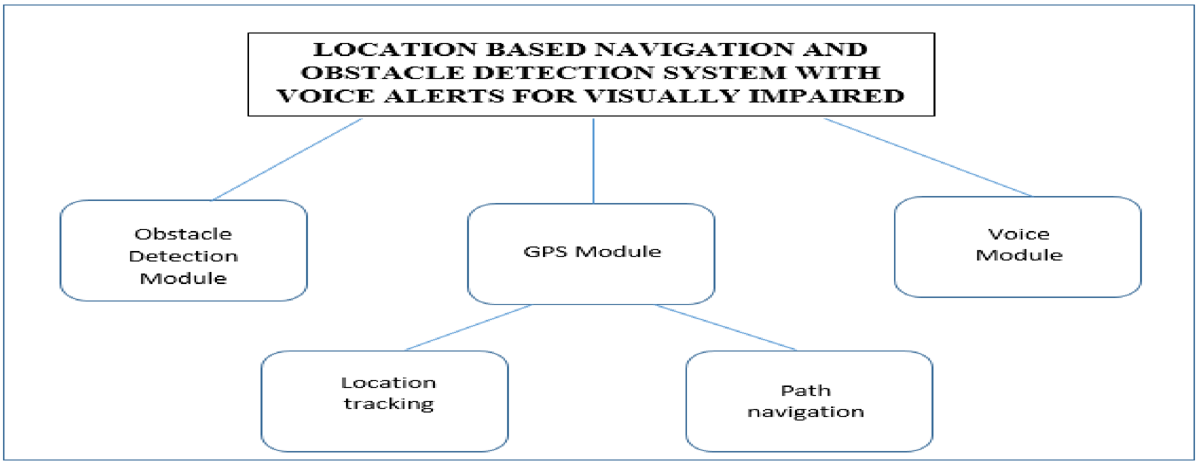


Figure 4.1: Experimental implementation of the project

The object detection flow diagram is as shown in figure 3.2, the arduino is initialized and if any obstacle comes in the blind person way then ultrasonic sensor will give information about that object, LDR sensor will give information about the light, moisture sensor about water, fire sensor about fire detected then the data processed by microcontroller is sent to the APR33A3 voice module which gives information to the blind person through voice command. If not the blind person will continue to walk. The flow diagram of blind man location tracking is as shown in figure 3.3 where arduino is initialized and if the person is in any trouble then his care taker will get the text message along with the location of that blind person by setting up of GPS for location and GSM for sending SMS to the care taker with some help text and location along with longitude and latitude, otherwise the person continues his walk smoothly.

4.2 SNAP SHOTS OF THE PROJECT

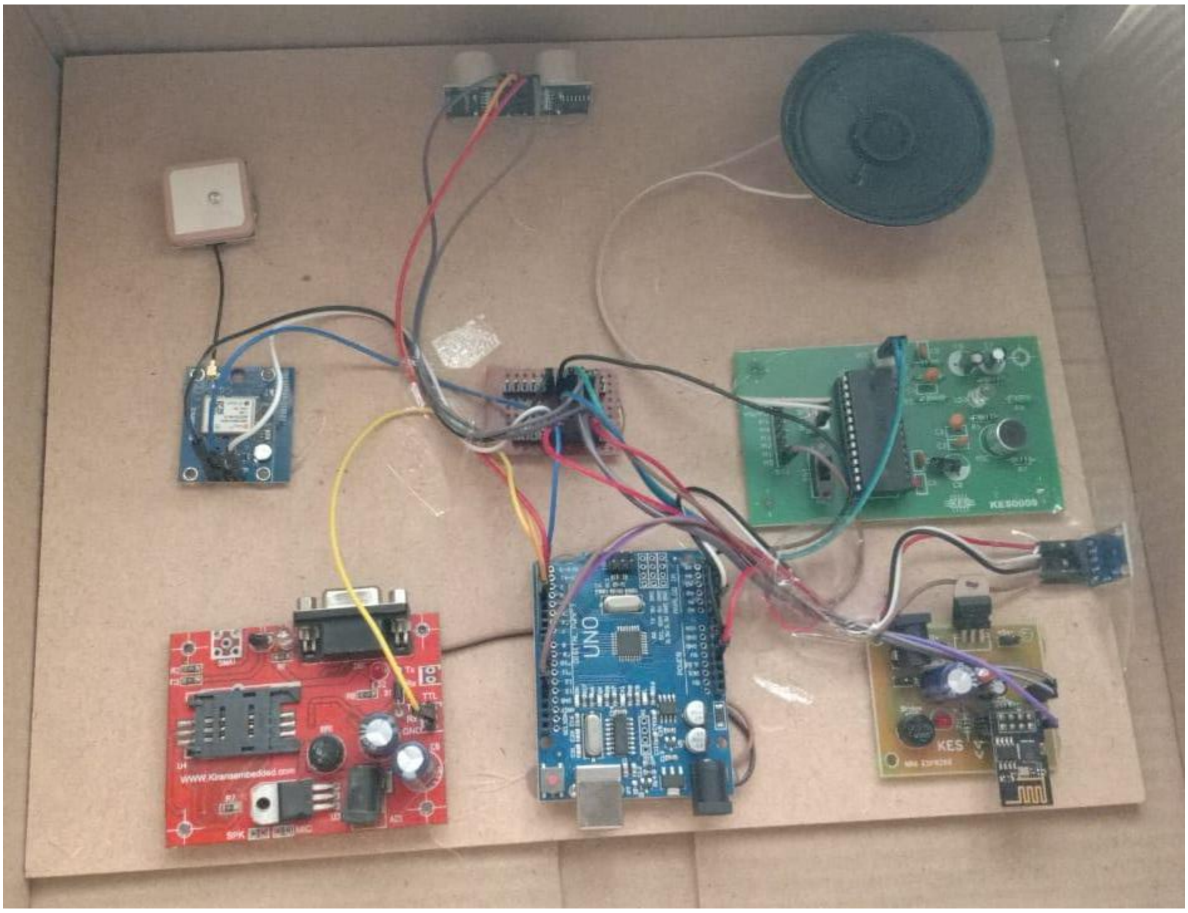


Figure 4.2 Implementation Of Project

4.3 ADVANTAGES

- Low design time.
- Low production cost.
- This system is applicable for both the indoor and outdoor environment.
- Setting the destination is very easy.
- It is dynamic system.
- Less space.
- Low power consumption.

CHAPTER 5

CONCLUSION AND FUTURE SCOPE

5.1 CONCLUSION:

Typical obstacles (walls, openings, and vertical rods) have been used to draw the protection zone of the Ultrasonic Sensor. The ability of the Ultrasonic sensor to find a path wide enough for a person to go through has been demonstrated. Theoretical and radiometric calculations based on optical geometry have been made to improve the design and performance of the system. The importance of intensity distribution to determine the protection zone has been highlighted. The technical compromises used in our new generation of Ultrasonic devices have been presented.

5.2 FUTURE SCOPE:

- This setup can be extended for alcohol detection and stopping the vehicle safely.
- The vehicle taken care by Autopilot system can be implemented using more sensors and technology.
- The system generate a signal to inform nearest Medical/ Ambulance/ Police help through satellite communication system.
- GPS tracking system for detection of accidents or to find out position of vehicle after accident.
- Sway detection system can also implemented.
- By using wire-less technology such as Car Talk2000 if the driver gets a heart attack or he is drunk it will send signals to
- Vehicles nearby about this so driver become alert.

CHAPTER 6

RESULT & BIBLIOGRAPHY

6.1 RESULT :

Thus our group actively with project, and we develop this project named as "GSM based Garbage wastage monitoring system". The system detects garbage to dustbin & send message through GSM module. The message is received to the no. which we have given in the program. It gets details of the details of the dustbin status from the SMS. It sends SMS in the form of percentage.

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