

SMART LUGGAGE BAG TRACKING BASED ON E-DEVICE

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in Electronics and Communication Engineering

By

RAM KUMAR M (Reg. No. 40130193)

HEMANTH SAI (Reg. No. 40130236)



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
CATEGORY -1 UNIVERSITY BY UGC**

**Accredited with Grade "A++" by NAAC | 12B Status by UGC | Approved by AICTE
JEPPIAAR NAGAR, RAJIV GANDHISALAI, CHENNAI – 600119**

APRIL 2024



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited "A++" Grade by NAAC | 12B Status by UGC | Approved by AICTE

www.sathyabama.ac.in

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING**

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **RAM KUMAR M ((40130193)** and **HEMANTH SAI (40130226)** who carried out the Project entitled "**SMART LUGGAGE BAG TRACKING BASED ON E-DEVICE**" under our supervision from November 2023 to April 2024.

Internal Guide

Dr. L. MAGTHELIN THERASE, M.E., Ph.D.,

Head of the Department

Dr. T. RAVI, M.E., Ph.D.,

Submitted for Viva voce Examination held on 17.04.2024

Internal Examiner
External Examiner

DECLARATION

We Ram Kumar M (Reg.No-40130193), Hemanth Sai (Reg.No-40130226), hereby declare that the Project Report entitled "**SMART LUGGAGE BAG TRACKING BASED ON E-DEVICE**" done by us under the guidance of **Dr. L. MAGTHELIN THERASE, M.E., Ph.D.**, Dept. of Electronics and Communication Engineering, SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY, CHENNAI is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

DATE: 17.04.2024

PLACE: Chennai

SIGNATURE OF THE CANDIDATES

1. Ram Kumar M

2. Hemanth Sai

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to The **Board of Management of Sathyabama Institute of Science and Technology** for their encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my thanks to **Dr. N. M. NANDHITHA, M.E., Ph.D., Dean, School of Electronics and Communication Engineering** and **Dr. T. RAVI, M.E., Ph.D., Head of the Department, Dept. of Electronics and Communication Engineering** for providing me necessary support and details at the right time during the progressive reviews.

I would like to express my sincere and deep sense of gratitude to my Project Guide **Dr. L. MAGTHELIN THERASE, M.E., Ph.D., Dept. of Electronics and Communication Engineering** for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of my project work.

I wish to express my thanks to all Teaching and Non-teaching staff members of the **Department of Electronics and Communication Engineering** who were helpful in many ways for the completion of the project.

ABSTRACT

The luggage tracking system is designed to track the luggage and bags which gets lost or theft from public and other areas. As people travel, there is always a risk of theft of the luggage and bags which is where the proposed system comes into account. The luggage tracking system works on an alarm basis where an alarm is set up with the Arduino uno board and a GPS module. Also the alarm is turned on as soon as the bag is theft and goes outside a particular range. Furthermore, a map is created through which we can track the location of the bag as it moves, as the markers are dropped which in a way gives us the location of the bag as it moves away from the owner. In this, the IoT components are being used like Arduino Board and a GPS Module in order to track the bag and a frontend or mobile application is created in order to monitor.

TABLE OF CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
	ABSTRACT	v
	LIST OF FIGURES	ix
	LIST OF TABLES	x
1	INTRODUCTION TO BAG TRACKING	1
	1.1 Introduction	1
	1.2 Embedded System	2
	1.3 Embedded System Several Function	3
	1.4 Block Diagram Of An Embedded System	4
	1.5 Characteristics Of Embedded System	5
	1.5.1 Application Specific System	5
	1.5.2 Reactive System	5
	1.5.3 Distributed System	6
	1.5.4 Heterogeneous Architectures	6
	1.5.5 Harsh Environment	7
	1.6 System Safety And Reliability	7
	1.7 Control Of Physical System	7
	1.8 Cost Sensitivity	8
	1.9 Power Management	8
	1.10 Embedded System	8
	1.10.1 Design Of Embedded System	9

	1.11 Proposed System	10
2	LITERATURE SURVEY	12
3	AIM AND SCOPE	14
	3.1 Aim	14
	3.2 Objective	14
	3.3 Scope of the Design	14
4	DESCRIPTION OF PROPOSED SYSTEM	16
	4.1 Block Diagram	16
	4.2 Arduino UNO	17
	4.3 Power Supply Circuit Diagram	18
	4.4 Material Used	19
	4.4.1 Transform	19
	4.4.2 Rectifier	19
	4.4.3 Filters	20
	4.4.5 LCD	20
	4.4.6 GSM	20
	4.4.7 MEMS	20
5	RESULTS AND DISCUSSION	24
	5.1 Software	24
	5.2 Received Signal Strength Indicator(RSSI)	24
	5.2.1 Zigbee Baseline Study	25
	5.3 Baseline Study With Packet Drop Rate (PDR)	26
	5.4 Functional Description of The Controller IC	27

	Registers	
	5.5 Absolute Maximum Ratings	29
	5.6 The Internet Of Things (IOT)	30
	5.7 Sensors & Actuators	31
	5.8 Embedded C	33
	5.8.1 Embedded C Programming	33
6	CONCLUSION	35
	REFERENCES	36

LIST OF FIGURES AND TABLES

FIGURE NO.	FIGURE NAME	PAGE NO.
1.1	Block Diagram Of a Typical Embedded System	4
1.2	Architecture Of Heterogeneous	6
1.3	Design Of Embedded System	10
4.1	Block Diagram	16
4.2	Arduino UNO	17
4.3	Power Supply Circuit Diagram	19
4.4	LCD	22
4.5	GSM	22
5.1	Distance Between Zigbee	25
5.2	Zigbee Without Network	27
5.3	Block Diagram	28
5.4	LCD Panel	28
5.1	Arduino Program	25
5.5	Absolute Maximum Ratings	29

CHAPTER – 1

1.1 INTRODUCTION

Loss of luggage can happen to anyone irrespective of the circumstances and conditions. Luggage and bags with important documents or precious things can be lost or theft with which people can lose their important material. Generally, it is seen that people get robbed in public areas like railway stations, bus stands and other public and private areas. Also, people can even forget their luggage and bags which can have important and necessary things. So it is very necessary to track down the bags in case of loss and theft. A lot of other tracking systems and devices are already present like car-tracking systems and shoe-tracking systems

The Internet of Things (IoT) is a network of objects like buildings, vehicles, etc which are embedded with sensors, electronics, and other network-related things that helps these objects to collect and exchange information. IoT allows the objects to be sensed and controlled from a remote access point

Disadvantage

- Again the tags don't notify you as soon as the bag is theft or lost, instead when we find out that the bag has been lost then only we try to track them down.
- It is very costly approx. \$56.
- It is available in western countries

Advantages

- The alarm would help the owner to identify from where the sound is coming and it would become easy for the owner to track down the bag as the range which has been set is less.

1.2 EMBEDDED SYSTEMS

Overview of embedded systems

An embedded system is a special-purpose computer system designed to perform one or a few dedicated functions, often with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use. Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale. Embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure. In general, "embedded system" is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems such as the operating systems and microprocessors which power them but are not truly embedded systems, because they allow different applications to be loaded and peripherals to be connected.

1.3 Embedded systems provide several functions

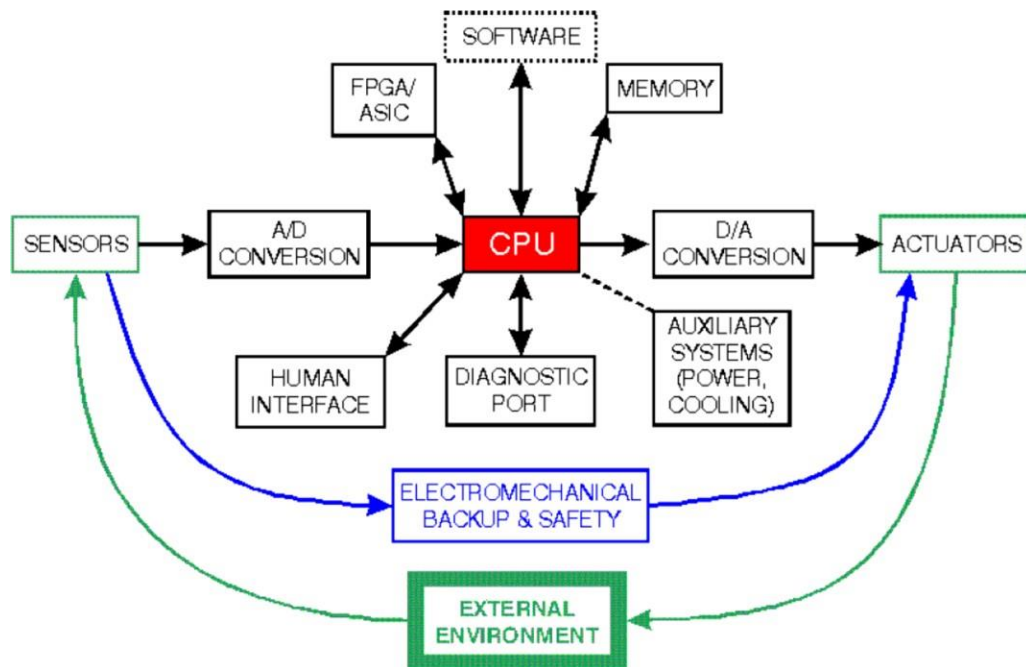
- Monitor the environment; embedded systems read data from input sensors. This data is then processed and the results displayed in some format to a user or users
- Control the environment; embedded systems generate and transmit commands for actuators.
- Transform the information; embedded systems transform the data collected in some meaningful way, such as data compression/decompression although interaction with the external world via sensors and actuators is an important aspect of embedded systems, these systems also provide functionality specific to their applications. Embedded systems typically execute applications such as control laws, finite state machines, and signal processing algorithms. These systems must also detect and react to faults in both the internal computing environment as well as the surrounding electromechanical systems. There are many categories of embedded systems, from communication devices to home appliances to control systems. Examples include;

Communication devices

- e.g.: modems, cellular phones
- Home Appliances
- e.g.: CD player, VCR, microwave oven
- Control Systems
- e.g.: Automobile anti-lock braking systems, robotics, and satellite control

1.4 Block diagram of an embedded system:

An embedded system usually contains an embedded processor. Many appliances that have a digital interface microwaves, VCRs, cars utilize embedded systems. Some embedded systems include an operating system. Others are very specialized resulting in the entire logic being implemented as a single program. These systems are embedded into some device for some specific purpose other than to provide general purpose computing.



1.1 Block diagram of a typical embedded system

1.5 Characteristics of embedded systems

Embedded systems are characterized by a unique set of characteristics. Each of these characteristics imposed a specific set of design constraints on embedded systems designers. The challenge to designing embedded systems is to conform to the specific set of constraints for the application.

1.5.1 Application Specific Systems:

Embedded systems are not general-purpose computers. Embedded system designs are optimized for a specific application. Many of the job characteristics are known before the hardware is designed. This allows the designer to focus on the specific design constraints of a well-defined application. As such, there is limited user reprogram ability. Some embedded systems, however, require the flexibility of reprogram ability. Programmable DSPs are common for such applications.

1.5.2 Reactive Systems

As mentioned earlier, a typical embedded systems model responds to the environment via sensors and control the environment using actuators. This requires embedded systems to run at the speed of the environment. This characteristic of embedded system is called “reactive”. Reactive computation means that the system (primarily the software component) executes in response to external events. External events can be either periodic or aperiodic. Periodic events make it easier to schedule processing to guarantee performance. Aperiodic events are harder to schedule. The maximum event arrival rate must be estimated in order to accommodate worst case situations. Most embedded systems have a significant reactive component. One of the biggest challenges for embedded system designers is performing an accurate worst case design analysis on systems with statistical performance characteristics (e.g., cache memory on a DSP or another embedded processor). Real time system operation means that the correctness of a computation depends, in part, on the time at which it is delivered. Systems with this

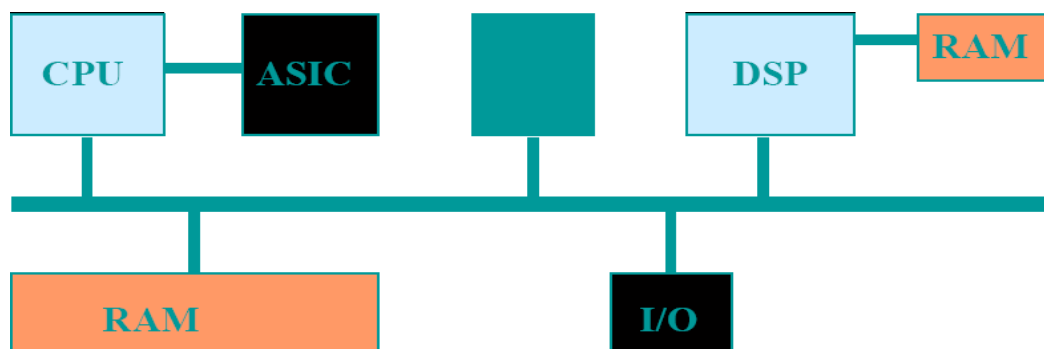
requirement must often design to worst case performance. But accurately predicting the worst case may be difficult on complicated architectures. This often leads to overly pessimistic estimates erring on the side of caution. Many embedded systems have a significant requirement for real time operation in order to meet external I/O and control stability requirements. Many real-time systems are also reactive systems.

1.5.3 Distributed Systems

A common characteristic of an embedded system is one that consists of communicating processes executing on several CPUs or ASICs which are connected by communication links. The reason for this is economy. Economical 4 8-bit microcontrollers may be cheaper than a 32-bit processors. Even after adding the cost of the communication links, this approach may be preferable. In this approach, multiple processors are usually required to handle multiple time-critical tasks. Devices under control of embedded systems may also be physically distributed.

1.5.4 Heterogeneous Architectures

Embedded systems often are composed of heterogeneous architectures (Fig 1.2). They may contain different processors in the same system solution. They may also be mixed signal systems. The combination of I/O interfaces, local and remote memories, and sensors and actuators makes embedded system design truly unique. Embedded systems also have tight design constraints, and heterogeneity provides better design flexibility.



1.2 Architecture of Heterogeneous

1.5.5 Harsh environment

Many embedded systems do not operate in a controlled environment. Excessive heat is often a problem, especially in applications involving combustion (e.g., many transportation applications). Additional problems can be caused for embedded computing by a need for protection from vibration, shock, lightning, power supply fluctuations, water, corrosion, fire, and general physical abuse.

1.6 System safety and reliability

As embedded system complexity and computing power continue to grow, they are starting to control more and more of the safety aspects of the overall system. These safety measures may be in the form of software as well as hardware control. Mechanical safety backups are normally activated when the computer system loses control in order to safely shut down system operation. Software safety and reliability is a bigger issue. Software doesn't normally "break" in the sense of hardware. However, software may be so complex that a set of unexpected circumstances can cause software failures leading to unsafe situations. Discussion of this topic is outside the scope of this book, but the challenges for embedded designers include designing reliable software and building cheap, available systems using unreliable components. The main challenge for embedded system designers is to obtain low- cost reliability with minimal redundancy.

1.7 Control of physical systems

One of the main reasons for embedding a computer is to interact with the environment. This is often done by monitoring and controlling external machinery. Embedded computers transform the analog signals from sensors into digital form for processing. Outputs must be transformed back to analog signal levels. When controlling physical equipment, large current loads may need to be switched in order to operate motors and

other actuators. To meet these needs, embedded systems may need large computer circuit boards with many non-digital components. Embedded system designers must carefully balance system tradeoffs among analog components, power, mechanical, network, and digital hardware with corresponding software. Small and low weight Many embedded computers are physically located within some larger system. The form factor for the embedded system may be dictated by aesthetics. For example, the form factor for a missile may have to fit inside the nose of the missile. One of the challenges for embedded systems designers is to develop non-rectangular geometries for certain solutions. Weight can also be a critical constraint. Embedded automobile control systems, for example, must be light weight for fuel economy. Portable CD players must be light weight for portability purposes.

1.8 Cost sensitivity

Cost is an issue in most systems, but the sensitivity to cost changes can vary dramatically in embedded systems. This is mainly due to the effect of computer costs have on profitability and is more a function of the proportion of cost changes compared to the total system cost.

1.9 Power management

Embedded systems have strict constraints on power. Given the portability requirements of many embedded systems, the need to conserve power is important to maintain battery life as long as possible. Minimization of heat production is another obvious concern for embedded system

1.10 EMBEDDED SYSTEM

A system is something that maintains its existence and functions as a whole through the interaction of its parts. E.g. Body, Mankind, Access Control, etc A system is a part of the world that a person or group of persons during some time interval and for some purpose choose to regard as a whole, consisting of interrelated components, each

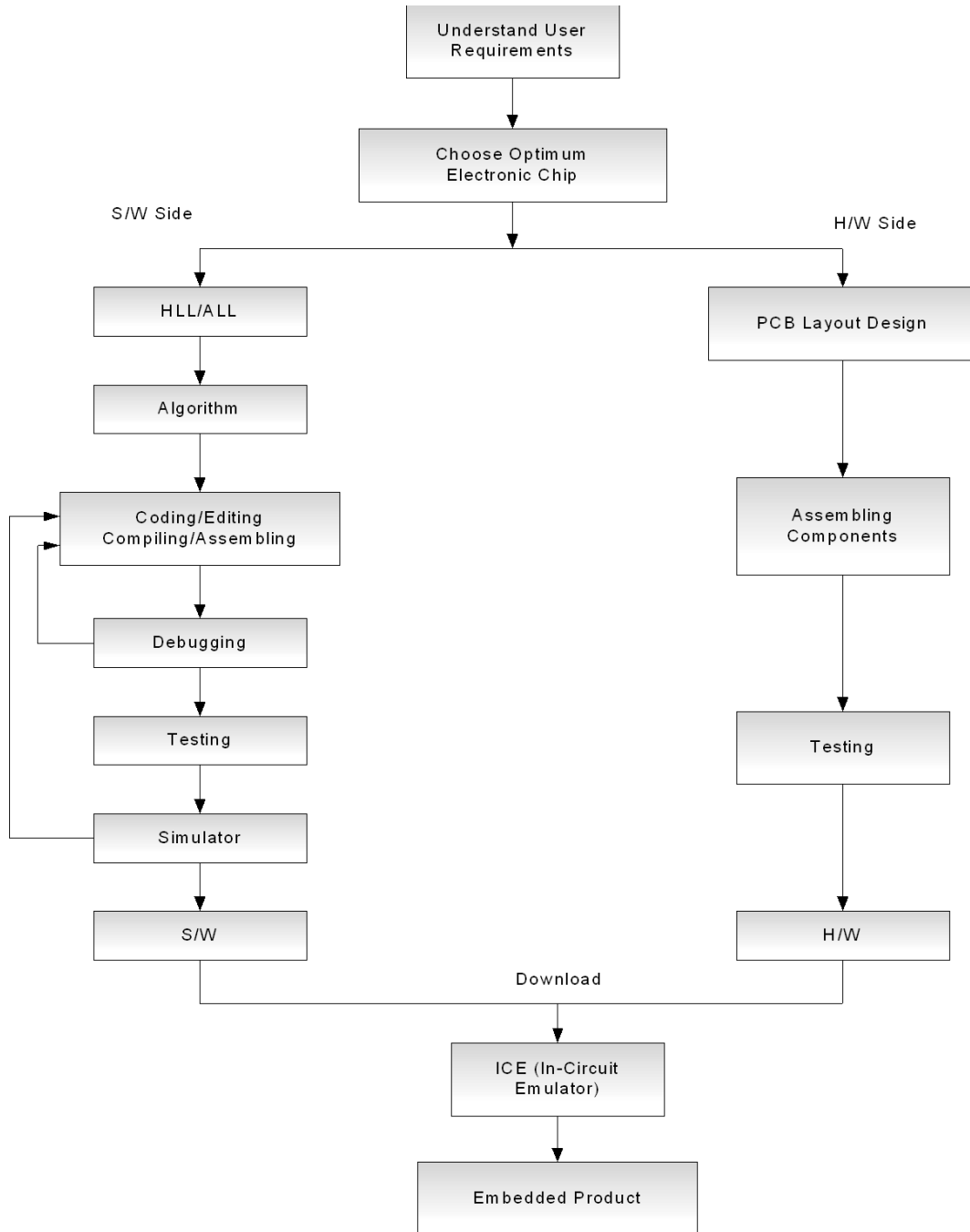
component characterized by properties that are selected as being relevant to the purpose.

- Embedded System is a combination of hardware and software used to achieve a single specific task.
- Embedded systems are computer systems that monitor, respond to, or control an external environment.
- Environment connected to systems through sensors, actuators and other I/O interfaces.
- Embedded system must meet timing & other constraints imposed on it by environment.

An embedded system is a microcontroller-based, software driven, reliable, real-time control system, autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost conscious market. An embedded system is not a computer system that is used primarily for processing, not a software system on PC or UNIX, not a traditional business or scientific application. High-end embedded & lower end embedded systems. High-end embedded system - Generally 32, 64 Bit Controllers used with OS. Examples Personal Digital Assistant and Mobile phones etc. Lower end embedded systems - Generally 8, 16 Bit Controllers used with a minimal operating systems and hardware layout designed for the specific purpose.

1.10.1 DESIGN OF EMBEDDED SYSTEM:

Like every other system development design cycle embedded system too have a design cycle. The flow of the system will be like as given below steps.



1.3 Design Of Embedded System

From the initial state of the project to the final fabrication the design considerations will be taken like the software consideration and the hardware components, sensor, input and output. The electronics usually uses either a microprocessor or a microcontroller. Some large or old systems use general-purpose mainframe computers or minicomputers.

CLASSIFICATION:

- Real Time Systems.
- RTS is one which has to respond to events within a specified deadline.
- A right answer after the dead line is a wrong answer
- RTS classification
- Hard Real Time Systems
- Soft Real Time System

Hard Real Time Systems

- "Hard" real-time systems have very narrow response time.
- Example: Nuclear power system, Cardiac pacemaker.

Soft Real Time System

- "Soft" real-time systems have reduced constrains on "lateness" but still must operate very quickly and repeatable.
- Example: Railway reservation system – takes a few extra seconds the data remains valid.

1.11 PROPOSED SYSTEM

- The proposed system uses the technique of Internet of Things in order to track the bags. In this a hardware would be created and installed which would be having the basic arduino board with a GPS module and an alarm being connected to it.
- A map has been created which would be synchronized in order to track the location of the bag.
- Furthermore, the map has the features that as soon as the bag gets lost or theft and it moves away from the owner and goes out of a particular range, the alarm would start ringing so that the owner gets notified where exactly the bag is. Also it would help the owner to track down the location of the bag which could be seen on the map as the markers would be dropped which gives us the location of the bag as it moves away from the owner. Moreover, the owner would also be notified with the flag messages when the bag moves out of a particular range like 10m, 20m and 30m.

CHAPTER-2

LITERATURE SURVEY

[1] "Luggage Tracking System Using IoT" deals with luggage tracking system is designed to identify the luggage which gets misplaced from the public and other areas. When people travel, there is always a risk of theft of the luggage and bags which is where the proposed system comes into account. The luggage tracking system works on an alarming basis where an alarm is set up with the Arduino Uno board and a GPS module. Also, the alarm is turned on as soon as the bag is theft and goes outside a particular range. Finally, a map is created through which we can track the location of the bag In this, the IoT components are being used like Arduino Board and a GPS Module to track the bag and a frontend or mobile application is created to monitor.

[2] "Smart Luggage Tracker" provides a major loophole in the Aviation industry is luggage mishandling. Luggage is often misplaced or lost and cases of damage to belongings are common. In this article, we proposed and implemented a luggage tracking and handle system using RFID tag which gets stored on cloud server. This algorithm is highly secure and the details of passengers and airlines are fetched in it. A prototype at the two locations of check-in and check-out are developed. Aauthentic-time location is also detected and fetched in a cloud server. Each passenger has a unique RFID code that has to be entered on the website to know the exact location and status of their luggage. Details include the exact time of arrival of luggage, location, net weight before and after loading. This information lets the passenger take necessary action if the luggage has been misplaced, stolen or tampered.

[3] "Smart Bag with Theft Prevention and Real-Time Tracking" establishes the studies related to smart bag. This technology enhances that the bag can be activated only by the owner and also location can be tracked using GPS and GSM.

for tracking the train.

[4] "Using RGB-D sensors for the detection of abandoned luggage" This article provides

functioning in dynamic environments. This approach consists of two sensors, the RGB and Depth sensor. The RGB sensor is used to extract type of discarded pieces of luggage and verify them. The Depth sensor is used to identify users and remove persons from the list of assumed objects.

- [5] “RFID Application to Airport Luggage Tracking as a Green Logistics Approach” provides a Green Airport luggage tracking system by developing RFID architecture, components, functioning, and middleware roles and then provides access to RFID data making authentication methods more robust and flexible.
- [6] “Remote Control and Tracking Dual-Mode Smart Suitcase” provides an intellectual travel case that can be vaguely inhibited. It can be used in airports, railway stations, etc. In an open and large space, the travel case can find the users position and track it and in case of a busy place, the working direction can be controlled. This system is also useful for cargo Handling.
- [7] “Tripartite Authentication Protocol RFID/NFC Based on ECC” The proposed system is based on the communication between the reader and the background. If it is unsafe the reader and background mutually authenticate each other besides the protocol provides a public secret for three participants to read and modify data.
- [8] “Colour tracking technique by using pixy CMUcam5 for wheelchair luggage follower” The proposed method is used for Wheelchair follower which uses a color tracking system. Pixy CMUcam5 sensor is used for color detection and Arduino MEGA is the controller for input and output data. Servo motor acts as a director of the front wheel while the ultrasonic sensor is used to avoid collision and transaxle motor is performed through the motor driver.
- [9] “Towards smart wearable real-time airport luggage tracking” consists of a innovative system for luggage tracking using the android application and smart watch. This software is used to detect the advent of luggage. We also developed a Smart power Management model which can recharge the tag.

CHAPTER-3 AIM AND SCOPE

3.1 AIM

Develop an efficient and reliable smart luggage tracking system utilizing e-device technology to provide real-time location monitoring, ensuring seamless and secure tracking of luggage throughout its journey, thereby enhancing traveler convenience and peace of mind.

3.2 OBJECTIVE

Develop a comprehensive smart luggage tracking system utilizing cutting-edge e-device technology to address the growing need for efficient and reliable luggage monitoring solutions in the travel industry. The objective is to design, implement, and deploy a sophisticated tracking platform that seamlessly integrates with luggage and e-devices such as GPS trackers or RFID tags. This system will enable travelers to remotely monitor the real-time location and status of their luggage through a user-friendly mobile application or web interface. Additionally, the system will incorporate advanced features such as geofencing, motion detection, and tamper alerts to enhance security and provide proactive notifications in case of any anomalies. Through rigorous testing and optimization, the objective is to ensure the system's accuracy, reliability, and scalability, catering to both individual travelers and commercial entities such as airlines or logistics companies. Ultimately, the goal of this project is to enhance travel experiences, minimize the risk of lost or mishandled luggage, and streamline baggage management processes for travelers and service providers alike.

3.3 SCOPE OF THE SYSTEM

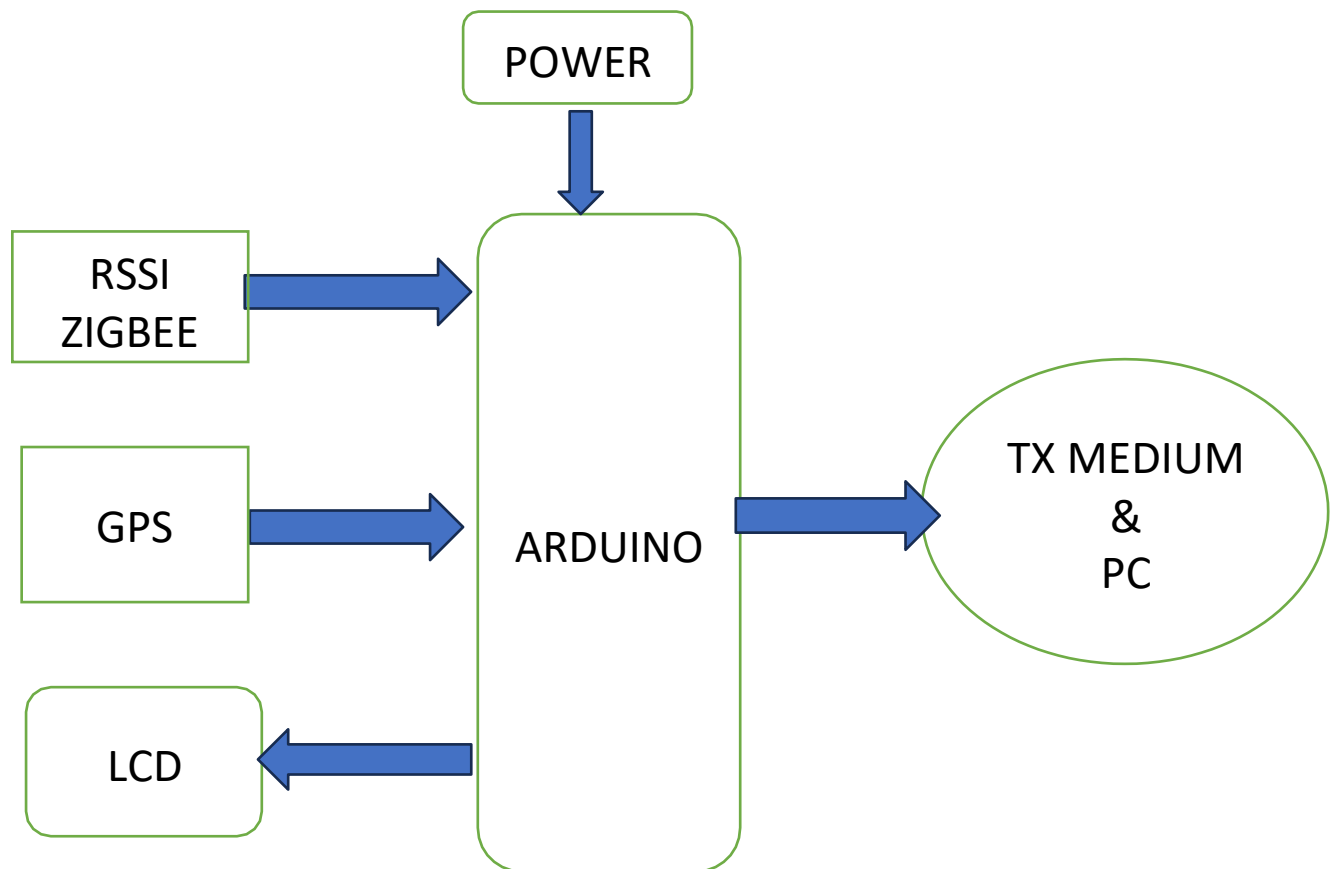
- **Hardware Integration:** The system will integrate with various e-devices such as GPS trackers, RFID tags, or Bluetooth beacons, which will be securely attached to luggage items.
- **Real-time Tracking:** The system will provide real-time tracking of luggage, allowing travelers to monitor the location of their belongings through a mobile application or web interface.
- **User Interface:** A user-friendly interface will be developed for both mobile and web platforms, enabling travelers to easily access and interact with the tracking system.
- **Location Updates:** The system will continuously update the location of the luggage, providing accurate and timely information to users.
- **Alerts and Notifications:** Users will receive alerts and notifications regarding the status of their luggage, including notifications upon arrival at specific locations, potential delays, or if the luggage moves outside predefined boundaries (geofencing).
- **Security Features:** The system will include security features such as tamper detection, ensuring that users are notified if their luggage is opened or tampered with during transit.
- **Integration with Transportation Services:** Integration with transportation services such as airlines or shipping companies will be explored to provide seamless tracking across different stages of the journey.
- **Data Privacy and Security:** Robust measures will be implemented to ensure the privacy and security of user data, including encryption of sensitive information and adherence to data protection regulations.

- Scalability: The system will be designed to accommodate a scalable infrastructure, capable of handling a large volume of luggage tracking requests efficiently.
- Testing and Validation: Rigorous testing and validation procedures will be conducted to ensure the reliability, accuracy, and performance of the tracking system under various conditions.
- Documentation and Support: Comprehensive documentation and user support resources will be provided to assist users in setting up and utilizing the tracking system effectively.
- Customization Options: The system may offer customization options for users to tailor tracking preferences according to their specific needs and preferences.

Overall, the scope of the system encompasses the development of a robust, user-friendly, and secure smart luggage tracking solution that enhances the travel experience by providing real-time monitoring and management of luggage items.

CHAPTER-4 DECRPTION OF PROPOSED SYSTEM

4.1 BLOCK DIAGRAM



4.2 ARDUINO UNO

ARDUINO (ATMega328) MICROCONTROLLER

- It has 20 digital input/output pins
- 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.
- Microcontroller ATmega328
- Operating Voltage 5 V
- Input Voltage (recommended) 7-12 V

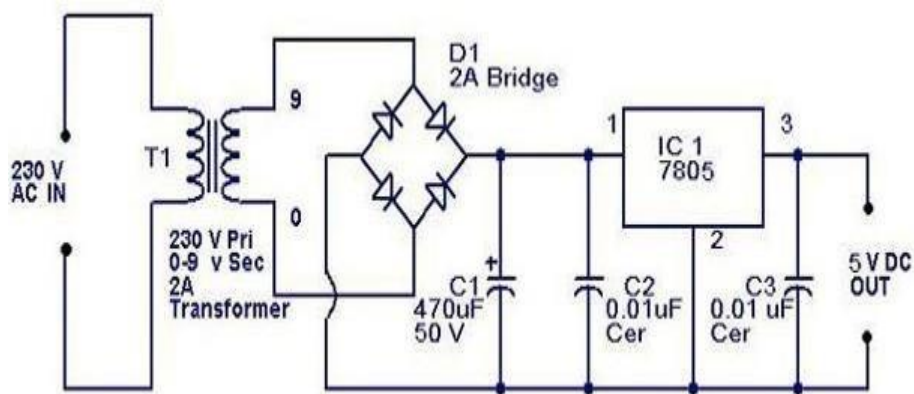


4.1 Arduino Uno

Arduino and its programming

- Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board.
- Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs.
- Arduino projects can be stand-alone, or they can be communicate with software running on your computer. The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free.
- The Arduino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment.

4.3 Power supply circuit diagram:



4.2 Circuit Diagram

4.4 MATERIALS USED

4.4.1 TRANSFORMER:

A transformer is a static piece of which electric power in one circuit is transformed into electric power of same frequency in another circuit. It can raise or lower the voltage in the circuit, but with a corresponding decrease or increase in current. It works with the principle of mutual induction. In our project we are using a step down transformer to providing a necessary supply for the electronic circuits. Here we step down a 230volts ac into 12volts ac.

4.4.2 RECTIFIER:

A dc level obtained from a sinusoidal input can be improved 100% using a process called full wave rectification. Here in our project for full wave rectification we use bridge rectifier. From the basic bridge configuration, we see that two diodes (say D2 & D3) are conducting while the other two diodes (D1 & D4) are in off state during the period $t = 0$ to $T/2$. Accordingly for the negative cycle of the input the

conducting diodes are D1 & D4. Thus the polarity across the load.

4.4.3 FILTERS:

In order to obtain a dc voltage of 0 Hz, we have to use a low pass filter. So that a capacitive filter circuit is used where a capacitor is connected at the rectifier output & a dc is obtained across it. The filtered waveform is essentially a dc voltage with negligible ripples & it is ultimately fed to the load.

4.4.4 REGULATORS:

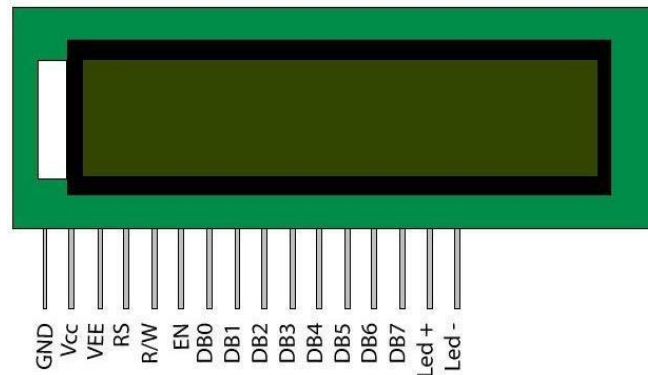
The output voltage from the capacitor is more filtered & finally regulated. The voltage regulator is a device, which maintains the output voltage constant irrespective of the change in supply variations, load variations & temperature changes. Here we use fixed voltage regulator namely LM7805. The IC LM7805 is a +5v regulator which is used for microcontroller.

4.4.5 LCD:

- The 16x2 LCD used in this experiment has a total of 16 pins. As shown in the table below, eight of the pins are data lines (pins 7-14), two are for power and ground (pins 1 and 16), three are used to control the operation of LCD (pins 4-6), and one is used to adjust the LCD screen brightness (pin 3). The remaining two pins (15 and 16) power the backlight. The details of the LCD terminals are as follows:
- Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid but are grouped together in an ordered form similar to a crystal.
- An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them. The inner surface of the glass plates is coated with transparent electrodes which define the character, symbols or patterns to be displayed

polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle.

- One each polarisers are pasted outside the two glass panels. These polarisers would rotate the light rays passing through them to a definite angle, in a particular direction
- When the LCD is in the off state, light rays are rotated by the two polarisers and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent.
- When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarisers, which would result in activating / highlighting the desired characters.

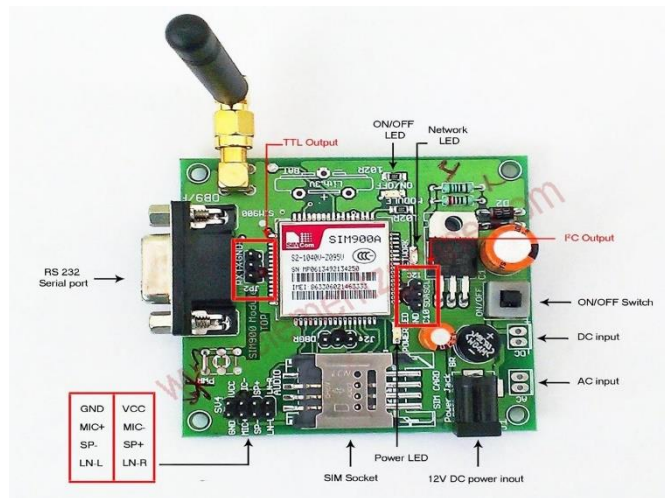


4.3 LCD

4.4.6 GSM:

- Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication.
- GSM is the name of a standardization group established in 1982 to create a

common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz.



4.4 GSM

4.4.7 MEMS

Micro-electromechanical systems (MEMS) is a technology that combines computers with tiny mechanical devices such as sensors, valves, gears, mirrors, and actuators embedded in semiconductor chips. MEMS or what he calls analog computing will be "the foundational technology of the next decade." MEMS is also sometimes called smart matter.

MEMS are already used as accelerometers in automobile air-bags. They've replaced a less reliable device at lower cost and show promise of being able to inflate a bag not only on the basis of sensed deceleration but also on the basis of the size of the person they are protecting. Basically, a MEMS device contains micro-circuitry on a tiny silicon chip into which some mechanical device such as a mirror or a sensor has been manufactured. Potentially, such chips can be built in large quantities at low cost, making them cost-effective for many uses.

Among the presently available uses of MEMS or those under study are:

- Global position system sensors that can be included with courier parcels for constant tracking and that can also sense parcel treatment en route

- Sensors built into the fabric of an airplane wing so that it can sense and react to air flow by changing the wing surface resistance; effectively creating a myriad of tiny wing flaps
- Optical switching devices that can switch light signals over different paths at 20-nanosecond switching speeds
- Sensor-driven heating and cooling systems that dramatically improve energy savings
- Building supports with imbedded sensors that can alter the flexibility properties of a material based on atmospheric stress sensing

CHAPTER-5 RESULTS AND DISCUSSION

5.1 SOFTWARE

Arduino Programming Basics

Command	Description
<code>pinMode(n,INPUT)</code>	Set pin n to act as an input. One-time command at top of program.
<code>pinMode(n,OUTPUT)</code>	Set pin n to act as an output
<code>digitalWrite(n,HIGH)</code>	Set pin n to 5V
<code>digitalWrite(n,LOW)</code>	Set pin n to 0V
<code>delay(x)</code>	Pause program for x millisec, $x = 0$ to 65,535
<code>tone(n,f,d)</code>	Play tone of frequency f Hz for d millisec on speaker attached to pin n
<code>for()</code>	Loop. Example: <code>for (i=0;i<3;i++){}</code> Do the instructions enclosed by <code>{}</code> three times
<code>if (expr) {}</code>	Conditional branch. If $expr$ true, do instructions enclosed by <code>{}</code>
<code>while (expr) {}</code>	While $expr$ is true, repeat instructions in <code>{}</code> indefinitely

5.1 Arduino Programs

5.2 Received Signal Strength Indicator (RSSI)

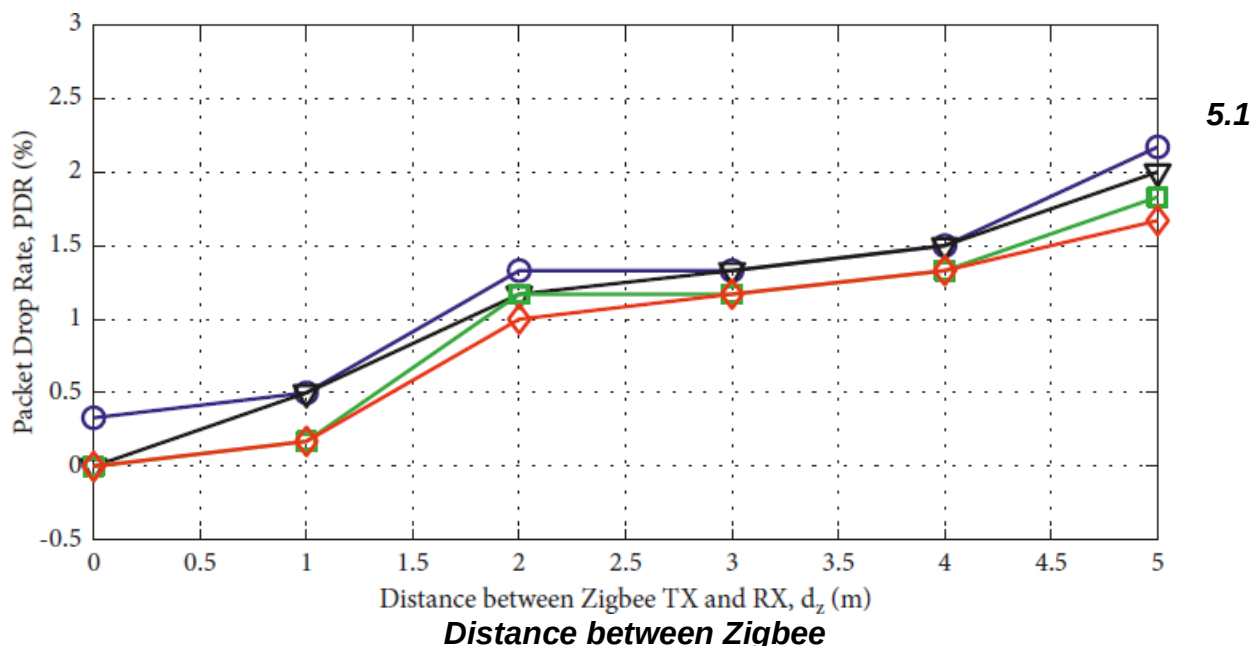
Measurement. The received signal strength indicator (RSSI) is an important performance indicator for a receiver in a communication network. Our experiments measured the performance of the Zigbee link in terms of its RSSI values at the receiver. In the experiments, we used various distances between the Zigbee TX and the Zigbee RX, d_z , and various Zigbee transmission powers, P_t . The experiments were performed according to the topology in Figure 3(a). In the experiments, the Zigbee transmitter was configured to transmit 200 frames each with a payload size of 50 bytes. When the Zigbee receiver

module received a packet, it sent back an acknowledgment to the Zigbee transmitter. *e RSSI values at both the local module (the Zigbee TX) and the remote module (the Zigbee RX) were measured. Each experiment was repeated three times for the averaged RSSI values. Five different values of the transmission power were used in the experiments, which were 8 dBm, 5 dBm, 1 dBm, -1 dBm, and -5 dBm. Other experimental configurations used in the measurements are shown in Table 4. Figure 6 shows the RSSI data versus the transmission distance, in a range of approximately 0 meters to 6 meters. *e data in the figure show the RSSI values for five different values of the transmission power, P_t . As anticipated, the RSSI values decrease with the increase in the transmission distance. *e figure also shows that the RSSI drops fast in the first couple of meters and then slows down in decreasing for longer transmission distances.

5.2.1 Zigbee Baseline Study.

One purpose of this baseline study was to determine a transmit timeout for the Zigbee frames when no Wi-Fi traffic was present. We tried to determine a Zigbee packet transmit timeout that offers a high loopback throughput and a Zigbee packet transmission interval that offers a low packet drop rate (PDR).

*is study also provides some baseline data for the other experiments.*e experimental setup shown in Figure 3(a) was used in these experiments.



5.3 Baseline Study with Packet Drop Rate (PDR)

Measurement. One XBee module was configured as a Zigbee end device (also as Zigbee TX), which transmitted Zigbee frames to the Zigbee coordinator device that acted as the receiver and counted the number of successfully received packets over the transmission period. The PDR measurement was conducted using unidirectional traffic; data frames were transmitted only from the end device to the coordinator. In the experiments, the distance between the Zigbee TX and the Zigbee RX, i.e., d_z , was varied in a range from approximately 0 meters to 5 meters. Each experiment was repeated three times with the same parameter settings for an average. The experiments were carried out for four different Zigbee packet transmission intervals such as 100 ms, 200 ms, 400 ms, and 500 ms. In each transmission period, 200 Zigbee frames were transmitted from the Zigbee TX to the Zigbee RX and the number of successfully received packets was counted by the XCTU at the receiver side. The PDR was calculated using the following formula:

$$\text{Packet Drop Rate PDR (\%)} = \frac{P_{Tx} - P_{Rx}}{P_{Tx}} * 100, \quad (1)$$

where P_{Tx} is the number of Zigbee frames transmitted by the Zigbee TX, and P_{Rx} is the number of successfully received packets by the Zigbee RX. The configurations used in the experiments in this section are listed in Table 2. Figure 4 shows the results of packet drop rate (PDR) vs d_z that were obtained from the experiments. We can see from Figure 4 that the PDR for a packet transmission interval of 500 ms is, on average, smaller than that for other packet transmission intervals, which are 100 ms, 200 ms, and 400 ms, although the PDRs are very close to each other under the same transmission distance.

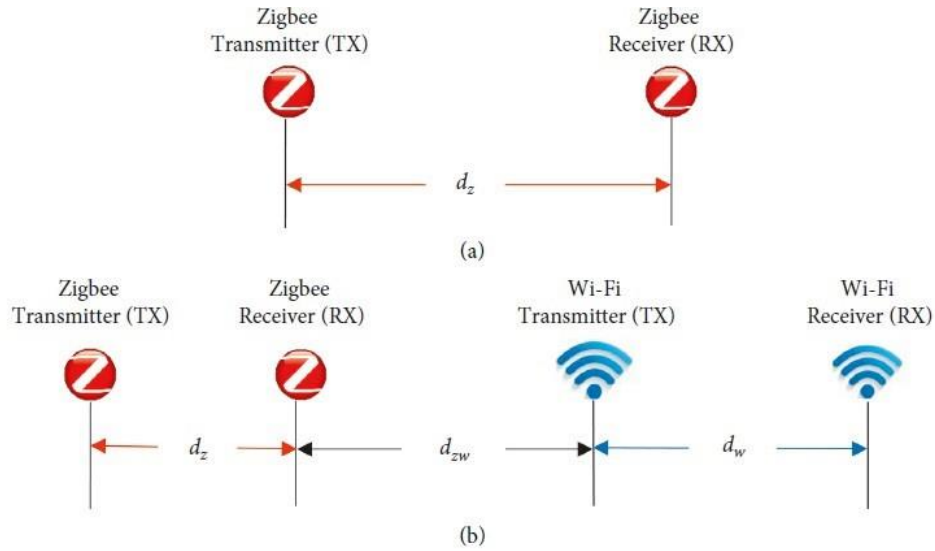


FIGURE 3: Testbed topologies: (a) Zigbee without a nearby Wi-Fi network. (b) Zigbee with a nearby Wi-Fi network.

5.2 Zigbee without network

5.4 FUNCTIONAL DESCRIPTION OF THE CONTROLLER IC REGISTERS:

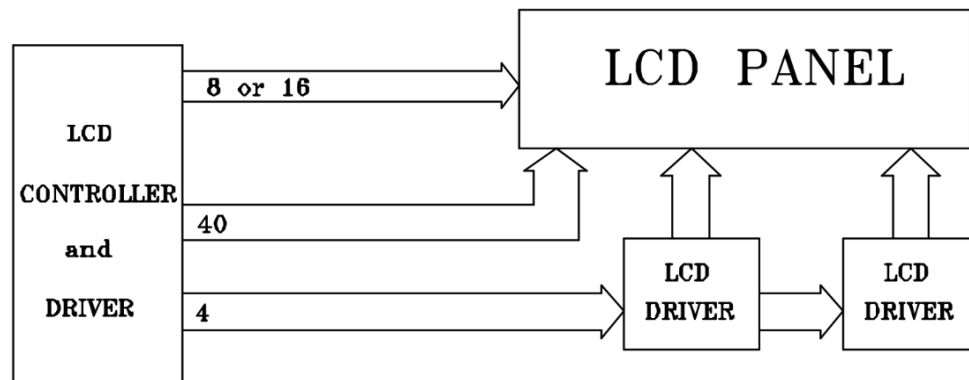
The controller IC has two 8 bit registers, an instruction register (IR) and a data register (DR). The IR stores the instruction codes and address information for display data RAM (DD RAM) and character generator RAM (CG RAM). The IR can be written, but not read by the MPU.

The DR temporally stores data to be written to /read from the DD RAM or CG RAM. The data written to DR by the MPU, is automatically written to the DD RAM or CG RAM as an internal operation.

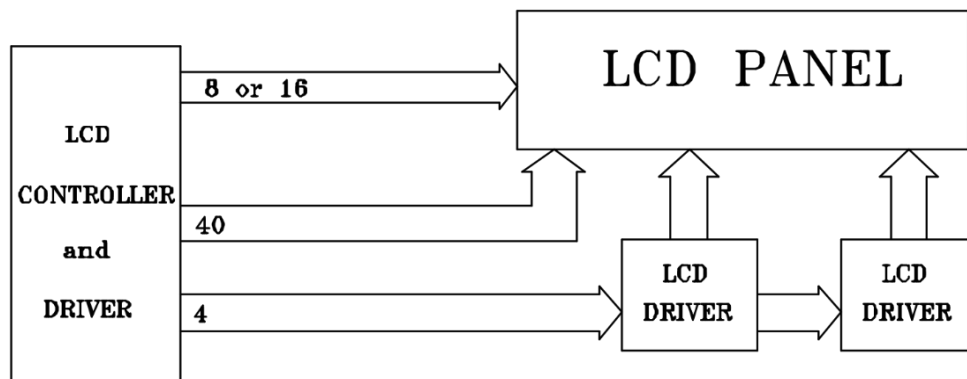
When an address code is written to IR, the data is automatically transferred from the DD RAM or CG RAM to the DR. data transfer between the MPU is then completed when the MPU reads the DR. likewise, for the next MPU read of the DR, data in DD RAM or CG RAM at the address is sent to the DR automatically. Similarly, for the MPU write of the DR, the next DD RAM or CG RAM address is selected for the write operation.

The dot-matrix liquid crystal display controller and driver LSI displays alphanumeric, Japanese kana characters, and symbols. It can be configured to drive a dot-matrix liquid

crystal display under the control of a 4- or 8-bit microprocessor. Since all the functions such as display RAM, character generator, and liquid crystal driver, required for driving a dot-matrix liquid crystal display are internally provided on one chip, a minimal system can be interfaced with this controller/driver.



5.3 Block Diagram



5.4 LCD Panel

5.5 Absolute Maximum Ratings:

Item	Symbol	Min	Max	Unit
Power Voltage	VDD - VSS	0	7.0	V
Input Voltage	Vin	VSS	VDD	
Operating Temperature Range	TOP	0	+50	T
Storage Temperature Range	TST	-20	+60	

5.2 Absolute Maximum Ratings

5.6 The Internet of Things (IoT)

The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data. IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration between the physical world and computer-based systems, and resulting in improved efficiency, accuracy and economic benefit.

Thus IoT has evolved from the convergence of wireless technologies, microelectromechanical systems (MEMS), microservices and the internet. The convergence has helped tear down the silos between information technology (IT) and operational technology (OT).

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

HOW IOT WORKS?

An IoT ecosystem consists of web-enabled smart devices that use embedded processors, sensors and communication hardware to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally.

5.7 SENSORS & ACTUATORS

Sensors:

- ☐ They are mainly input components
- ☐ They sense and collect surrounding information
- ☐ Basically three types:
 - ☐ Passive, omnidirectional (e.g. mic)
 - ☐ Passive, narrow-beam sensor (e.g. PIR)
 - ☐ Active sensors (e.g. sonar, radar, etc.)

Actuators:

- ☐ They are mainly output components
- ☐ They alter the surrounding. Some examples:
 - ☐ Adding lighting, heat, sound, etc.
 - ☐ Controlling motors to move objects

- ☐ Displaying messages and others...
- ☐ A “thing” always feature communications for “team working”
- ☐ The Role of Communications
- ☐ Providing a data link between two nodes

Communication type:

- ☐ Wireline (e.g. copper wires, optical fibers)
- ☐ Wireless (e.g. RF, IR). RF-based communication is the most
- ☐ popular choice (and also our focus)
- ☐ Popular RF-based communication solutions:
- ☐ IEEE 802.15.4 ☐ used in XM1000
- ☐ IEEE 802.11 (or Wifi)
- ☐ Bluetooth
- ☐ Near Field Communication (NFC), e.g. RFID

TECHNOLOGICAL CHALLENGES OF IOT

At present IoT is faced with many challenges, such as:

- ☐ Scalability
- ☐ Technological Standardization
- ☐ Inter operability
- ☐ Discovery
- ☐ Software complexity
- ☐ Data volumes and interpretation
- ☐ Providing a data link between two nodes

Communication type:

- ☐ Wireline (e.g. copper wires, optical fibers)
- ☐ Wireless (e.g. RF, IR). RF-based communication is the most popular choice (and also our focus)
- ☐ Popular RF-based communication solutions:
 - ☐ IEEE 802.15.4 ☐ used in XM1000
 - ☐ IEEE 802.11 (or Wifi)
 - ☐ Bluetooth
 - ☐ Near Field Communication (NFC), e.g. RFID

5.8 EMBEDDED C

- Embedded C Programming is the soul of the processor functioning inside each and every embedded system we come across in our daily life, such as mobile phone, washing machine, and digital camera.
- Each processor is associated with an embedded software. The first and foremost thing is the embedded software that decides functioning of the embedded system.
- Embedded C language is most frequently used to program the microcontroller.

5.8.1 EMBEDDED C PROGRAMMING

- Looking around, we find ourselves to be surrounded by various types of embedded systems.
- Be it a digital camera or a mobile phone or a washing machine, all of them has some kind of processor functioning inside it. Associated with each processor is the embedded software.
- If hardware forms the body of an embedded system, embedded processor acts as the brain, and embedded software forms its soul.
- It is the embedded software which primarily governs the functioning of embedded systems.

- During infancy years of microprocessor based systems, programs were developed using assemblers and fused into the EPROMs.
- There used to be no mechanism to find what the program was doing. LEDs, switches, etc. were used to check correct execution of the program

Hardware tools

- Power supply
- Arduino UNO
- LCD
- GSM
- IOT

Software tools

- Embedded c
- Arduino IDE

CHAPTER-6

CONCLUSION

This article shows the implementation of tracking the bags which are either lost or using IoT. Certain procedures and techniques have been made and proposed in order to achieve the same. Experimentation has been done and maps have been created in order to track the location of the bags which are misplaced and lost. Experiment results further concludes that the bags can be easily tracked based upon the hardware installed in them and then by tracking that hardware and tracking the route, directions and location of the bag with the help of a map luggage tracking system is designed to track the luggage and bags which gets lost or theft from public and other areas. As people travel, there is always a risk of theft of the luggage and bags which is where the proposed system comes into account. The luggage tracking system works on an alarm basis where an alarm is set up with the arduino uno board and a GPS module. Also the alarm is turned on as soon as the bag is theft and goes outside a particular range. Furthermore, a map is created through which we can track the location of the bag as it moves, as the markers are dropped which in a way gives us the location of the bag as it moves away from the owner. In this, the IoT components are being used like Arduino Board and a GPS Module in order to track the bag and a frontend or mobile application is created in order to monitor.

REFERENCES

- [1] Sudha Senthil Kumar, Brindha. K, Rathi. R, Charanya. R, MayankJain, Professor, VIT, Vellore –632014. Tamil Nadu, India “Luggage Tracking System Using IoT”, 2017, International Journal of Pure and Applied Mathematics Volume 117, No. 17, 2017.
- [2] Keerti S. Nair, Anjitha Jyothi Kumar, A. P. Anushka Pillai, M. S. Greeshma, Jibin Joseph “Smart Luggage Tracker”,International Journal of Research in Engineering, Science and Management Volume-2, Issue-6, June-2019
- [3] Ankush Sutar, Tukaram Kocharekeal, Piyush Mestry, PrathameshSawantdesai, Mrs. Suhasini S. Goikar, “Smart Bag with Theft Prevention and Real-Time Tracking”, International Journal of Trend in Scientific Research and Development, Volume 2, 2018.
- [4] Ravi Jadiwal, Abhishek Parmar, Leena Raut, ”Rail Rush System for Crowd Analysis” 2018 International Conference on Smart City and Emerging Technology
- [5] M. Ajami, B. Lang, “Using RGB-D sensors for the detection of abandoned luggage”,7th International Conference on Imaging for Crime Detection and Prevention 2016
- [6] YassirRouchdi, AchrafHaibi, Khalid El Yassini, Mohammed Boulmalf,KenzaOufaska, “RFID Application to Airport Luggage Tracking as a Green Logistics Approach”2018 IEEE 5th International Congress on Information Science and Technology
- [7] Peixuan Wang, Tianlong Zhang,Sunbo Wang, “Remote Control and Tracking Dual-Mode Smart Suitcase”2018 3rd International Conference on Robotics and Automation Engineering

8] Yong-Shuang Wei and Jian-Hua Chen, "Tripartite Authentication Protocol RFID/NFC Based on ECC", International Journal of Network Security 2019

[9] M. F. Ahmad, H. J. Rong, S. S. N. Alhady, Wan Rahiman, W. A. F. W. Othman, "Colour tracking technique by using pixy CMUcam5 for wheelchair luggage follower", 2017 7th IEEE International Conference on Control System, Computing and Engineering

[10] Mohammed Ghazal, Samir Ali, FasilaHaneefa, Ahmed Sweleh, "Towards smart wearable real-time airport luggage tracking", 2016 International Conference on Industrial Informatics and Computer Systems.