REVOLUTIONIZING PARCEL COLLECTION: THE GSM-ENABLED AUTOMATIC BOX

Rajeev Ponna, Chetana Kommi, **C Pavan Kalyan,** Department of ECE, Sreenidhi Institute of Science and Technology, JNTUH, Hyderabad, Telangana, India
Ms. E. Lavanya, Assistant Professor, Department of ECE, Sreenidhi Institute of Science and Technology, JNTUH, Hyderabad, Telangana, India

Abstract:
This idea, often referred to as a smart package delivery acceptance system, is a highly practical tool for household applications while we are not at home. People's current lifestyles are more comfortable and opulent since everything is brought right to their front doors via the internet market. Instead of physically going to stores and making purchases, people are now buying all kinds of things online, from all-pins to couch sets. Amazon is a global leader in the online marketplace, and we purchase a lot of goods from their website. The delivery person usually doesn't bring the package when we are not at home and the door is locked; if this happens again, the package will be returned back, which is rather annoying for both the customer and the provider. Here, this smart box is made to collect the package in order to prevent this type of difficulty. A package collection box that can be used from any location in the globe can be mounted on a wall next to the front door of the house. The parcel collection box door may simply be opened from the same phone when the courier guy calls to bring a package, and we can instruct him to place the package inside the box. The same door may be closed using the same mobile phone after placing the package inside the box. Only authorised mobile phones may run this mechanism, which relies on GSM technology, which has no limitations on its operating range. As a result, the box can be used everywhere in the world because the mobile network is present everywhere. One tiny rectangular box will be built with wooden planks and its front half with acrylic sheet to allow visibility of the mechanism's working in order to demonstrate the concept effectively. Here, a sliding door proposal is described, which will be operated by a DC motor connected to a H Bridge integrated circuit. The embedded system is interfaced with the GSM module. An LCD is used to show the courier boy what to "call the Clint" for, and to draw their attention to, the package collecting box. When the box is powered on, an indication made of a few red LEDs will begin blinking. The system shows "Parcel is detected" and sends the same information to the phone in order to detect the package, whether or not it is maintained within the box. This is done using an IR-based trigger circuit. The owner of the package can close the door using the same mobile phone after receiving this notification.

Major building blocks: Main processing unit built with Arduino UNO, construction of parcel keeping box, construction of sliding door mechanism, L293D H Bridge IC, limit switches, rack, pinion, GSM module, DC motor, LCD, Parcel detecting circuit built with IR sensors and IC567, red indicator, PSU, etc.

Introduction

One of the numerous issues caused by the fast expansion of online shopping is that many customers are having trouble getting their packages delivered on time since the delivery person cannot be located at home. When a consumer is away from home, this is a major issue. The custom followed by couriers is to notify the people they are responsible for that they were unable to deliver the product because of a locked door. We may order the delivery of a package to our neighbours on occasion, but the delivery may be delayed for a variety of reasons, including our own forgetfulness or that of our neighbours. In usually, the delivery guy calls the client to pick up the product when he arrives at the address; if the customer is not home, then all of these sorts of issues may arise. These days, all residents of the household, even the children, leave throughout the day to go about their daily activities. In light of this situation, a means to receive a package at home even when no one is home is required, and a solution is provided here. In this work, we introduce a smart package collection box as the ideal resolution. This might give the package a safe place to be kept until

someone comes home to pick it up. Due to our hectic contemporary lifestyles, we often don't have enough time to pick up our packages since we are at work or the office and can't make it home in time. This autonomous package collection box, which uses GSM technology and can be controlled by our cell phone, is designed to handle such circumstances. With the use of a mobile communication network, this system offers a low-cost, quicker, safer, and more effective way to install smart box technology so that it may be used from anywhere on Earth. In this project effort, a unique gadget known as an automated package collecting mechanism is introduced. For demonstration purposes, a medium-sized package collection box with a motorised sliding door mechanism will be built. Its doors may be opened or closed using a phone that has been authorised by the company. When the delivery boy arrives at the desired residence to deliver the product, he calls the client, who then instructs him to unlock the door and place the parcel inside the box using the same mobile phone. When the package is retained within the box, the client automatically receives a message instructing them to use the same mobile device to close the box's door. This smart shipping container is made of a rectangular wooden box with a see-through acrylic sheet covering part of it. This allows users to clearly see how the mechanism or process works, which is crucial for demonstration purposes. The H Bridge IC serves as the motor driving circuit. The processing unit is interfaced with the GSM module of the SIM 800A. The package is detected using IR sensors connected to a tone decoder IC-built trigger circuit. This configuration, which includes the control circuit, will be placed within a box that is visible from the outside. The sliding door mechanism is controlled by a low RPM DC motor. The instructions are shown on an LCD. In the chapters that follow, the complete procedure will be described in full. Instrumentation systems are increasingly implemented using microcontrollers. Therefore, it's critical to have a solid understanding of microcontroller-based systems. Microcontrollers are now a crucial component of every instrument. Microcontroller-based dedicated systems have undoubtedly enhanced the functional, operational, and performance-based characteristics. The computation and networking capabilities of the Micro controller devices were and are the cause of the architectural changes in instrumentation and control systems. The microcontroller must be seen as a computing and communication instrument. Understanding microcontrollers is valuable and highly satisfying if it is used to create a product that is beneficial to the industry or to society as a whole. This is a topic that directly relates to the automation and development of industrial products. This project uses a microcontroller that has been programmed to carry out the encoding and decoding operations necessary for any biological equipment.

Any microcontroller that runs the programme that is stored in it. The programme in this instance is set up such that the system operates the smart package collection box utilising GSM technology via a mobile phone. The software is known as machine language since the programme is nothing more than a collection of instructions. These instructions are frequently produced in binary code and are known as machine code. Writing a programme in such a code requires special skills and is quite time-consuming. Because the programme is essentially a collection of 0s and 1s, it is prone to mistakes because it is difficult to understand the instructions by simply looking at the pattern. An approach is to represent the patterns of 0s and 1s using a shorthand code that is simple to understand. A microcontroller has the ability to read and store data from external devices. Micro-controllers carry out a single duty and execute a single programme. The programme is often not changed and is kept in read-only memory (ROM). The current programme must be deleted from the chip and a newly amended programme loaded into the chip using a chip burner if there are any changes to the function or software faults. The next chapters offer a full explanation of these controllers. It is obvious that the aforementioned operations cannot be carried out without microcontrollers, which is why these components are referred to as the instruments' "hearts" nowadays. As a result, more and more communication systems, instrumentation, control systems, robotics, etc. are being designed with micro-controllers. Therefore, it's critical to have a solid understanding of instruments built using microcontrollers.

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Proposed methodology

The fundamental notion is to use technology in our life to keep an eye on things that need our human involvement. By doing this, we hope to offer a dependable and approachable answer to issues encountered while purchasing online. For the customer's convenience, a stand-alone smart box is created that accepts and stores the intended package. We frequently don't have enough time to do our normal tasks, such as answering the door when someone knocks or picking up a delivery when it comes to our modern, hectic existence. We recommend automating the parcel collecting unit as a remedy for such circumstances. In this project, the role of GSM in home sophistication is discussed, along with a suggested method for automating the collecting of parcel deliveries. This system uses wireless sensor networks to execute the Smart Box System in a safe, quick, affordable, and efficient manner. Excellent properties of reliable (strong) digital communication are present in GSM communication patterns. Variable bit rates can thus be enabled for desired applications like speech or data. A smart mailbox is a crucial component of a future home with delivery notification. As a result, the user may view a real-time tracking of the delivered items. Elderly folks, residents of sparsely populated areas, and farmers with remote mailboxes will also find it useful. Since GSM network has the benefit of spanning a larger region of operation even when the user is mobile, text messages are sent via this technique. Through the use of wireless sensor networks and obstacle sensors, this system offers a Smart Parcel Box System implementation that is low cost, quick, safe, and efficient. For this, a unique gadget known as a hardware kit has been developed and created. IR transmitter and IR receiver are found on obstacle sensors. The beams are sent via an IR transmitter. The item is identified when the rays strike the object and are reflected back to the IR receiver. In our current system, customers are alerted by sending a text message via a SIM card, but if necessary, IOT technology may be leveraged to introduce an Android application that delivers the notification online. However, this idea makes use of GSM technology. The article provides an illustration of how this gadget works and how the notification-receiving programme works. This system minimises human effort.

Block diagram

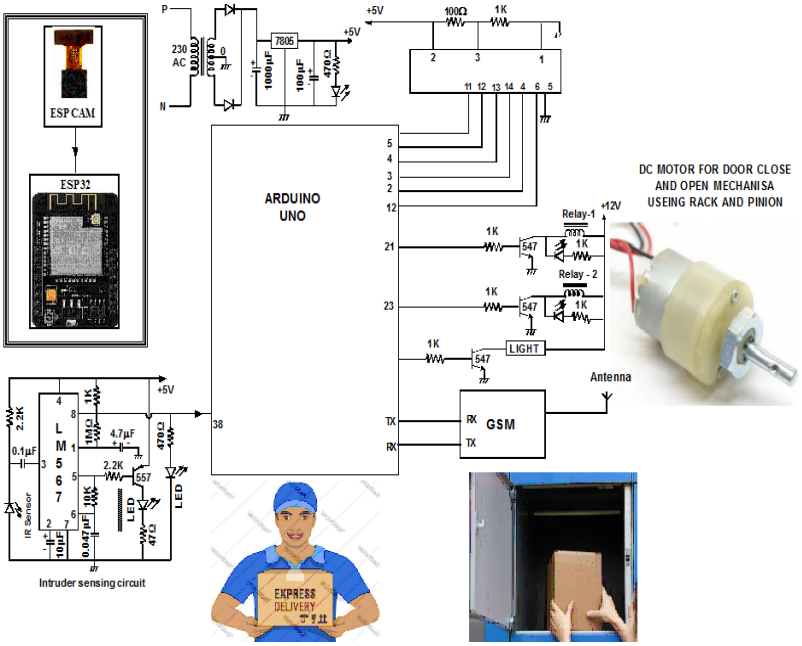

Fig 1. Automatic parcel collection block diagram

Literature survey

[1] Smart Home Delivery Systems:

A Review of Current Technologies and Trends This review article provides an overview of various smart home delivery systems and technologies available in the market. It discusses the challenges faced by traditional package delivery methods and explores innovative solutions such as smart

lockers, smart doorbells, and package acceptance systems. It can provide insights into the existing research and technologies related to smart package delivery.

[2] IoT-Based Parcel Delivery Systems:

This research paper focuses on IoT (Internet of Things)-based parcel delivery systems and their potential applications. It discusses the use of IoT devices, such as sensors, actuators, and communication modules, to enable seamless package delivery and collection. It can provide information on how IoT technology can be integrated into the proposed smart package acceptance system.

[3] Mobile-Based Access Control Systems for Smart Homes

This study investigates mobile-based access control systems for smart homes and their implications for package delivery. It explores the use of mobile phones as a means to control access to various smart devices and services in a home environment. It can provide insights into the feasibility and implementation of using mobile phones to operate the proposed smart package collection box.

[4] GSM Technology for Remote Monitoring and Control

This research paper focuses on the use of GSM (Global System for Mobile Communications) technology for remote monitoring and control applications. It discusses the capabilities of GSM networks and how they can be leveraged for long-range communication and control. It can provide information on the technical aspects and limitations of using GSM technology in the proposed smart package acceptance system.

[5] Embedded Systems and their Applications

This literature discusses embedded systems and their applications in various fields, including home automation and control systems. It provides an understanding of the fundamental concepts of embedded systems, their components, and how they can be programmed and interfaced with other devices. It can help in understanding the embedded system design and integration aspects of the proposed smart package collection box.

[6] Automation and Control Techniques for Package Delivery Systems

This research paper explores automation and control techniques employed in package delivery systems. It discusses different mechanisms used for package collection and delivery, including motorized doors, sensors, and communication interfaces. It can provide insights into the design and implementation of the proposed sliding door mechanism and IR-based trigger circuit in the smart package acceptance system.

Principles of operation

Mobile Phone Authorization:

The system allows only authorized mobile phones to control its operation. This is achieved by using GSM technology, which ensures that only specific mobile phones with the correct credentials can access and interact with the system.

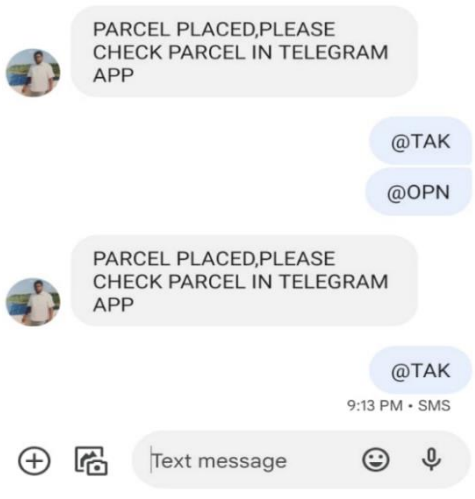

Fig. 2. Mobile phone controlling the operations of the box.

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Parcel Collection Box:

A specially designed package collection box is installed next to the front door of the house. This box serves as a secure and convenient location for the delivery person to place the package when the homeowner is not available. The box is constructed using wooden planks and has an acrylic sheet on the front half for visibility.

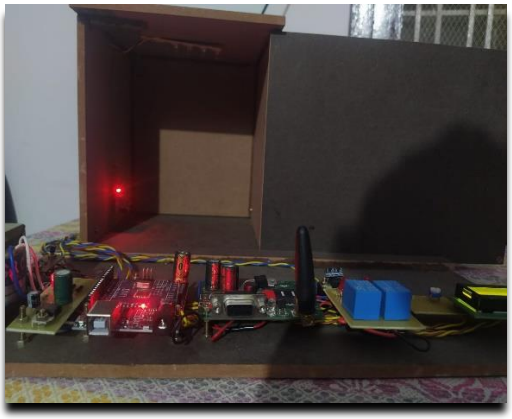

Fig. 3. Smart parcel box with sliding door mechanism.

Sliding Door Mechanism:

The package collection box is equipped with a sliding door mechanism for opening and closing. A DC motor connected to a H Bridge integrated circuit is used to operate the sliding door. When authorized, the mobile phone can send commands to the embedded system to open or close the door.

GSM Module and Mobile Communication:

The embedded system is interfaced with a GSM module, which enables communication with authorized mobile phones. When the courier calls to bring a package, the system uses an LCD to display instructions on the phone screen, guiding the courier to place the package inside the box. The same mobile phone can also be used to close the box after receiving the package.

Fig. 4. Message received to open the box when approved by the owner.

Fig. 5. Message shown on LCD display when box is closed.

Package Detection:

To ensure that the system detects the presence of a package inside the box, an IR-based trigger circuit is used. When the box is powered on, the trigger circuit detects the presence of the package and sends an indication to the system. This information is then relayed to the authorized mobile phone to notify the homeowner that the package has been detected.

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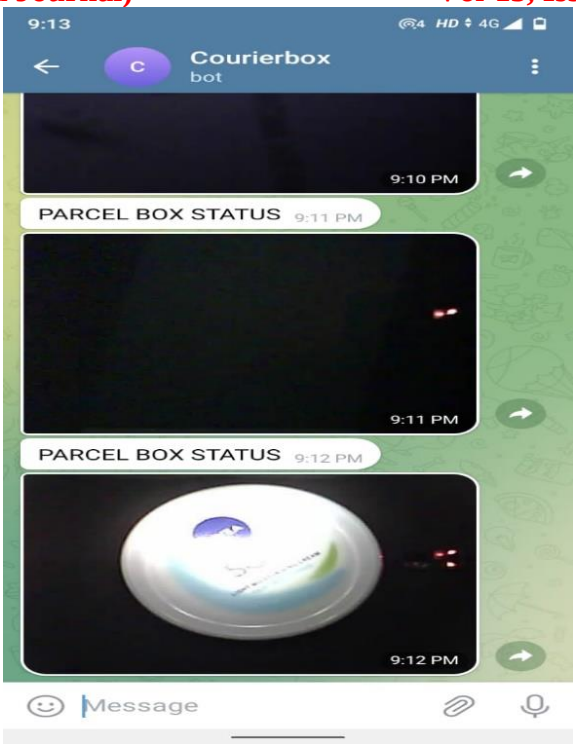

Fig. 6. Status of the parcel being notified on Telegram.

Indicator LEDs:

The system incorporates a few red LEDs that start blinking when the box is powered on. These LEDs serve as an indication that the system is operational and ready to receive packages**.**

Conclusion

The objective of engineering studies is to enhance the quality of life through continuous innovation and research. By leveraging technological advancements, an effort has been made to simplify the delivery process, which typically requires significant human effort and time. Delivery and logistics companies currently face challenges in handling packages, tracking them, and ensuring timely delivery. To address these issues and improve customer experience, an automatic smart parcel box has been developed for installation at customer premises. The project has been successfully designed and developed, and a prototype module has been constructed and tested with satisfactory results. While creating the prototype module, various challenges were encountered, and significant effort was invested to make it closely resemble a fully functional system. The prototype was built using locally available components to minimize costs. However, some modifications will be necessary to transform it into a fully operational system. This monograph presents the Smart Parcel Receiving System, which aims to address the problem of missed deliveries and provide a smart and secure solution for parcel delivery that can be monitored and controlled through a smartphone. The rise of online shopping has introduced new challenges for customers, particularly regarding parcel receiving when they are not at home. The concept of the Smart Parcel Receiving System is to establish a mechanism that can verify and accept ordered parcels while notifying both the customer and the e-retailers of the parcel's arrival.

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