IJIREEICE

ISSN (Online) 2321-2004
ISSN (Print) 2321-5526

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 6, June 2021

DOI 10.17148/IJIREEICE.2021.9639

Zero Contact Delivery for Faster and Safer Delivery Through IOT

Dr. Rekha N[1], Dhananjaya Kumar S[2], Prajwal A [3], Ravitej K[4], Yashasvi Bhat [5]

Associate Professor, Department of Telecommunication, KSIT, Bengaluru, India[1]

UG Student, Department of Telecommunication, KSIT, Bengaluru, India[2,3,4,5]

Abstract: As we know, the advancements in the Radio Frequency and Messaging technologies have made a platform to come up with various innovations reducing human effort. Since online shopping has become a part and parcel of common man's life, this is the right time to make use of existing technologies to simplify the procedure. The basic idea of the work is to introduce technology into our lives for monitoring issues which demand our personal presence. The aim is to provide a reliable and user friendly solution to problems incurred during online shopping. A stand alone box is designed which receives and stores the intended parcel so that the customer can retrieve it as and when required.

Keywords: SMART Locker, IOT network, Cloud, Sensors

I. INTRODUCTION

Intelligent and secure electronic locker systems for parcel delivery and collection [1]. Enable your multi-family housing residents to collect parcels, with 24/7 access from any delivery source. The smart locker is a modular and expandable solution developed especially for parcel collection. The functionality can be managed locally. Security of data [2] is of primary concern and the system is fully compliant with all data protection standards. No resident data is stored locally thanks to the enterprise-level cloud-based control system [3]. With the rise of e-commerce, there is an increasing need to manage online purchase deliveries effectively. Now here is this more apparent than within apartment complexes nationwide. During peak holiday times, parcel and package, deliveries can easily increase by a factor of five. As a multi-family housing unit owner or operator, this places an increasing demand on your staff to manage these packages until the time of collection. In addition to the time and effort it takes to manage this process, you are also taking responsibility for the package security. Wireless Sensor Networks (WSNs) have evolved from supporting application-specific deployments such as habitat monitoring, health care, and retail supply chains [4], to enable multiuser platforms that simultaneously support multiple applications operating in a large-scale Internet of Things (IoT) environment [5] wirelessly to the end users [6].

SMART locker [7] is the newest delivery option available to customers whose appetite for online shopping [8] is not only growing but also intertwines with the increased need for mobility. It is an easy solution for clients who don't want or cannot wait for the courier to address; they can organize their day schedule without taking into account their route and schedule. Lockers are located in 24/7 access places, so the parcel can be lifted at any time for 7 days. It is also a delivery solution for us, so our couriers do not have to return to the address several times in order to be able to deliver if at the first touch the customer was not found at the address or if he requested the delivery outside the courier working schedule.

II. LITERATURE SURVEY

In express delivery [9], couriers will generate a mass of trajectory logs when delivering shipments. To analyze these logs is of great value for the promotion of express delivery service.

With the increasing demand for express delivery, a courier needs to deliver many tasks in one day and it's necessary to deliver punctually as the customers expect. At the same time, they want to schedule the delivery tasks to minimize the total time of a courier's one-day delivery, considering the total travel time. However, most of scheduling research on express delivery focus on inter-city transportation, and they are not suitable for the express delivery to customers in the "last mile". To solve the issue above a personalized service for scheduling express delivery, which not only satisfies all the customers' appointment time but also makes the total time minimized. In this service, personalized and accurate travel time estimation [10] is important to guarantee delivery punctuality when delivering shipments. Therefore, the personalized scheduling service is designed to consist of two basic services: 1) personalized travel time estimation service for any path in express delivery using courier trajectories, 2) an express delivery scheduling service considering multiple factors, including customers' appointments, one-day delivery costs, etc., which is based on the accurate travel

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time estimation provided by the first service. We evaluate our proposed service based on extensive experiments, using GPS [11] trajectories generated by more than 1000 couriers over a period of two months in Beijing. The results demonstrate the effectiveness and efficiency of our method.

With the continuous growing of e-business, the logistics industry is developing rapidly. There is an increasing requirement for punctuality and efficiency of express delivery service. In light of this requirement, a great deal of related research have been conducted. However, most of the literatures focus on the scheduling of inter-city transportation, rather than the “last mile” delivery.

For any research based on trajectory data, map-matching [12] plays an important role, a design which is used for map-matching service especially for courier trajectories. Existing map-matching algorithms are designed mainly for cars or walks or ignoring means of transportation. Although these methods can be applied to courier trajectory map-matching, the accuracy of them can hardly be A Map-Matching Service Designed for Courier Trajectories guaranteed as they ignore the characteristics of courier trajectories. To solve this problem, a map-matching service was designed based on the map-matching algorithm called Courier Trajectory Based Map-Matching (CTB-Matching), which is specially used to deal with courier trajectories. Courier trajectories have some characteristics different from traditional trajectories. Firstly, couriers have to deliver shipments at different sites, so the trajectories seem more irregular, which is called as "fragmentation" problem. Secondly, unlike cars, couriers' positioning information is mainly generated by Wi-Fi location system [13], which is not precise as Global Position System (GPS), so the location deviation problem should be considered. Courier trajectories have some characteristics different from traditional trajectories. Firstly, couriers have to deliver shipments at different sites, so the trajectories seem more irregular, which is called as “fragmentation” problem. Secondly, unlike cars, couriers’ positioning information is mainly generated by Wi-Fi location system, which is not precise as Global Position System (GPS), so the location deviation problem should be considered. What is more, couriers usually use electric bikes for delivery, which travel slower than cars, and are less likely to be influenced by traffic. Therefore, the speed or temporal analysis for cars is not suitable here. Based on the analysis of current algorithms and the problems stated above, this paper designs a map-matching service for courier trajectory data. The experiments verify that our service performs better when dealing with courier trajectory data. Besides, our service is efficient with low time complexity and space complexity, making our service responses with low latency.

A hybrid heuristic approach [14] for public data delivery under ultra-large-scale smart-city settings. In this approach, public transportation vehicles are going into election process to be utilized as Mobile Couriers (MCs) that read public Access Points (APs) data loads and relay it back to a central processing base-station. A cost-based fitness function for the MCs election in the smart-city project which forms a real implementation for the Internet of Things (IoT) paradigm was introduced. The cost-based function considers mobile resource limitations in terms count, storage, and energy. Extensive simulations are performed, and the results confirm the effectiveness of the proposed approach in comparison to other heuristic approaches with identical objectives.

The success of express courier services [15] often depends on both how to assign service centers to consolidation terminals and how to extend their cutoff time (deadline) for direct home deliveries coordinated by service centers near customers. This study suggests an approach to design express courier service networks with respect to assignment of service centers to consolidation terminals and extension of their cutoff times. The integer programming model and a genetic algorithm-based solution procedure that allows express couriers to maximize their incremental profit. The productivity and service level-up of the express courier service is highly related to how to operate the consolidation terminals. A consolidation terminal typically acts as a hub where the ordered products from a number of service centers are combined, mixed, sorted, and transshipped to nearby service centers for local deliveries. Since a delay at the service center creates a whiplash effect on the succeeding consolidation terminals and service centers, the extension of cutoff time may lead to customer dissatisfaction and the lost sales. On the other hand, the extension of cutoff time can increase sales opportunity. This dilemma can be further complicated by varying cutoff time for different service centers. Despite numerous merits, none of prior consolidation studies considers spatial network design problems linking terminals to customers and temporal consolidation problems determining the cutoff time for order aggregation simultaneously. Another shortcoming of the consolidation literature is an oversight of the door-to-door shipping option via express courier services. In the meantime, Leung et al. (1990) presented a mathematical model and its solution procedure for solving point-to-point delivery problems. However, their study did not take into account door-to-door service coverage problems with cutoff time restrictions on consolidation. The study conducted by Cheung et al. (2000) was the first to examine a service network design problem encountering express couriers such as DHL Hong Kong. A hybrid optimization/simulation model that aimed to maximize service coverage and service reliability by adjusting cutoff time is used. The most intriguing feature of their model is its ability to examine the impact of cutoff time changes on service coverage and reliability. Their study revealed that the extension of cutoff time led to a higher level of service coverage, while decreasing the service reliability. Recently, Ko et al. (2007) developed a mixed integer program and a genetic algorithm to determine the cutoff time at each service center according to the spatial proximity

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of service centers to customers and the capacity of a consolidation terminal. Their study was also confined to a single consolidation terminal linking service centers. Therefore, this study considers a problem for reconfiguring the express courier service network by means of both reassignment of service centers to consolidation terminals and adjustment of their cutoff times. A mixed integer program and a genetic algorithm-based solution approach to assign each service center to each consolidation terminal and to determine the cutoff time at each service center according to the spatial proximity of service centers to customers and the capacity of a consolidation terminal. The integer programming model was formulated within a framework of a single machine scheduling problem under the first-in-first-out rule (FIFO) where efficient solution procedures such as a genetic algorithm are readily available for practical-sized problems. For illustrative purposes, the proposed model and solution procedure was performed with reduced data sets from an express courier in Korea.

To solve the problem of the inefficiency of China's current terminal logistics system, this paper mainly contributes to the designing of a logistics distribution visualization system [16]. According to the comparison of the usage of different smart phone operating systems, this project chose IOS [17] as main developing environment, which is one of the most popular operating systems nowadays. The logistic system mainly consists of two parts, couriers' distribution system and customer system, which has the function of courier route planning, dynamic tracking of the package and nearby courier and so on. With the rapid development of computer science and the popularity of all types of Internet applications, China's ecommerce is developing rapidly. According to the 36th "China Internet Development Statistics Report" released by China Internet Network Information Center (CNNIC) recently, it can be concluded that China's online shopping users has reached to 361 million by the end of June 2015. This number increased 5953 million compared with that in 2013 and the semi-annual growth rate is 19.7%. China's online shopping market always maintains a high level of activeness. For example, the annual total number of transactions has reached 17.3 billion and the per capita has 48 transactions in 2015. It shows that China's e-commerce transactions have an increasing trend every year. With the advent of "11.11" shopping carnival, the logistics has to face serious pressure in our country. The established logistics infrastructure cannot meet the fast growth of customer demand. It doesn't have the professional talent in logistics. The industry is not standardized, and the logistics-related facilities construction is not complete, so that the terminal logistics efficiency can't meet the customer's need nowadays. Based on these problems, it proposes to study the path planning of terminal logistics. At the same time, smart phone has become one of the indispensable equipment in our daily life. It can be applied to the management of terminal logistics through developing relevant applications, which can increase the visualization of terminal logistics and share the logistics information more easily. The application will improve the efficiency of the delivery and receive of package. For the reasons above, this paper propose the design of an application system for the optimization of terminal logistics distribution which can plan the road automatically for couriers and track the package information for the customers. Comparing with the traditional logistics method, using the new mobile phone application can meet the market need better in the future, which make the study more value. — Smart city [18] is an emerging concept that aims to improve the quality of city life, to enhance the efficiency of urban operations and services as well as to create a sustainable economic growth of the city. The growing urge of the people to live in an urban environment has significantly increased the city population, which in turn demands for development of smart cities to improve the quality of the city life as well as to enhance the efficiency of urban operations and services by using information and communication technologies (ICT) and other means. On the other hand, the aim of a smart sustainable city should be not only improving the quality of city life, but also to fulfill the requirements of present and future generations with respect to economic, social and environmental aspects. A formal and well understood definition of a smart city should be it is the seamless integration of various electronic equipment's as well as communication paradigms into a strategic way for the well-being of the citizens as well as to create a sustainable economic growth of the city. According to researchers in [19] different components of smart cities are smart infrastructure, smart transportation, smart environment and energy, smart health care, smart governance and education etc. Although the potential market of the smart city is predicted to reach at hundreds of billions dollars by 2020 [20], there are some obstacles to its realization from political, financial and technical perspectives. The major political barrier to making a city smarter is the involvement of different stakeholders into the decision-making process that focuses on the strategic planning and management aspects of the smart cities. A possible way out to remove this political barrier is to assign this entire decision-making and execution power to make the city smarter to a single dedicated department

Automation of Parcel Delivery Collection Using IoT [21] presents a brief structured outline of the system framework which is implemented by using two basic devices like bar code reader in combination with weight sensor. As the delivery boy places the product inside the box on the weight sensor through the front door the customer get the notification about the product weight and the barcode reader confirms the product that is placed. Once the customer confirms the product placed inside the smart system, he will be able to collect it when returning home. Smart system tells us only about the product collected that is kept inside the box with no proper measures taken to overcome the external issues faced.

Parcel locker's efficiency Analysis [22] based on the last mile delivery solution. The system is designed to collect the product and secure it until product in collected from the system. The huge system consisting of many lockers are

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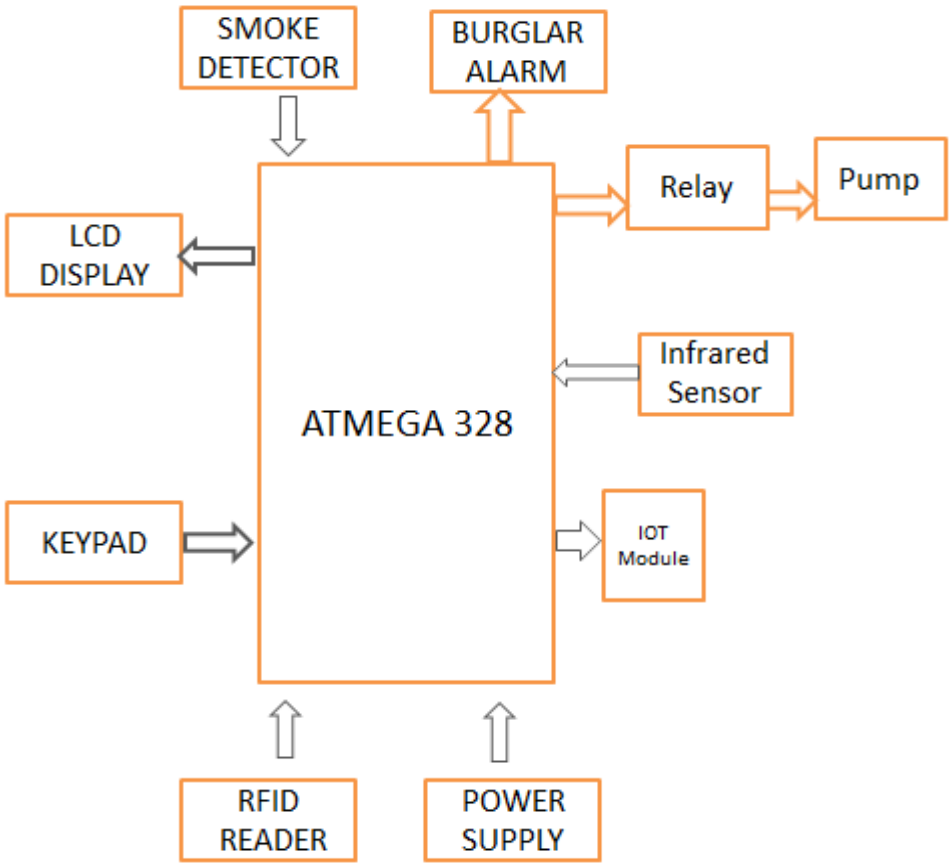
installed in the major interaction point in the city where the people are attracted most. The online retailer places the parcel in one of the locker and informs the receiver to collect. The receiver has to travel to the locker in order to collect the parcel which is total waste of his time and travelling expenses.

The growth of online selling, and E-commerce and demand of courier service [23] with the growing habits of consumers to buy online has effectively change the demand for such delivery services. With online shopping, courier services have grown around the world and having the option of buying or selling items online made the courier services more necessary Today, demand for courier services has risen significantly because of the threat of the COVID-19 pandemic. Demand is always followed by supply; courier services provide the delivery of food, groceries, documents, electronics, clothes, and other essential items. The application is also effortless to integrates with multiple servers. In some cases, it is capable to integrate with IoT devices like Arduino and Raspberry Pi [24], [25]. Telegram much faster to exchange messages compared to others messaging application. The Telegram also provide synchronization, reliable for backup and security [26].

III.METHODOLOGY



- Once the online order has been launched and the delivery option is chosen, expeditions are taken over by SMART Courier representatives, and in an average of 24 hours they are deposited in the e-BOX chosen by customers.
- The system automatically labels sender's package delivery by size (S, M, L) and when the AWB is drawn, a box is reserved in the SMART Courier system according to the size.
- As soon as dispatches are available in vending machines, the recipients receive a SMS or an email with a secret collection code (PIN) and other information needed to pick up expeditions.
- All that customers have to do is to enter the keypad screen, SMS / email PIN plus name and signature; the operations they have to perform at terminals are intuitive and easy to go.
- When leaving the SMART Courier warehouse, the system warns the lockers, so from the submission of the shipment, the system already has all the data about the package to be handed over, the identity of the courier and the password with which it opens and closes the E-Box.
- At the locker, the courier identifies with ID and password, logs in and selects the parcel delivery option.

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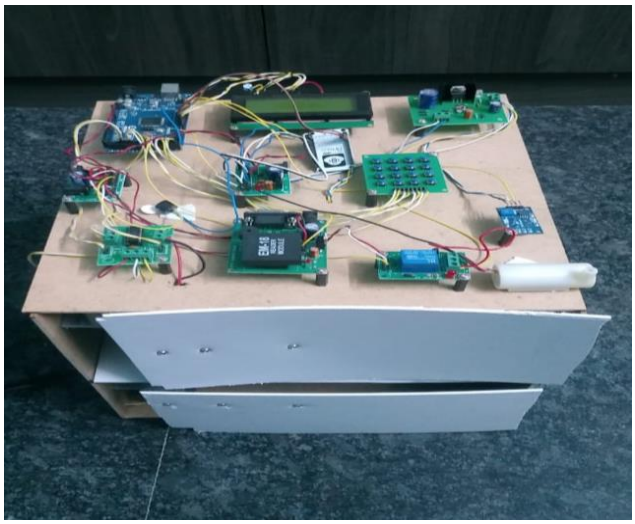
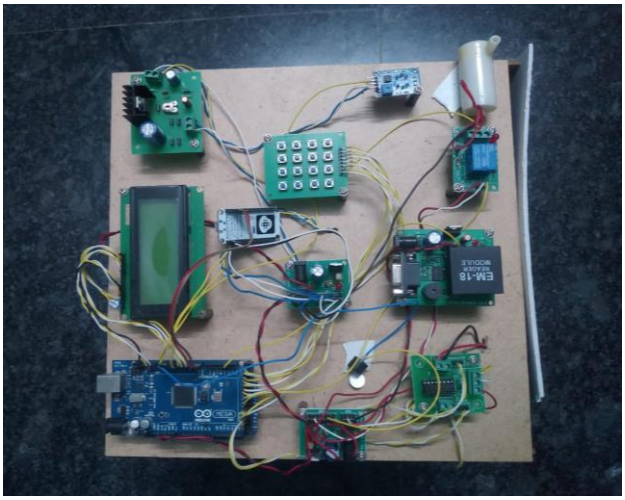
- After handing over the parcel, the compartment closes, and the system automatically generates a unique collection code that is sent to the recipient via email and SMS.
- The courier cannot submit another referral in a compartment until the first deposit is perfectly secure. If the customer has wrongly selected the size of the package, the courier has the option to manually choose another compartment.
- Based on the SMS or email received, the customer can pick up the shipment from the chosen wardrobe: type the Unique collection code received, sign electronically on the touch screen, and pick up the expedition.
- The E-BOX option is based on an easy and intuitive operating mechanism and is perfectly secured by the Austrian company KEBA. The locks are installed in controlled areas and are provided with alarm and anti-burglary systems.

IV. CONCLUSION AND RESULT





This paper provides the brief idea about how the 'Zero Contact Delivery System for Faster and Safer Delivery Through IOT' works. This paper explains about the various features available for this project. This project ensures if the package is safely delivered to the customer at the specified time. It also helps the delivery executive to efficiently deliver a greater number of packages in a shorter span of time as the delivery executive does not have to contact the customer personally to make the delivery. In this present COVID-19 pandemic situation this system can be effectively implemented to further prevent the spread of virus.

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