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A Survey of Drone Delivery System: For Medicine and First Aid Emergency

Harshit Mali[1], Anish Pashte[2], Amogh Chemburkar[3], Prakash Choudhary[4], Prof. Supriya Dicholkar[5]

[*1]*BE Electronics and Telecommunication Engineering Student, Atharva College of Engineering, Mumbai, India, Mumbai University*
[2]*BE Electronics and Telecommunication Engineering Student, Atharva College of Engineering, Mumbai, India, Mumbai University*
[3]*BE Electronics and Telecommunication Engineering Student, Atharva College of Engineering, Mumbai, India, Mumbai University*
[4]*BE Electronics and Telecommunication Engineering Student, Atharva College of Engineering, Mumbai, India, Mumbai University*
[5]*Assistant Professor, Atharva College of Engineering, Mumbai, India, Mumbai University*

Abstract
There is an exponential growth in the IOT industry and their applications in recent years, which has led to the development in logistic services in many countries. Unmanned aircraft systems, commonly referred to as drones, are getting increasingly popular in modern logistics operations. Drones were originally introduced as military weapons and were primarily used for surveillance against targeted attacks. Applications and usage of this technology have since evolved to incorporate a variety of labor-intensive and complex tasks across all industries. These include detecting defects in oil/gas pipelines, checking crop health, detecting hot spots in fire situations, monitoring mining and construction activities, filming movies, delivering packages, and more. Automated drones can deliver personalized care kits to the user's location so that the victim can diagnose treatment until an ambulance arrives at the victim's location and transports the victim to a hospital. Users also can request pharmacy for immediate remedy medicines in case of emergency. In our survey we found some key findings, consistent with analysts, operating costs for drone delivery services are 40% to 70% less than vehicle delivery service models. Additionally, the COVID-19 pandemic has further accelerated the necessity for alternative safe and contactless delivery models. This has increased the worldwide demand for drone delivery services.

Keywords: *Drone, last mile delivery, medicine delivery, unmanned aerial vehicle.*

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I. INTRODUCTION

Drones work remotely or autonomously using software which coordinates with onboard sensors and GPS. It can be used for a variety of things, including medicine delivery, security, aerial photography, and emergency response.

Smart homes, smart farms, smart buildings, smart campuses, smart logistics, and other smart elements make up smart cities. Smart cities incorporate a variety of technologies that provide cutting-edge services to enhance the quality of life for its residents. The citizens, the governments, the urban enterprises, and the service providers are the main stakeholders in smart cities. Unmanned Aerial Vehicles or drones provide the distinctive capabilities and functions necessary to actualize the vision of smart cities in this regard.

Patients typically buy their medications from actual pharmacies. Many times, due to lengthy lines, a lot of time is wasted. However, some pharmacies provide their customers with delivery services utilizing standard delivery vehicles. Even though this method reduces the amount of time patients must wait in lines, it still takes time to deliver the order because of drawn-out order administration processes and challenging road conditions like traffic and other obstacles. Drones will enable us to provide more efficient healthcare to people who are located a great distance away. The necessity for some human steps could be reduced in the future by small indoor drones bringing medication from the pharmacy to the patient's bedside. Because of this, drugs would work more quickly and with fewer mistakes. As supplies can be called to the patient's bedside rather than having to spend time gathering them, nurses and pharmacists can perform their jobs more effectively. A patient living at home could be monitored by a drone.

Drones enable the delivery of blood, vaccines, birth control, snake bite serum, and other medical supplies to remote places. They may also reach patients who need rapid medical attention within minutes, which in some circumstances could be the difference between life and death.

The main objective of this project is to minimize the waiting time of the delivery. Medical Drones Systems is typically used in places like amusement parks and ski resorts. These areas are frequently filled with tourists enjoying a wonderful time. But in an emergency, getting to the patient or injured person quickly will be quite difficult. Not only do you need time to find the injured individual, but you may also need to travel a considerable distance to get to them. The process takes a long time and puts people's lives at risk. As a result, this technology is built to perform this activity more efficiently without human error, saving time, energy, and successfully performing injured person rescues.

Sr No.	Title	Published
1	A Simulation-Based Process Model for Managing Drone Deployment to Minimize Total Delivery Time.	IEEE Engineering Management Review
2	Campus priority delivery system for the mail office of a university using an autonomous drone.	IEEE Research paper
3	Drone Design for first aid kit Delivery in Emergency situation.	2020 6th International Conference on Advanced Computing & Communication Systems
4	Drone Services: An Investigation via Prototyping and Simulation.	2018 IEEE Conference paper
5	DroneTalk: An Internet-of-Things-Based Drone System for Last-Mile Drone Delivery.	IEEE Transactions On Intelligent Transportation Systems Journal
6	E-Medic Autonomous Drone for Healthcare System.	2021 International Conference on Computing, Communication, and Intelligent Systems (ICCCIS)
7	Medical Drones System for Amusement Parks.	2017 IEEE/ACS 14th International Conference on Computer Systems and Applications
8	Optimal Indoor Goods Delivery Using Drones.	2019 IEEE Conference paper
9	Parcel Delivery with Drones: Multi-criteria Analysis of Trendy System Architectures.	2021 29th Mediterranean Conference on Control and Automation (MED)
10	Service-Based Drone Delivery.	2021 IEEE 7th International Conference on Collaboration and Internet Computing (CIC)

II. SURVEY OF PAPERS

1. A Simulation-Based Process Model for Managing Drone Deployment to Minimize Total Delivery Time.

This paper focuses on how managers can reduce total delivery time by deploying drones. The objectives of this paper are to develop a simple, accurate, and efficient model that replicates the dynamic interaction of variables and their collective impact on total delivery time. The simulation model was given a range of testing to understand and compare total delivery time between steps 1) Collecting Delivery Data 2) Determine Distributions for Each Segment of Total Delivery 3) Determine Total Delivery Time Distribution Time. A final important conclusion is that, in most instances, as the delivery distance increases, the distance of the road travel route gets closer to that of the direct flight route. This means that, all else equal, drones are less effective over longer distances. However, in many rural areas, roads are sparse or curvy and the likelihood of a direct (i.e., straight) ground route has a lower probability of occurrence, even for longer distances. Future research should examine the impact of geographical contours, population size, and road density on the comparison between drones and surface vehicles.

2. Campus priority delivery system for the mail office of a university using an autonomous drone.

The authors of this paper used CAD software for designing the prototype and compared the computer model obtained with the actual prototype. The model chosen was S500 frame, selected for its compatibility with common drone components, in addition to having a distance of 150mm from the base to the landing gear. The estimated displacement of the route to be covered was calculated using Google Earth tool which gave a distance of 558.27m and the range of antenna must have that distance along with an operating frequency between 430 to 438MHz. For optimization purposes, simulation techniques were used. Since it is necessary to analyze both software and hardware components, two simulations of a different discipline were carried out. In the hardware simulation it will illustrate the effect of an overload on the vehicle stability. On another hand, a software in the loop (SITL) simulator will allow you to execute the sequential code in a virtual flight, which follows the route that was designed in order to avoid houses, vehicular roads, and areas with crowds of people. The risk analysis is based on the risk management system endorsed by

International Civil Aviation Organization ICAO. This analysis will show reliability of the system for an implementation on campus in the future.

3. Drone Design for first aid kit Delivery in Emergency situations.

In this paper they have contemplated that this system has gyroscope sensor, accelerometer and GPS for the safety purposes in which accelerometer is used for orientation purposes and coordinate acceleration gyroscope for rotation tracking when the user books an ambulance for the victim from system where it shows victim details and latitude and longitude coordinates are automatically detected then alert is given to ambulance if it is stuck in traffic it notifies the nearest drone then drone will deliver the emergency first aid to victim whereas what has been used here is quadcopter in this the propellers are vertically oriented of varying speed the flight of drone is automated by fixing waypoint in the software. After getting the first aid kit the victim can contact the doctor in this software will show green field for pending request and red for requests attended the quadcopter is made up of carbon fiber lipo-battery of 5200 MAH is used the flight controller which is APM 2.8 controls the entire flight of drone sensors are attached to change the orientation mission planner is the software used for planning flight where drone can fly for 15-20 minutes at speed of 40 to 50 kmph.

4. Drone Services: An Investigation via Prototyping and Simulation.

In this paper, it is proposed to investigate an approach for using drones to provide services, one where drones act as fly-in fly-out servers in order to collect data, provide Internet access. These services include transporting data from the mobile client to the station .Then using a simulation based study they found out to improve services and this prototype consists of three main components Drone,Controller,client .The experiments comprise two Android devices. We have implemented the following three drone services in one Android application called Drone services: Data Collection Service, Data Provisioning Service, Data Processing Service. The front-end component that offers mobile clients simple interactions with the system In addition to this prototype, The two strategies are out of which the First Drone Strategy is Always the first available drone in the queue is responsible for serving incoming requests. If the first drone is busy or unavailable the second drone in the queue is used, and so on second strategy Strong Drone Strategy: For each incoming request, the drone with the highest battery level is selected. Then 2 experiment is Drone Station Location where strategies include Edge Location Strategy where Drone station placed at the edge of the serviced area and Middle Location Strategy is Drone station placed in the middle of the serviced area whereas third experiment is Drone Battery Run-Time Charging Here, clients are randomly distributed but request services that require 180 seconds of processing time. The results of varying different number of clients comparing the scenario where drones recharge when at the station and when they don't recharge; if drones are allowed to recharge in between requests , drones can service more requests, while non-recharging drones' capacity to serve stagnates and the fourth experiment is Drone Cell we focus on using one cell only with one or two drone stations .All drones in one station, drones distributed roughly equally in two stations, and two stations as before but where for each request, strictly the drone from a station nearer to the request is used, instead of any drone from either station Using two stations technique clearly, improves the number of served requests. Finally, combining the four techniques have a significant impact on developing drone services.

5. DroneTalk: An Internet-of-Things-Based Drone System for Last-Mile Drone Delivery.

In this study, they investigated solutions for enabling drones to fly autonomously in mixed indoor–outdoor environments. They propose a novel Internet of Things (IoT)-based drone delivery system, namely DroneTalk. Simulation results indicate that the proposed system can attain a high user-defined flight success rate without any collisions; thus, the proposed system can be feasibly used in real-world environments. The DroneTalk server which was developed on an IoT device management platform called IoTtalk consists of two components: the DroneTalk engine and DroneTalk graphical user interface (GUI). When the drone is in a GPS-friendly open area, the GPS module receives reliable GPS positions for the drone and then forwards these positions to DroneTalk. DroneTalk then triggers the path calculator to convert the appropriate outdoor path into corresponding control commands. The command generator receives the current drone position and destination from DroneTalk and then generates the corresponding control command for drone flight control.Although only a prototype system was developed in this study, it provides a successful framework for developing urban last mile drone delivery systems, which may be generalized and/or even productized in the future.

6. E-Medic Autonomous Drone for Healthcare System.

In this paper, the E medic system consists of four major components. First, is an Autonomous drone which contains obstacle detection and avoidance, Raspberry pi, GPS sensor, Pixhawk flight controller and motor controllers. Raspberry pi runs all the algorithms and gets the sensor reading from the sensors. Then it controls the Pixhawk flight controller using the MAV Link protocol. After that the flight controller sends the necessary PWM signals to the motor controllers to navigate the drone. For obstacle detection and avoidance Canny algorithm was used as it has a lower error rate, good localization, and minimal response. In this work, an E-medic drone uses a single Pi camera mounted in its front to get the front view of the flight and detect any incoming objects. So the third component was the Healthcare platform that consisted of Doctor portal, Patient Mobile application, and Pharmacy portal. This portal was mainly developed using the Angular framework and it uses firebase as the backend. Also, this portal contains an OCR recognition system for hardcopy prescription recognition with the assistance of an OCR recognition REST API. REST API is for real-time communication with the drone and client app. And the last was the ETA calculating system because several factors are affecting the delivery time of order. E- medic Cluster its previous deliveries using the K-means algorithm.

7. Medical Drones System for Amusement Parks.

In this paper implementation of a Medical Drones Systems is shown. MDS is a system that can be implemented in such areas like skiing resorts and amusement parks. These areas are usually filled with tourists who are scattered everywhere enjoying their time. In case of emergencies, it will be very difficult to quickly reach the patient. You need time for locating the injured person, but there might also be a long distance. In case of the situation developing so fast and the patient is too sick or weak to call for an emergency. People around the person would ask for help using the same mobile application. Different accidents can happen like fainting due to diabetes and bleeding injuries. A person will send it to the mobile application so that MDS would be alerted, and it will locate the place of the emergency using GPS. Drones are faster than humans, so they will reach the required destination faster and assist the situation by dropping essential medical supplies so other people around the injured person use those supplies to help him. The MDS will be provided with a camera to be able to see and interact with the situation. In this prototype, two drones are used which can carry different medical supplies of varying weights for different types of emergencies. The first one is considered a racing drone which is known for its high speed. Furthermore, the second medical drone we are using is the Hexacopter. It can handle inserting a bigger box which we used for the first aid kit supplies. The GPS coordinates were sent to the ground control station after pressing on one of the SOS buttons. So in this way it can be used in amusement parks for first aid delivery.

8. Optimal Indoor Goods Delivery Using Drones.

The authors in this research tackled a different application, one is gathering goods from indoor storage zones and their transportation into specific delivery areas, similar to trucks that should be automatically loaded with different goods from a warehouse and other is solving a type of Vehicle Routing Problem (VRP) specifically for drones goods gathering and deployment scenarios. The constraints and objective of our problem can be casted as a suite of Binary Integer Programming (BIP) problems which can be solved by using existing optimization routines as CPLEX, GLPK, Matlab. The BIP formulation is inspired by Mixed Integer Linear Programming (MILP) descriptions from which different vehicle routing problems were solved by multiple movement tours. Validation was carried in two steps. First, numerical evaluation was done on more than 10 scenarios with different complexities. Next, a real-time experiment was performed for illustrating preliminary reliability of the proposed solution. In the current phase of research real-time experiments were done using an off-line path planning followed by an online path following. The path planning was obtained off line using Matlab, after a scanning of the environment with the 3D-RGB sensor. This allows the storage and the goods areas position to be identified. Next, the path following was performed on-line, by running a Python script.

The drones communicate with a central unit via Bluetooth, using separate threads. Drone detection is done using OpenCV library and implies identification of the front propellers when they are spinning.

9. Parcel Delivery with Drones: Multi-criteria Analysis of Trendy System Architectures.

This paper aims at fulfilling this gap by proposing the application of a Multi Criteria Decision Making (MCDM) technique to compare and rank different parcel delivery systems. In this it is proposed the use of the cross efficiency Data Envelopment Analysis that is a well-known mathematical method in the class of MCDM techniques, able to support the decision-making process in the presence of a large amount of data.DEA allows considering both quantitative and qualitative data at the same time.The aim is to assess

each DMU by all the weights of the other DMUs , thus providing a relative efficiency. Hence, here we propose the application of the cross efficiency DEA to perform a comparative analysis among three parcel delivery systems the three parcel delivery architectures that, according to the state of the art, The first approach is Parcel Delivery Systems Architectures System 1 allows a client to place an order from a personal device to the warehouse ERP System 2 manages the interaction between the drone and the organization server implemented in the freight logistics sector value. System 3 manages the integration of an external notification service with the organization. Second approach is the Cross-Efficiency Data Envelopment Analysis. DEA is a non-linear programming technique aimed at computing the efficiency of homogeneous operating units, called Decision Making Unit. Then comes the case study to show the effectiveness of the proposed technique. In particular, we consider the case of a logistics service provider company that aims at optimally selecting the most efficient delivery system architecture for its own organization. This paper proposes the application of a multi-criteria decision making technique to evaluate the efficiency of alternative delivery system architectures. The aim is to support logistic service providers in comparing and assessing the efficiency of novel delivery systems based on unmanned aerial vehicles with respect to the classical truck-based ones. The effectiveness of the proposed methodology -based on the cross-efficiency Data Envelopment Analysis.

10. Service-Based Drone Delivery.

They proposed a novel service-oriented approach to enable the ubiquitous delivery of packages in a drone-operated skyway network. They discuss the benefits, framework and architecture, contemporary approaches, open challenges and future visioned directions of service-based drone deliveries. They highlighted the benefits of service-based drone deliveries from service providers and consumers perspectives. They then proposed a service-oriented framework that utilizes a sensor-cloud infrastructure for optimal drones operations in a smart city. This document develops a strategy to leverage the service model for the possibility of using drones for delivery services in the smart city. They highlight the benefits of service-based drone delivery from a supplier and consumer perspective. A service provider primarily benefits from reduced costs and increased profits. Using drones, delivery companies have significantly reduced labor costs. A recent study estimated that drones can account for a third of the day's deliveries for each 2030. This growth will come through the profits of delivery service providers who were early adopters of drone technology. According to Amazon, 86% of their shipments weigh less than 5 pounds. This weight limit is something most commercial drones can carry and what flight regulator regulations allow. As a result, delivery service providers adopting drones can rest assured that their drones will be in high demand. Service consumers can be defined as the end customers who order packages. Drones offer an option to deliver packages faster than ground delivery. Drones for delivery can lead to lower costs. These cost savings can be passed on to end users through lower service prices. On-demand drone delivery contributes to consumer convenience as consumer demand for speed increases.

III. CONCLUSION

So after surveying all the paper which we looked after we came to a conclusion that in addition for what drone does while delivering a thing for eg medicine or food etc over a geographical area for shortest path available we will be having a locking mechanism where it will be easier to access the receiver client with the help of rfid wherein it will be able to detect the nfc tag of the user mobile by placing near the drone while it receives the rfid identification number of mobile which will be available as string then it will send the data to server for verification purpose then it checks if the string matches the user which has ordered than it receives green signal from server that it has matched and the locks gets unlocked where makes it unique in every aspects

REFERENCES

[1]. David Swanson. “A Simulation-Based Process Model for Managing Drone Deployment to Minimize Total Delivery Time” Associate Professor of Transportation and Logistics Coggin, College of Business, University of North Florida, IEEE ENGINEERING MANAGEMENT REVIEW, VOL. 47, NO. 3.

[2]. Juan Camilo Angarita Noriega, Sebastian Roa Prada, Camilo Emique Moncada Guayazan “Campus priority delivery system for the mail office of a university using an autonomous drone”, 2020 IX International Congress of Mechatronics Engineering and Automation (CIIMA).

[3]. Parvathi sanjana, M. Prathilothamai. “Drone Design for first aid kit Delivery in Emergency situation”, 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS).

[4]. Majed Alwateer, Seng W. Loke, Wenny Rahayu “Drone Services: An Investigation via Prototyping and Simulation”, 2018 IEEE 4th World Forum on Internet of Things (WF-IoT).

[5]. Kuan-Wen Chen, Ming-Ru Xie, Yu-Min Chen, Ting-Tsan Chu, Yi-Bing Lin “DroneTalk: An Internet-of-Things-Based Drone System for Last-Mile Drone Delivery”, IEEE Transactions on Intelligent Transportation Systems (Volume: 23, Issue: 9, September 2022).

[6]. Dr Pradeep Abeygunawaradana, Narmada Gamage, Lanka De Alwis, Shalika Ashan, Chathura Nilanka, Pasan Godamune, "E-Medic Autonomous Drone for Healthcare System", 2021 International Conference on Computing, Communication, and Intelligent Systems (ICCCIS).
[7]. Ahmed Bitar, Aliaa Jamal, Hesham Sultan, Nour Alkandari, and Mohammed El-Abd, "Medical Drones System for Amusement Parks", 2017 IEEE/ACS 14th International Conference on Computer Systems and Applications.
[8]. Marius Kloetzer, Adrian Burlacu, Gabriel Enescu, Simona Caraiman, Cristian Mahulea, "Optimal Indoor Goods Delivery Using Drones", 2019 24th IEEE International Conference on Emerging Technologies and Factory Automation (ETFA).
[9]. Graziana Cavone, Nicola Epicoco, Raffaele Carli, Anna Del Zotti, Joao Paulo Ribeiro Pereira, Mariagrazia Dotoli, "Parcel Delivery with Drones: Multi-criteria Analysis of Trendy System Architectures", 2021 29th Mediterranean Conference on Control and Automation (MED).
[10]. Balsam Alkouz, Babar Shahzaad, Athman Bouguettaya, "Service-Based Drone Delivery", 2021 IEEE 7th International Conference on Collaboration and Internet Computing (CIC).