

Unmanned Aerial Vehicle for Medical Applications

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ABSTRACT

Advances in technology have revolutionized the medical field and changed the means of healthcare delivery. Unmanned Aerial Vehicles are successive wave of technological advancements that have the potential to form a large change in healthcare delivery. UAV, originally developed for military use, are creating their means into the general public and personal sectors as a result they will be flown autonomously and might reach virtually any geographical location, the importance of UAV are getting progressively apparent within the medical field. UAV supply a cheap answer to expand the accessibility of care to hospitals. The increase in quality and application of UAV, particularly within the public sector, will be attributed to their ability to perform a large variety of tasks, that embrace delivering product quicker than ground transportation, traversing rough parcel of land, and capturing aerial pictures. Our model, that use drone delivery, can facilitate a lot of timely and economical health care delivery to hospitals. The applying of drones in drugs seems to be promising and might increase the standard and accessibility of care.

KEYWORDS: *Unmanned Aerial Vehicle; drone delivery; healthcare*

How to cite this paper: Suryamathi J | Sri Haran S | Prince Sunny | Udaya Kumar P "Unmanned Aerial Vehicle for Medical Applications"

Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-5, August 2020, pp.1694-1697, URL: www.ijtsrd.com/papers/ijtsrd33195.pdf



IJTSRD33195

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INTRODUCTION

Unmanned aerial vehicles (UAVs) have recently aroused great interest and a spotlight within the educational circle worldwide because of their great potential in variety of applications [1]. Nowadays, the transportation of medical product in times of emergency is limited to wheeled vehicles and aircrafts which can be expensive and slow. UAVs could also transport product quickly, safely, and inexpensively across each accessible and inaccessible areas like to stranded mountain climbers. This presents medical suppliers with compelling new potentialities for transportation in times of need and in routine circumstances [2].

CONCEPTUAL STUDY OF THE PROJECT

Especially for light-weight flying systems, the dynamic model ideally includes the rotating mechanism effects ensuing from each the rigid body rotation in the house, and therefore, the four propeller's rotation. The UAV is represented vehicle as having four propellers in cross configuration. The 2 pairs of propellers (1, 3) and (2, 4) successively in opposite directions. By variable the rotor speed, one will raise the force and build motion. Thus, increasing or decreasing the four propeller's speeds along generates vertical motion. Dynamically the two and four propeller's speed conversely produces roll rotation in addition to lateral motion. Pitch rotation, and the corresponding lateral motion, resulting from one and three propellers speed conversely changed. Yaw rotation is additional delicate because it results from the distinction within the counter-torque between every try of propellers. In spite of the four actuators, the Quad rotors still

associate degree under-actuated and dynamically unstable system [3].

SCOPE OF THE PROJECT

Wireless networks comprising of UAVs will offer fly communication facilities in a very cost-efficient method in situations wherever a part of the prevailing terrestrial infrastructure is destroyed and there's a requirement to supply emergency services and avoid any more destruction in the disaster struck areas [6, 7, 8]. In most cases, UAVs are solely used for military functions, however once they are equipped with little access points they'll give a communication bridge between ground users and network nodes. Similarly, UAVs can be utilized in package delivery, police investigation operations and IOT applications. Surveillance operations typically involve observing the areas of interest over an extended amount of time. Such operations could embody search and rescue operations, border patrol and traffic monitoring, fireplace observance and lots of additional applications [6, 8, 9].

OBJECTIVES OF THE PROJECT

To propose a thought of drone-aided health care delivery and pickup service for hospitals: drones will offer aerial health care delivery and pickup services to help the restricted variety of caregivers and reduce the owed expenses for the hospitals that require routine health care services.

To develop a model in drone-aided health care delivery and pickup service: strategic aiming to optimally decide altitude

and speed of the UAV considering the space between the delivery and pickup location to offer blood luggage to the hospitals in times of need quicker than the road transport.

LIMITATIONS

The use of drones within the medical field compels to live their effects on medical merchandise, samples, medication, blood product, or transporting human elements between hospitals. The impact of drones on blood transport from one hospital to a different hospital and to explain a way to maintain the temperature and physical elements of blood. There's no adverse impact of drones transporting any medical product within the future, once the drones succeeded in maintaining the integrity of blood elements like temp, PH, hemolysis the drone transport of blood supply may be implemented [4]. For the drones, response time was 5 minutes and twenty one seconds, except for the normal ambulance; it absolutely was sixteen minutes and thirty-nine seconds. Saving sixteen minutes is very much appreciated in this case. These results have received smart feedback and inspired researchers to continue with additional flight tests to find additional regarding the practicableness of as well as drones in the emergency medical services system [4, 5].

LITERATURE REVIEW

[1] Mario Arturo Ruiz Estrada and Abraham Ndoma (2019) the uses of unmanned aerial vehicles UAV's (or drones) in social logistic: Natural disasters response and humanitarian relief aid. The effectiveness of Quad copters, Drones, smart Platforms (SP), and LUAV's within the case of natural disasters extremely depends on the right balance between the technology development of software package and hardware along. to boot, the skilled coaching for future pilots (human capital) to come up with economical and effective missions in several stages. These 3 steps in any mission square measure foremost the aerial observance of postnatural disasters impact.

[2] Wen-Chyuan Chiang et al., (2019) Impact of drone delivery on sustainability and cost: Realizing the UAV potential through vehicle routing improvement. the employment of drone delivery is helpful to the atmosphere and value saving. Ideally, drones yield lower energy consumption and crop greenhouse emissions, thus reducing the carbon footprint and enhancing environmental property. A genetic formula is developed to efficiently solve the difficult model, and an intensive experiment is conducted to illustrate and validate the analytical model and additionally the resolution formula. Optimally routing and delivering packages with UAVs would save energy and cut back carbon emissions. the method results powerfully to support the notion that operating UAVs for supply is not only worthy, but put together environmentally friendly.

[3] Gloria Cerasela Crişan and Elena Nechita (2019) cooperative truck and drone delivery system: Considering drones and optimizes numerous cost functions. Heuristic for minimizing the full transportation time of a truck-and-drone delivery system proposes a replacement price function to incorporate the flying time of the drone and performs a comparison with previous similar approaches. Experiments with totally different parameter settings on 2 massive space representative drawback instances show vital total time savings for the planned approach and supports future analysis once considering real-world eventualities.

[4] Aaron Pulver and Ran Wei (2018) Optimizing the spatial location of medical drones: Emergency management systems should account for the actual fact that resources won't continually be obtainable come distress calls return on. it's vital that extra resources and facilities will give some level of service in these things. This additionally applies to new future technologies like medical unmanned aerial systems (UAS). To support the situation higher cognitive process of medical drones, a brand new location model, the BCLP-CC, that aims to maximise both the first and secondary coverage provided by a group of launch sites whereas expressly taking under consideration the unceasingly distributed demand. Results show that the BCLP-CC will considerably improve backup coverage with least loss of primary coverage. Since the BCLP-CC model is a smaller amount computationally complicated than connected models, it had been able to be resolved with affordable process efforts on a typical desktop digital computer

[5] Kunj Bhatt et al., (2018) Targeted Applications of Unmanned Aerial Vehicles (Drones) in Telemedicine: Drones might provide a unique and cheap way to transport medical provides, medications, and specimens quicker than ground transportation. Organizations and corporations like the United Parcel Service of America (UPS), Deutsche Post DHL group, and also the National physics Associate in Nursingsingd house Administration (NASA) have already experimented with the thought of delivering medical supplies as an initiative to extend access to care. However, for drones to be effective, the consequences of flight should not alter medical supplies. These parameters are restricted to changes in temperature, pressure, and forces of gravity. many studies revealed the consequences of flight on varied laboratory samples. These initial studies once for all indicate that drones are a secure modality for the delivery of medical provides.

[6] Evsen Yanmaz et al., (2018) Drone networks: Communications, coordination, and sensing: Small drones are being utilised in observance, transport, safety and disaster management, and alternative domains. picturing that drones form autonomous networks incorporated into the traffic, tend to describe a high-level design for the planning of a cooperative aerial system consisting of drones with on-board sensors and embedded process, coordination, and networking capabilities. to implement a multi- drone system consisting of quad copters and demonstrate its potential in disaster help, search and rescue, and aerial observance.

[7] Andreas Claesson et al., (2017) Time to Delivery of an Automated External Defibrillator Using a Drone for Simulated Out-of-Hospital Cardiac Arrests vs Emergency Medical Services: Unmanned aerial systems, normally known as drones, is activated by a dispatcher and sent to an address provided by a 911 caller. The drone might carry an automatic external electronic device (AED) to the placement of associate OHCA in order that a witness will detach and use it. Theoretical geographical data system models have shown that drones carrying associate AED will scale back response times in rural areas.4,5However, whether or not they reduce response times in an exceedingly real-life state of affairs is unknown. This study compared the time to delivery of an AED using totally autonomous drones for simulated OHCAs vs emergency medical services (EMS).

WORK FLOW

If a hospital needs particular blood for the patient in an emergency situation, send a request to the nearby blood bank through the message. Then the nearby blood bank receive the request message and check the availability of the requested blood. If the blood bank has the availability then it sends the confirmation message to the requested hospital. If the blood bank doesn't have the availability then the process terminated. If multiple blood banks send the confirmation to the requested hospital then they need to find the shortest path and need to select a set point of a particular hospital. Then the information sends to the drone server and it starts to transport the blood from blood bank to hospital.

A. Relay

A relay is an electrically operated switch. Relays use a small flow of current circuit to manage consecutive flow of current. the current that is flown through the relay creates a field that pulls and makes the switch contacts. the current flowing through the coil may be turned on or off in order that the relay switch positions and also throws double switches. Relays allow one circuit to alter a second circuit which could become independent primarily

B. ESC

ESC also referred to as Electronic Speed Controller is used in this system to vary the servo meter speed and also act as a dynamic brake for the propeller. The Drone Electronic Speed Controller on a drone is a hard-working, powerful element. Brushless motor needs an ESC; a quad copter would require four ESCs. The ESC takes the signal from the flight controller and power from the battery and makes the brushless motor spin

C. BLDC motor

Brushless DC motor systems integrate compact yet powerful brushless DC automobiles and high-overall performance drivers to offer first-rate strength savings and speed balance in addition to a extensive speed control rang

D. Power Source

The energy source utilized in the system is LiPo battery that is designed to function on a secure voltage from 3V to 4.2V. The battery discharging at 3V could result in non-reversible overall performance and also harm the battery life. Overcharging the battery after 4.2V leads to fire in battery and also there is a chance of whole battery failure by means of exploding.

E. Main Controller Board

It is the mind of the tetra rotor and this part is most important because it guides the moves of the 4 rotors of the machine

F. Receiver and Transmitter

The transmitter transmits the records from the operator to the tetra rotor. The operator inputs the information of what it desires the rotor to do on the transmitter. The receiver then receives that command and passes on that statistics to the principle controller.

G. Frame

The frame gives shape, stability, appearance and shape to the tetra rotor. The frame is the skeleton of tetra rotor which helps it even as the vehicles fly it in to the air. Frame is to be

had in various materials however the frame should be durable, robust and mild weight. The most usually used frames are made from fiber and aluminum.

H. Motor controller

Each quad copter motor has a circuit referred to as an Electronic Speed Control (ESC). An electronic speed controller is an digital circuit with the motive to differ an electric powered motor's pace, its route and also braking. Electronic Speed Controllers are an crucial component of contemporary quad copters.

I. System ratings:

Battery Power: 4-cell Lithium-polymer (LiPo) 1000mAh
Propellers: 4 propellers of 4" x 12" carbon fiber propellers
Motors: Brushless out runner type motors - 4x 1000kv torque-type.

TABLE I

SI. NO	UAV specifications		
	Criterion	Parameter	Results
1	Payload capacity	Up to 1 kg	A maximum of 700 mgs was tested
2	Flight endurance	Up to 30 min	15 min for 700 mgs payload and 25 min for GoPro/YI action camera (weight less than 100 gm)
3	Fly height	Up to 100 meters	Tested up to 50 m which was good enough for required applications
5	Fly range	Up to 100 metres	Tested up to 100 ms with clear line of sight

CONCLUSION

This project provides the insight on the feasibility of the goals began to be accomplished. The team successfully designed and engineered a drone with an arm attachment to alter the transportation of blood supplies. Thus, the planning and testing of the semi-automatic UAV successfully demonstrated the construct practicableness of implementing medical supply delivery drones in the healthcare system. This model that use an involving ancient land transportation followed by drone delivery, can facilitate additional timely, economical and economical care delivery. Healthcare prices are a serious concern in both developed and developing countries. The models use a budget constraint that permits timely delivery. Since time is of the essence in an emergency, quicker response would prevent medical trauma and probably save lives.

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