A Mini-Project Report on

AI Based Smart UAV

Submitted in fulfilment of Mini-Project (ITM605) of

Semester VII

in

Information Technology

By

Utkarsha Potdukhe-17104007

Vaishnavi Patil – 17104023

Vaishnavi Potphode – 17104007

Name of Guide- Mr. Vishal Badgujar.

Department of Information Technology
A.P. Shah Institute of Technology
G.B. Road, Kasarvadavli, Thane(W), Mumbai-400615
UNIVERSITY OF MUMBAI
2019-2020

CERTIFICATE

This is to certify that

Ms. Utkarsha Potdukhe Student ID: 17104004

Ms. Vaishnavi Patil Student ID: 17104023

Ms. Vaishnavi Potphode Student ID: 17104007

has completed all the specified work for submission in Mini-Project (ITM605) of Semester VII, as laid down by University of Mumbai in satisfactory manner within the premises of Institute during the academic year 2019-20._.

Mr. Vishal Badgujar Guide

Mr. Kiran Deshpande
Head Department of Information Technology

Dr. Uttam D.Kolekar
Principal

External Examiner(s)

1.

2.

Place: A.P. Shah Institute of Technology, Thane

Date:

Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic with honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

(Signature)

(Utkarsha Potdukhe 17104004)

(Signature)

(Vaishnavi Patil 17104023)

(Signature)

(Vaishnavi Potphode 17104007)

Date:

Abstract

Unmanned aerial vehicles, also known as drones, can play a significant role in military and civil emergency medicine. The aim of the study was to present the real possibilities of using them in rescue operations and to examples from all over the world. UAV's can be applied to transport goods on demand, provide blood in urban areas, save sinking people, analyses the scale of damages, monitor large human gatherings, perform exploration activities, deliver blood samples and other analysis material, provide automated external defibrillators, support rescue operations and air transport, and perform agricultural activities.

CONTENTS

Chapter 1: Introduction 6

Chapter 2: Literature Review. 8

Chapter 3: Existing System Architecture / Working… 11

Chapter 4: Problem Definition. 12

Chapter 5: Objectives. 13

Chapter 6: Proposed System Architecture / Working…. 14

Chapter 7: Proposed Technology Stack…. 16

Chapter 8: Conclusion 17

Chapter 9: References 18

1. Introduction

Artificial intelligence and drones are a match made in tech heaven.Pairing the real-time machine learning technology of AI with the exploratory abilities of unmanned drones gives ground-level operators a human-like eye- in- the-sky.More than ever before, drones play key problem - solving roles in a variety of sectors — including defence, agriculture, natural disaster relief, security and construction. With their ability to increase efficiency and improve safety, drones have become important tools for everyone from fire - fighters to farmers.

Unmanned aerial vehicles (UAVs) are an emerging technology with the potential to revolutionize commercial industries and the public domain outside of the military. and can be used for autonomous delivery systems. Unmanned aerial vehicles (UAVs) UAVs would be able to speed up rescue and recovery operations from natural disasters are an emerging technology with strong implications for improving many common public and private processes. Public departments (i.e., police, public safety and transportation management) are beginning to use UAVs to deliver timely disaster warnings and improve the efficiency of rescue and recovery operations when a telecommunication infrastructure in a region is damaged or otherwise unavailable .Natural disasters are increasing at an alarming rate in the world.Every now and then we hear in the news about an area affected by earthquake,flood or a hurricane etc.There is a need to examine such a disaster stricken area before undertaking necessary rescue and help measures.

Smart UAVs are so popular, in fact, that the process of seeking medical attention in remote regions in India should be improved to increase healthcare accessibility. The healthcare system should aim to provide the best and fastest possible medical attention to all people throughout the country while optimizing for cost and time efficiency. However, India's current healthcare system is inefficient & lacks the accessibility of medical services in various regions of country. Artificial intelligence(AI) in healthcare is the use of complex algorithms & software to emulate human cognition in the analysis of complicated medical data.

The primary aim of health-related AI applications is to analyse relationship between prevention or treatment techniques and patient outcomes.Drones used as a security camera for monitoring the unusual activities outside threats like theft or violence and protest to recognize the people or track their activities. In addition to street surveillance, authorities are also using drones to broadcast messages and information about lockdown measures, especially an in rural area that lacks open communication channels for health information. Drones equipped with loudspeakers are used to make public announcements to keep people indoors, take necessary precautions, make social-distancing and wear a mask if stepping outside from home. Doctors and hospitals need medical supplies and laboratory testing more than ever, and drones are the safest and fastest ways to deliver medical supplies and

transport samples from hospitals to laboratories. This technology not only speeds up delivery of essential medical supplies and samples but also reduces the risk of exposure to medical staff and making a major difference in efforts to combat the disease.

The use of drones for medical purposes brings many advantages, such as quick help, shortening the time of traveling to the patient, reduction of complications in the injured owing to a short time to wait for rescue, support and improvement of basic operations of medical emergency teams, and the opportunity to reach places inaccessible for basic means of medical transport.

AI drones in construction companies can scan or map the terrain of buildings within a few minutes, that human requires several days to complete. In military and defence sector drones are becoming popular to develop for the unmanned weapons to combat or bombard on the enemies in the war.Military officers often have to petrol areas in order to search for any potential threat ,illegal activity or any intrusion within the bordersof the citiy that can put the lives of the civilians in threat.Such areas involve very high risk to human life.The Aerial Surveilance System can be used easily to get this job done without any loss of human life also the speed of the operation will be faster with the drones. Until recently, though, drones were only able to display what their cameras captured.Now, thanks to artificial intelligence software, they can perceive their surroundings, which enables them to map areas, track objects and provide analytical feedback in real-time.

2. Literature Review

Paper 1

Title : IoT based Unmanned Aerial Vehicle system for Agriculture applications

Author : Dr. Usha Rani. Nelakuditi, M. Manoj Vihari , M. Purna Teja IoT based Unmanned Aerial Vehicle system for Agriculture applications. 2018 International Conference on Smart Systems and Inventive Technology (ICSSIT). doi:10.1109/icssit.2018.8748794

Methodology : Pesticides and fertilizers help to maintain the health of the crops and avoid the damage caused by pests respectively. Using Unmanned Aerial Vehicles (UAV) for spraying pesticides can cover large area in short time with reduced use of chemicals and water. A sprayer mechanism was added to the body of Quad copter. They can spray the pesticides uniformly to nook and corner of the field without need of a farmer

Advantages : The main advantage of this drone is reduction of spraying time.It can fly across different terrains and there will be even spraying of the fertilizers from a single safe place.The average area covered by the prototype system is around 3 feet by 3 feet at a height of 6 feet. The spray time is about 1 minute for the 250 ml of content.

Disadvantages : It goes without saying that when the weather is terrible and there are massive gusts of wind, there is no point flying an aircraft as for one, it won't fly properly, and two, it won't be able to collect accurate data or imagery.

Paper 2.

Title : Farm Fields UAV Images Clusterization

Author : Mikhail Yu.Kataev, Maria M. Dadonova
Qadeer. 2019 International Multi-Conference on Engineering, Computer and Information Sciences (SIBIRCON)

Methodology : The monitoring of the research processes, controlling the phases of plant growth, predicting crop yields, using unmanned aerial vehicles are relevance for farming. One of the options for solving the problem is to process the received images from the board of an unmanned aerial vehicle (UAV). An important part of image processing connected with application of the clustering method to isolate different types of plants in the field, such as, weeds. The report shows examples of an application of the standard K-means method for clustering images of agricultural fields.

Advantages : UAV easily and often used to satisfy the need for rapid monitoring, assessment and mapping of natural resources by the user at a spatial-temporal scale. Digital devices on board the UAV allow more detailed spatial images than satellites

Disadvantages : This project can incorporate collision avoidance in Aerial Surveillance System.This can be done by using Infrared sensors to detect obstacles, Thus the Aerial Surveillance System will be able to make its path through the hindrances and reach the destination quickly

Paper 3.

Title : Monitoring Road Traffic with a UAV-based System

Author : Elloumi, M., Dhaou, R., Escrig, B., Idoudi, H., & Saidane, L. A. (2018). Monitoring road traffic with a UAV-based system. 2018 IEEE Wireless Communications and Networking Conference (WCNC). doi:10.1109/wcnc.2018.8377077

Methodology : UAVs monitor the traffic on a city road, they are responsible for collecting and sending, in real time, vehicle information to a traffic processing center for traffic regulation purposes. We show that the performance of our system is better than the performance of the fixed UAV trajectory traffic monitoring system in terms of coverage rates and events detection rates.

Advantages : The first advantage of UAV based Road Traffic Management systems is that they allow the monitoring of a larger area. UAVs can move from one area to another. UAVs can perform vehicle identification when equipped with cameras and image processing capabilities, without the need for embedded sensors within cars.

Disadvantages : UAVs are limited by battery life and their use causes privacy issues.

Paper 4.

Title : UAV-Based IoT Platform: A Crowd Surveillance Use Case

Author : Naser Hossein Motlagh, Miloud Bagaa, and Tarik Taleb. IEEE Communications Magazine (Volume: 55 , Issue:2 , February 2017)

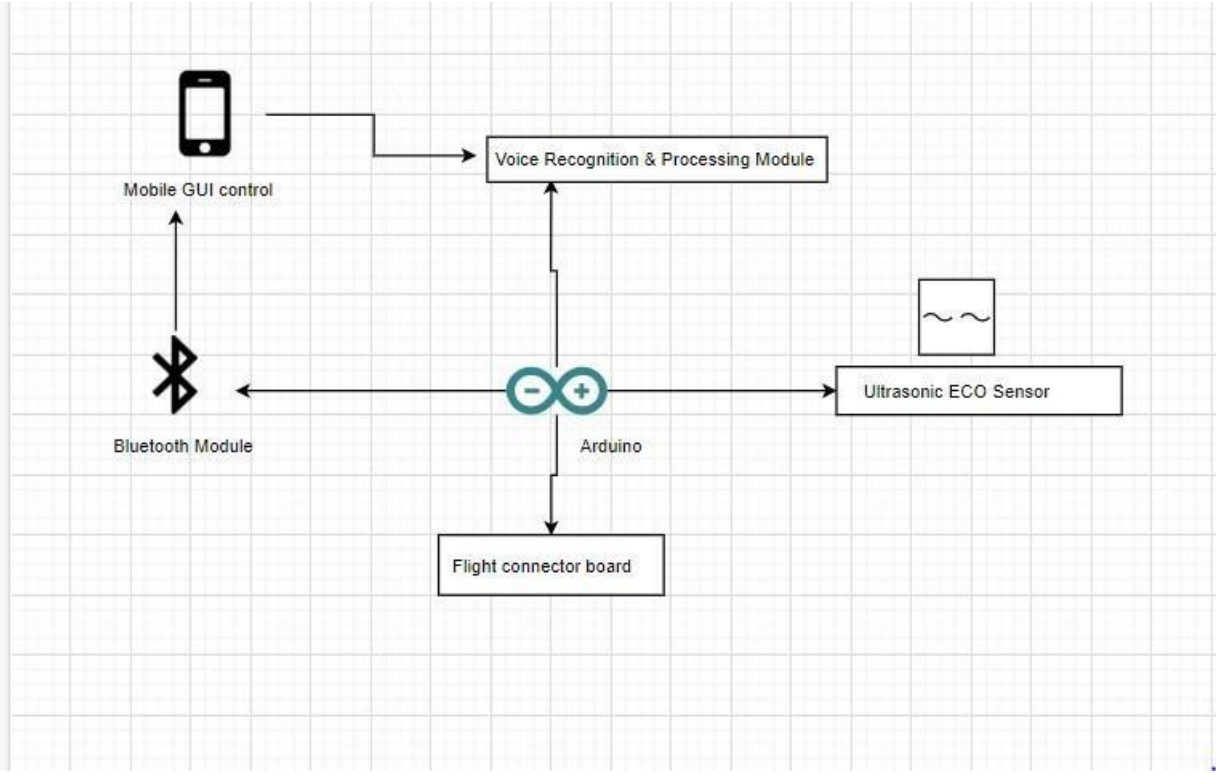
Methodology A high-level view of a UAV-based integrative IoT platform for the delivery of IoT services from large height, along with the overall system orchestrator, is presented in this paper. As an envisioned use case of the platform, the paper demonstrates how UAVs can be used for crowd surveillance based on face recognition. They have developed a testbed consisting of a local processing node and one MEC node.

Advantages : The System Orchestrator is assumed to have all necessary intelligence to be self-capable to autonomously self-operate, self-heal, self-configure, and adequately resolve any possible conflicts from diverse policies

Disadvantages : The overall system has more energy consumption and the overall processing time can be reduced

3.Existing System Architecture/Working

The following figure 1 shows the existing system architecture of Arduino based UAV.This system has Arduino as a core component and can be controlled through mobile GUI using Bluetooth



Working :

Normally the drones are controlled using an RF remote, or for autopilot using a GPS module to control it automatic by giving proper direction by it. But here in this system a drone is constructed using an Arduino Uno.

The main objective of this project is to collect data and 2D video information from a particular known area. In order to get the information, we must to assign the values of length and width that the drone can travel using Arduino programming. As its name suggests, autopilot means that the drone will be handled by i tself, while controlling action of the drone will be handled by a flight controller that has built-in sensors to balance the drone.

An Arduino Uno is the brain of the system, which gives the proper signal to flight controller. To maintain stability and sustained operation, It consists of an OpenPilot CC3D microcontroller (or any flight controller), along with a camera to capture live data with weather monitoring sensors. Finally, the system includes a Bluetooth module to turn the drone on/off and display the live data using a Android mobile device.

4. Problem Definition

- The Government of India needs to lay down policies for Pandemic National Emergency (such as Covid-19 disease) and for disaster management to minimize collateral damage and loss of life.

- To improve this working cycle, an AI based smart UAV(unmanned aerial vehicle) has been developed for disinfecting roads and public places and to also monitor the situation during lockdown and store the information which can be accessed later (in case of National Emergency).

- The UAV has been enabled to make important announcements on detecting any human violating the Government Lockdown Rules.

5. Objectives

- By now it has become a common knowledge that the novel coronavirus is transmitted via respiratory droplets and has the tendency to spread by touching contaminated surfaces like metals floors and other surfaces indoors and outdoors.

- These AI based UAV can be used for spraying disinfectant in public areas like airports, railway station, Park and roads.

- Drones disinfect 50 times more area than traditional methods in a given time and at the same time keeps human operators out of harm.

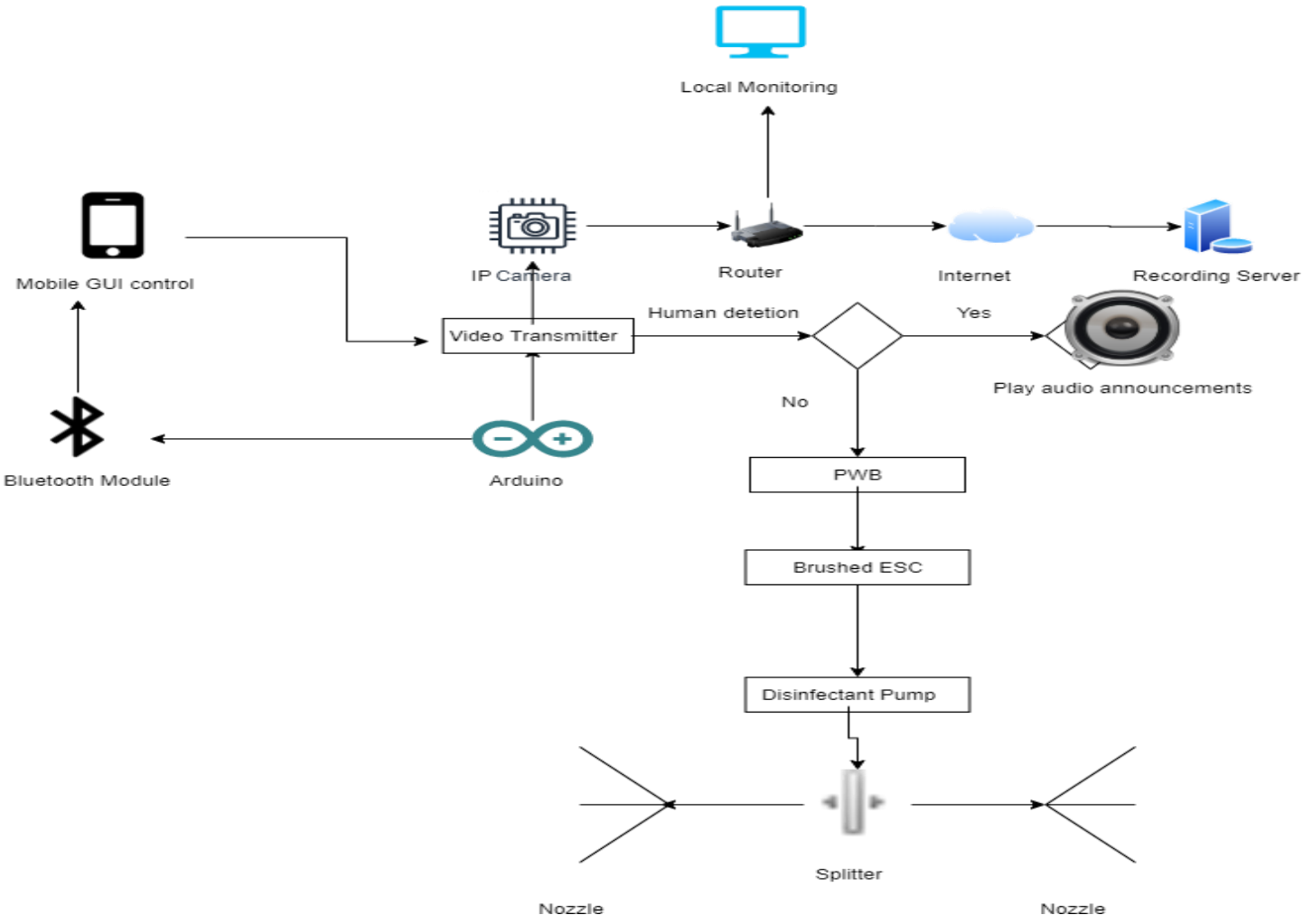
- Apart from spraying disinfectants these drone have public monitoring and warning system equipped with camera.

- Speaker to monitor high risk places by real time analysis for crowd gathering and keeping the count of the crowd gathered in a particular area and give relevant instructions to the crowd using the fitted speakers.

- Besides, the UAV is capable of storing the data which can be use when necessary.

6. Proposed System Architecture/Working:

The following figure shows the system architecture of UAV equipped with surveillance cameras,thermal imaging payloads and sky speaker for public announcements, drone-based aerial inspection capability is positively augmenting the police's ability to combat the spread of the pandemic.Bt providing situational awareness on a real-time basis,the the technology gives the Police the means to understand and deploy resources very quickly to manage evolving situations.



Working :

To make the quadcopter economical and efficient for small level applications this work is proposed, which design and develop a quadcopter using Arduino Uno board. It has wide application like quadcopter mounted with camera and speakers which could be used for surveillance of wide areas such as forest and coast guard applications etc. Quadcopter uses its four propellers attached to motors which creates thrust and help quadcopter to elevate high.It is Arduino based UAV. Arduino board consist of everything needed to work with microcontroller. Arduino IDE (Integrated Development Environment) is use to upload programs to the arduino boards and further these programmed boards can be used to perform intended tasks. Four 30A ESCs (electronic speed controllers) are used in proposed Quadcopter. It convert the PWM signal received from flight controller or radio receiver and then drives the brush less motor by providing required electrical power. Thus ESC is an electric circuit that control the speed and direction of electric motor by varying the magnetic forces created by the windings and magnets within the motor. ESCs receive command from micro controller circuit board and further give command to the motors for rotation. FCB(Flight Controller Board) generates various commands for ESC and motors according to the need of user.The ip camera will give the real time images and store it over cloud which can be used further.This system uses ML to check for the presence of anyone so as the area is free to spray the disinfectant through nozzle and if not then through fitted speakers the necessary announcement can be done along with the crowd estimation.

7. Proposed Technology Stack

- Brushless DC Motors.
- KK 2.1.5 Flight Controller
- Raspberry pi
- Propeller
- Arduino UNO & Genuino UNO
- BLE-Bluetooth Low Energy Module
- Drone frames
- Lipo Battery
- Transmitter & Receiver
- Nozzle
- Splitter
- Goodle Cloud/SD card
- ML
- OpenCV- HOG algorithm

8. Conclusion

- The UAV provides the best and fastest possible medical attention to all people throughout the country while optimizing for cost and time efficiency. However, India's current healthcare system is inefficient & lacks the accessibility of medical services in various regions of country.

- Drone applications into various fields are becoming significant and AI-based drones can provide game-changing results to get connected from distant locations providing real-time data for quick action.

- Smart UAVs are so popular, in fact, that the process of seeking medical attention in remote regions in India should be improved to increase healthcare accessibility.

9. References

1. Oniniwu, G. Onojo, O. Ozioko and Nosiri, O. (2016) Quadcopter Design for Payload Delivery. Journal of Computer and Communications, Vol.4, PP:1-12.

2. Dr. Usha Rani. Nelakuditi, M. Manoj Vihari , M. Purna Teja IoT based Unmanned Aerial Vehicle system for Agriculture applications. 2018 International Conference on Smart Systems and Inventive Technology (ICSSIT). doi:10.1109/icssit.2018.8748794

3. Mikhail Yu.Kataev, Maria M. Dadonova Qadeer. 2019 International Multi-Conference on Engineering, Computer and Information Sciences (SIBIRCON)

4. Elloumi, M., Dhaou, R., Escrig, B., Idoudi, H., & Saidane, L. A. (2018). Monitoring road traffic with a UAV-based system. 2018 IEEE Wireless Communications and Networking Conference (WCNC). doi:10.1109/wcnc.2018.8377077.

5. Naser Hossein Motlagh, Miloud Bagaa, and Tarik Taleb. IEEE Communications Magazine (Volume: 55 , Issue:2 , February 2017