IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

VISION – A Drone For Emergency Operations

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***Abstract*- In the current Era, there are such a large number of advancements in the field of automatons. Additionally, the military and business uses of automatons, there is no uncertainty in their productivity in the event of supporting crisis calamity activities. This paper assesses a few encounters and portrays a few activities utilizing automatons to help crisis debacle tasks. It concentrates for the most part in crisis tasks, similar to action following the event of a debacle like atomic mishaps, risky material discharges, floods, seismic tremors. For unique salvage groups, the automaton can help much in a fast area determination, identifying constant circumstance, tallying number of individuals or guys and females. Floods are commonplace for a moderate beginning debacle. Interestingly, overseeing floods is a mind boggling and troublesome errand. It requires consistent observing of dykes, overflowed and compromised zones. Automaton can help chiefs to a great extent holding a region under perception. Automaton can be utilized for fire location, intercession observing and furthermore for post-fire checking. In the event of atomic mishap or unsafe material spillage drone is likewise a compelling or can be the just one device for supporting crisis tasks.**

***Keywords*— Drone, GPS, Raspberry Pi.**

I. INTRODUCTION

A drone is an aircraft without a human pilot on board. Its flight is controlled either autonomously by computers in the vehicle or under the remote control of a pilot on the ground or in another vehicle.

We are going to create a Drone which is a flying robot with an embedded system and work in the conjunction with on board sensors and GPS. It enables Object Detection & Face Recognition. We named it as VISION-A Drone for Emergency Operations. It is used to detect and analysis the disaster and count number of people, their gender and prepare the dataset, also detect the real time situation of the area.

1.2 million Deaths, 2.9 billion People are affected. $1.7 trillion in damages. According to data from the United Nations Office for Disaster Risk Reduction, these staggering figures are the total economic and human impact of global disasters from 2002 to 2012[1]. With a steady growth in annual disasters, especially climate-related ones, emergency management strategies are being put under the microscope. Disaster management technologies, on the other hand, we have seen some remarkable breakthroughs in the past decade.

A small scale VISION(Drone) can be designed using Flight controller, APM(2.8), Quadcopter frame, Brushless motors, Raspberry Pi , GPS, Ultrasonic sensors, Pi Cam, Electronic Speed Controller (ESC),IR Sensors, Transmitter & Receiver.

II. COMPONENTS

Brushless Motor:

It is a simultaneous engine that is controlled by a DC electric source by a coordinated exchanging power gracefully, which creates an AC electric sign to drive the engines. Electronic Speed Controller with Battery Eliminator Circuit: It is an electronic circuit with the goal to fluctuate an electric Motor's speed, its heading and perhaps at the same time to go about as a unique brake [2].

Lithium battery:

Lithium-particle polymer battery is a battery-powered battery. It for the most part comprises of a few indistinguishable optional cells in corresponding to expand the release current ability and is every now and again accessible in arrangement design to build the absolute accessible voltage [3].

Transmitter/ Receiver:

It plays out the activity of transmitting and getting correspondence signals used to control any framework. It has a scope of 1 kilometer sweep and accompanies 4 channels which are utilized to run various parts associated with the collector [4].

APM (2.8):

It is a finished open source autopilot framework. The APM 2.8 is a finished open source autopilot framework and the top of the line innovation that won the esteemed Outback Challenge UAV competition[5]. It permits the client to turn any fixed, rotating wing or multirotor vehicle (even vehicles and pontoons) into a completely independent vehicle; equipped for performing customized GPS missions with waypoints.

Raspberry Pi:

It resembles a working framework. The Raspberry Pi is a minimal effort, charge card estimated PC that connects to a PC screen or TV, and utilizations a standard console and mouse [6].

Quadcopter Frame:

It resembles a working framework. The Raspberry Pi is a minimal effort, charge card estimated PC that connects to a PC screen or TV, and utilizations a standard console and mouse.

Ultrasonic Sensor:

For identifying ground and furthermore utilized in Terrain Follow Mode. Ultrasonic transducers or ultrasonic sensors are a sort of acoustic sensor partitioned into three general classifications: transmitters, beneficiaries and transceivers. Transmitters convert electrical signs into ultrasound, recipients convert ultrasound into electrical signs, and handsets can both transmit and get ultrasound [8].

Power Module:

Utilized for power transformation hardware, for example, mechanical engine drives, implanted engine drives, air conditioning dc power supplies.

IR Sensor:

An Infrared Sensor is an electronic instrument that is utilized to detect certain attributes of its environmental factors. It is occurred by either producing or distinguishing Infrared Radiation.

III. PROPOSED SYSTEM

We are going to develop a drone with some AI features like object detection, face recognition and perform some special tasks like counting people and counting number of males and females with the help of ML and Al techniques which will help in some special or emergency operations so first we need to make a drone. To make a drone we need a frame, four brushless motors, ESC (electronic speed controller), propellers, flight controller, transmitter and receiver, power distribution board, GPS, and battery for power supply and assemble all these parts which will forms a drone which perform all basic drone tasks like take off, move forward, move backward, move left, move right and landing so this is a basic drone now we need to make it smart. With the help of Raspberry Pi and Pi cam we give it an Intelligence from python programming in raspberry pi. To give intelligence to the drone we use open CV for object detection and face recognition which take input from the Pi Cam and GPS and after analyses the data it send data to the system administrator which is a easy task rather than use a manual method. To understand the working of the Vision we took an example. For example there is a flood in the city and we need to rescue the stuck people in the city and we did not know that how many number of people in the city, so we send our vision drone to the location which have intelligence to do this work efficiently.

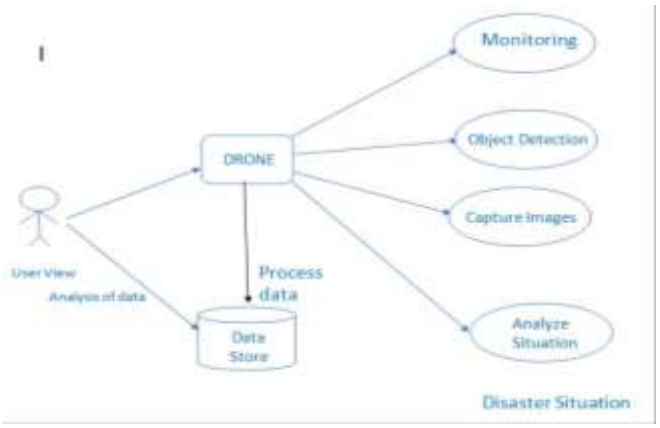

Fig.1 Use Case Diagram of Proposed System

IV. EXPERIMENT PROCEDURE

The essential goal of this paper is to assess how Drones or unmanned elevated vehicles – UAV's in the present or not so distant future can help survivors on account of a tidal wave, quake, flooding, and any cataclysmic event. At first, we expect that in any catastrophic event consistently exist the high chance of harm to the foundation, transportation frameworks, media communications frameworks access, and essential administrations right away. This exploration proposes three regions the employments of unmanned elevated vehicles – UAV's-(or Drones) on account of cataclysmic events reaction and helpful alleviation help.

Fig.2 Procedure of Vision-A Drone for Emergency Operations

Module 1. Face Recognition

A facial acknowledgment framework is an innovation fit for recognizing or confirming an individual from a computerized picture or a video outline from a video source. There are numerous techniques where facial acknowledgment frameworks work, yet all in all, they work by looking at chosen facial highlights from given picture with faces inside a database. It is additionally depicted as a biometric Artificial Intelligence based application that can exceptionally recognize an individual by breaking down examples dependent on the individual's facial surfaces and shape.

Algorithm Used For Face Recognition

Principal Component Analysis (PCA) for face acknowledgment depends on the data hypothesis approach. It removed the pertinent data in a face picture and encoded as effectively as could be expected under the circumstances. It recognizes the subspace of the picture space spread over by the preparation face picture information and stylistic layout relate the pixel esteems. The old style portrayal of a face picture is gotten by anticipating it to the arrange framework characterized by the foremost parts. The projection of face pictures into the vital part subspace accomplishes data pressure, decorrelation and dimensionality decrease to encourage dynamic. In numerical terms, the essential segments of the dispersion of appearances or the eigenvectors of the covariance framework of the arrangement of face pictures, is looked for by regarding a picture as a vector in a high dimensional face space. We apply PCA on the database and get the remarkable element vectors utilizing the accompanying technique .Suppose there are P designs and each patter has preparing pictures of m x n setup [9].

- **Step 1**: Import numpy, matplotlib, open-cv and glob
- **Step 2**: Using a glob loop through each of the .jpg files present in your current working directory and store them in a list 'txtfiles'.
- **Step 3**: Read each of the .jpg files using cv2.imread().
- **Step 4**: Convert the image to gray image as OpenCV face detector expects gray images.
- **Step 5**: Now, we have to load our Haar classifiers downloaded XML files) for face detection and eye detection, which takes as input the training file of the Haar classifier.
- **Step 6**: Now, how do we detect a face from an image using the Cascade Classifier ?
- EX-detectMultiScale(image,scaleFactor,minNeighbors)
- **Step 7**: Now print the number of faces from each image (this is basically count the population of people in disaster situation).
- **Step 8**: Now basically we're finding faces, breaking the faces, their sizes, and drawing rectangles and stored into database.

Fig.3 Example of Face Recognition

Module 2: Gender Recognition Algorithm

It is utilized to detect age and age of clients who passes by dependent on online face examinations. Sex character is the individual feeling of one's own sexual orientation. Sex character can relate with an individual's doled out sex during childbirth or can contrast from it. Sex articulation ordinarily mirrors an individual's sex character, however this isn't generally the situation. While an individual may communicate practices, mentalities, and appearances reliable with a specific sexual orientation job, such articulation may not really mirror their sex personality. The term sex personality was initially instituted by Robert J. Stoller in 1964[10].Gender acknowledgment utilizing OpenCV's fisherfaces usage is very mainstream and some of you may have attempted or found out about it moreover. Be that as it may, in this model, I will utilize an alternate way to deal with perceive sex. This technique was presented by two Israel scientists, Gil Levi and Tal Hassner in 2015. I have utilized the CNN models prepared by them in this model. We are going to utilize the OpenCV's dnn bundle which means "Profound Neural Networks".

Gender Recognition Algorithm

- **Step 1** : Import all the required libraries.
- **Step 2** : Often, we have to capture live stream with a camera. OpenCV provides a very simple interface to this. We can capture the video from the camera, convert it into grayscale video and display it.
- **Step 3** : Using set() I'll set the height and width of our video frame.
- **Step 4** : Create 3 separate lists for storing Model_Mean_Values, Age and Gender.
- **Step 5** : I have defined a function to load caffemodel and prototxt of both age and gender detector, these are basically pre-trained CNN models which will do the detection.
- **Step 6** : Now we will perform face detection, Age detection, and Gender detection and for that create a function video_detector(age_net,gender_net) inside your main function and pass age_net and gender_net as its parameters.
- **Step 7** : Read the cap object which is created from VideoCapture() in step 3.
- **Step 8** : Convert the image to gray image as OpenCV face detector expects gray images.
- **Step 9** : Load the pre-built model for facial detection.
- **Step 10** : Now, how do we detect a face from an image using the CascadeClassifier ?
- **Step 11** : Predict the gender.
- **Step 12** : Predict the Age.
- **Step 13** : Now we have to save into the database.

Fig.4 Example of Gender Recognition

Module 3: Working Principle of Drone

A Flying robot or a vehicle without a human pilot ready and a sort of unmanned vehicle. UAVs are a segment of an unmanned airplane framework; which incorporate a UAV, a ground-based controller, and an arrangement of correspondences between the two. An automaton controller works by imparting a radio sign from the remote control to the automaton, which instructs the automaton. Radio signs are sent from the radio transmitter in the automaton controller and got by the automaton's receiver[11]. This is the reason the automaton controller is now and again essentially called the automaton radio transmitter or the automaton radio controller

Working Principle of Drone

1. Firstly, we have to make a frame of light weight material such as, Aluminium frame.
2. Quadcopter is a device with a intense mixture of Electronics, Mechanical and mainly on the principle of Aviation.
3. The Quadcopter has 4 motors whose speed of rotation and the direction of rotation changes according to the users desire to move the device in a particular direction (i.e. Takeoff motion, Landing motion, Forward motion, Backward motion, Left motion, Right Motion.)
4. The rotation of Motors changes as per the transmitted signal send from the 6-Channel transmitter.
5. The signal from microcontroller goes to ESC's which in turn control the speed of motor.

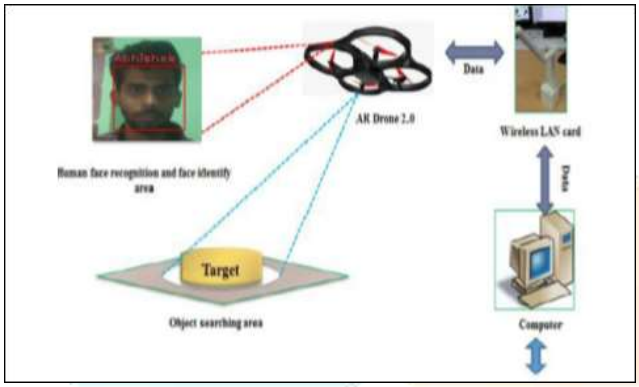

Fig.5 Working of Drone

V.USES OF VISION

- Real time surveillance
- Search and rescue.
- Save human life.
- Provide food, medical kit etc. in disaster situation.
- Used to detect Harmful Gases.
- Used many different areas like monitoring, security, personal drone delivery etc.

VI. ADVANTAGES

- Live Streaming and monitoring.
- Save lives.
- Drones minimize the obvious dangers and health risks.
- Identify and detect the human face.
- Used in dangerous environments.

VII. WARNING

We should utilize the Drone securely and mindfully consistently, to stay away from any harm or damage being caused to any individual, creature or property close to which you are flying the Drone. In this regard you ought to guarantee that you generally work the Drone in consistence with this Quick Start Guide and our Safe Use of the Drone directions. Parrot additionally advises you that you ought not utilize the Drone for any unapproved or unlawful purposes, as you will in any case be completely subject for any misfortune or harm caused because of such unapproved use.

Risks associated with the use of drones The use of drones on a large scale entails a high risk. The main danger is the fall of a drone from a great height, which may be due to:

1.Discharge of the battery,
2.Damage caused by weather conditions (low air temperature, precipitation),
3.Hitting in an obstacle (tree, building, high-voltage line).

These dangers can be anticipated The battery status and other telemetry information, including temperature can be controlled remotely by the framework. In the event of surpassing the one of the parameters the alert ought to be propelled. This will permit make the move, for example, crisis review the automaton to a branch. Nonetheless, the sensors and programming that dependent on the flight way and on the recognized impediments consistently update the course are liable for the evasion of obstructions. A genuine danger to the automaton, because of its worth is the individuals. It tends to be taken. In this circumstance, it might be useful the limitation work and perceiving the circumstance. Change of the machine course can demonstrate about the robbery. At this case, the automaton can start to take pictures utilizing cameras (sensors) and give a blare hindrance the hoodlum and centering consideration of witnesses [4]. These dangers can be anticipated; subsequently the move ought to be made to forestall their uprising. The battery status and other telemetry information, including temperature can be controlled remotely by the framework. In the event of surpassing the one of the parameters the caution ought to be propelled.

A significant dangers related with the broad utilization of regular citizen drones is connected with security. These gadgets have the capacity of following for the followed object and to watch it from a wide range of perspectives[12]. They can be outfitted with cameras, night vision gadgets and different sensors, encouraging sneaking around. While their wide utilizing by metropolitan administrations (counting the police) to control the regular citizen populace, could represent a genuine threat to human rights. Potential dangers related with the across the board utilization of automatons require the utilization of complex arrangements and the to human rights. presentation of intentional guideline focusing on compelling assurance of residents' security.

VIII. CONCLUSION

This paper concludes that the disaster is a sudden accident or a natural catastrophe that causes great damage or loss of life. So using the VISION, provides applicable information and assistance, therefore we need to build a procedure of disaster information collection and build. They can provide an instant telecommunications infrastructure, assist in telemedicine-enabled clinical services, ,perform equipment / drug / patient delivery, enhance search and rescue efforts, assess damage and map disaster zones. Base on this we can get effective information at appropriate time and provide the reference for the phases of disaster-preparedness, and its response. The small scale VISION is cost effective and has many applications. This brief look at the emerging technologies merely scratched the surface of employing VISION in a strike role.

IX. FUTURE WORK

Our general plans were excessively eager. Our group objectives were to configuration, test, and manufacture a quadcopter unit, interface an information logging framework, and plan and execute AI orders for our quadcopter. Shockingly, we couldn't finish every one of these objectives. Later on, if time licenses, we might want to actualize these orders. There were numerous issues that we didn't represent all through the venture. These issues deferred our advancement and we couldn't complete what we set out to do first and foremost. We have discovered that we should permit time for taking care of issues later on.

Different plans later on incorporate including a sonic sensor for progressively precise elevation assurance. Right now the main techniques to decide elevation is by utilizing the barometric weight sensor and the GPS collector. There is no real method to securely decide the quadcopters elevation comparative with its arrival surface. A sonic sensor could take care of this issue, and be utilized to help the auto-arrival order.

Another tentative arrangement would include more strategies for gathering information. Numerous ports despite everything stay unused on the control board. Including a camera could consider computerized photographs or video to be taken. Adding some approach to stream information from the quadcopter to the controller could be another incredible element to add to our quadcopter, this would consider significantly simpler access to the information gathered by the quadcopter. Advanced mobile phone capacities could be another element our gathering might need to include what's to come.

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