Garuda: Calamity observation Model

Zubair Iqbal
CS&E Deptt MIT, Moradabad
zubairiqbal17@gmail.com

Sudhanshu Devran
CS&E Deptt MIT, Moradabad
Sudhanshudevran02@gmail.com

Priyanshu Saxena
CS&E Deptt MIT, Moradabad
Saxenapriyanshu779@gmail.com

Shivank Chaudhary
CS&E Deptt MIT, Moradabad
Shivankchaudhary24@gmail.com

Pranjal Rathour
CS&E Deptt MIT, Moradabad
Rathorepranjal21@gmail.com

Abstract- Apart from military and commercial applications of drones. Unmanned aerial vehicles, or drones, are being used more and more often across a wide range of industries. To gain the greatest benefits in the future, developed nations like the USA have been spending more and more in their drone technology. Since the use of UAVs will usher in the next great revolution, emerging nations like India have begun to explore this sector's potential. This paper focuses on applications of drone in any calamity such as earthquake, flood, landslides, avalanche, etc. An earthquake is a quick movement of geological materials beneath the earth's surface that causes the ground to shake violently or weakly. The tectonic plate border is where the earthquakes start. Floods, the most common sort of natural disaster, happen when an excess of water submerges normally dry ground. Floods are frequently brought on by prolonged periods of heavy rain, quick snowmelt, or storm surges from tropical cyclones or tsunamis in coastal locations. Managing floods is a highly challenging and complex operation, and Drones can aid in managing them an emergency drone speeds up the process of finding missing individuals by rescuers. It aids in the hunt for missing persons or lost animals in difficult-to-reach areas like summits, destroyed buildings, etc. Multispectral drones are a necessity for search and rescue operations.

Keywords— Convolutional Neural Network, Face Detection

I. INTRODUCTION

Any unpiloted aircraft is referred to by the technical term "Unmanned Aerial Vehicles (UAVs)," more commonly referred to as "drones."

We are going to create a ML based Drone which works
As an observer in any calamity such as earthquake, Flood, landslides, avalanche, etc. We named it as Garuda: Calamity observation Model The key purpose of the Drone is to identify the number Of persons which are trapped in any area, recognizing their gender, and predicting their age.

firstly, we are going to create a drone which is a flying robot without a human pilot on board. Then we will be looking forward to capturing the necessary details as mentioned.

Drone use and adoption have increased during the pandemic, similar to other technology. Drone use is anticipated in a number of industries in India, including geospatial mapping, infrastructure, emergency response, and agriculture. They are currently used this to map as well as survey land.

The first 72 hours after a tragedy are crucial in terms of disaster management. The goal of the damage controllers is to both contain the disaster and preserve lives. Drones are often employed in these situations to enable quick response, distribute supplies to remote locations, learn more about the affected areas, and take images for monitoring and communication.

II. LITERATURE REVIEW

According to Goldman Sachs, there has been a growth in drone use across a variety of industries, including urban services, entertainment, marketing, medical services, disaster risk management, etc.

This has been made feasible in part because of the development of quick microprocessors, which permit sophisticated autonomous control of a number of systems, and in part because of the quickly evolving consumer market, which lives on quick decisions.
There is a lot of material about drones and how they can be used in different industries. Drones will be the main topic of discussion because they are a common tool for disaster risk management worldwide.

Drones have been utilised for disaster risk management during floods, tremors, forest fires, tornadoes, and other natural disasters in a number of real-world locations, including North Carolina, Nepal, Virginia, and others. In addition, many nations, including India, have used drones to fight Covid. These countries have done so by mapping habitation lands in remote regions to just provide safe vaccination, collecting lab samples, delivering and transferring medical supplies, aerially spraying disinfectants, monitoring and guiding public spaces, and more. Drones have proven to be very helpful in these circumstances (Bhargava & Reuter, 2021).

India's distinct bio-geographical, hydro-meteorological, and agro-climatic conditions make it distinctive. India has always been subject to natural catastrophes, and more lately, it has developed an equal vulnerability to many man-made calamities, like all other nations worldwide. The frequency and severity of disasters have substantially grown during the past few decades. If preparedness, mitigation, and prevention measures had been taken, the number of fatalities and

financial losses from many disasters would have been decreased. (Puducherry government, 2021)

Also, there is a growing understanding that catastrophes and their effects (damages and loss) are caused by the fragility or susceptibility of the revealed components, which are clustered together to show the elements at risk, in addition to the intensity of this "natural hazard" phenomena.

TNO publications have conducted substantial research on drone usage in recent years and have come to the conclusion that drones can be useful in a variety of situations where there are restrictions, prohibitions, or environmental issues that make access difficult. TNO also tested drones for drowning detection to show their usefulness (Scheveningen, 2021).

III. COMPONENTS

A small scale drone for our proposed system is made up of
The following components-: A Flight Controller, Quadcopter frame, Brushless motors, Raspberry Pi , Electronic Speed Controller (ESC), Transmitter & Receiver.

Brushless Motor: An electric motor known as a brushless DC electric motor (BLDC) is one that is powered by a direct current voltage source and commutated electronically as opposed to using brushes like typical DC motors do. As there are no brushes rubbing against anything, no energy is lost due to friction. High wattage ratio, high speed, almost immediate control of speed (rpm) and torque, efficiency, and cheap maintenance are all benefits of brushless motors over brushed motors.

Flight Controller: The drone's motors and ESCs are managed by the flight controller, which is often known as the drone's brain. Receiving and processing input signals from receiver and carrying out the proper user commands are two of a flight controller's main responsibilities.

Simply expressed, one could relate aircraft controllers to the nervous system. Like how our brains instruct us on how to walk, flight controllers are the brains of quadcopters that instruct them on how to fly.

Quadcopter frame: A multi-rotor drone with four motors is called a quadcopter. Using an electronic sensor and control system, this drone stabilizes its flying. There are three different kinds of quadcopters: plus-shaped, cross-shaped, and h-shaped**.**

Raspberry Pi: The Raspberry Pi is a credit card-sized minicomputer that can communicate with any output and input hardware, such as a monitor, a tv, a mouse, or even a keyboard, turning the setup into a fully functional PC at a reasonable price.

Electronic Speed Controller (ESC): Electronic speed controllers (ESCs) are tools that drone flight controllers can use to regulate and manage the motor speed of the aircraft. The ESC adjusts the voltage to the motor in response to a signal received from the flight controller, adjusting the propeller's speed as necessary.

Transmitter & Receiver: The Radio Receiver, which is attached to an aircraft or quadcopter that is being remotely controlled, receives commands from the Transmitter wirelessly over a predetermined radio frequency.

IV. PROPOSED SYSTEM

In the proposed system we are going to develop a drone
To perform some special task like counting number of people and recognize the gender of people captured and predict their age accordingly. This can be done with the help of some AI and ML techniques .
The proposed system will help us in various emergency situations . Frame, four brushless motors, an ESC (electronic speed controller), propellers, a flight controller, transmitter, receiver, power distribution board, and a battery for power supply are all necessary for the construction of a drone. Once these components are put together, the drone will be complete.
Which will be going to perform basic operations like take off, move backward, move forward, move right, move left and landing so this is a basic drone now we need to make it smart . For making our drone smart we take Raspberry Pi and Pi cam and perform python programming on Raspberry Pi which will make our drone intelligent and then we will perform gender and age recognition while also counting the
Number of people. To understand this let us take an example- there is a natural calamity like flood in the city
And we have to rescue the stuck people in the city not knowing the number of people their gender and age probability so our drone (Garuda) will help us in performing the required intelligent behaviour.

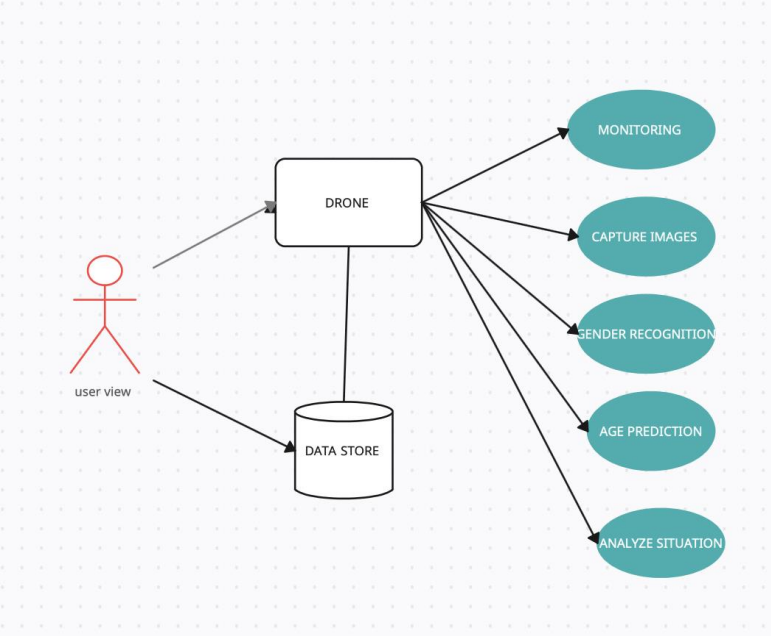

Fig.1 Use Case Diagram of proposed system

Basically, the system is divided into two broad modules – the first module is concerned with drone construction and the other is with calamity observation

Module 1. Drone Construction

The quadcopter's four-armed frame is its major component. To support, four brushless DC motors (BLDC), a LIPO battery a controller board, and four propellers, the structure needs to be lightweight and sturdy. Electronic Speed Controllers can change the speed of BLDC motors (ESC). Batteries are positioned in the lower half of the system for more stability, or a lower C.G. The motors are positioned on the opposite sides, equally spaced from the center. The space between motors is generally regulated to prevent any aerodynamic interaction between propeller blades. The quadcopter's main frame, or chassis, is where all these components are placed.

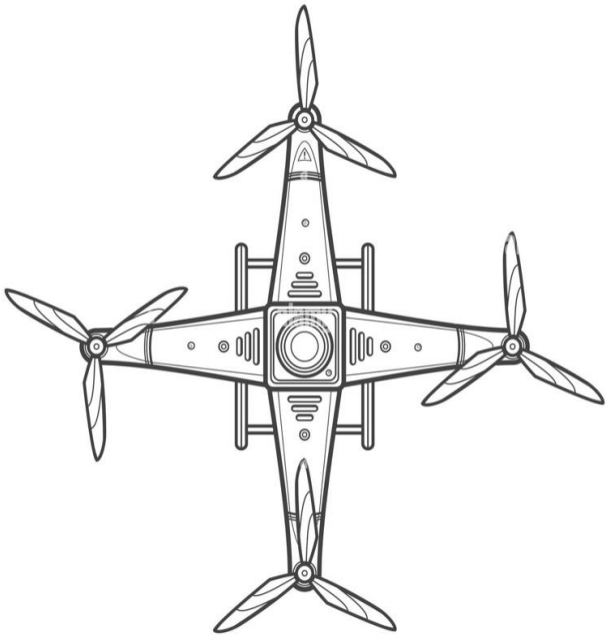

Fig.2 Structure of Drone

Working principle of Drone:

1. To begin with, we must create a frame out of a lightweight material, such as an aluminium frame.
2. Quadcopter is a device with a intense mixture of Electronics, Mechanical and mainly on the principle of Aviation.
3. The quadcopter includes four motors whose rotational direction and speed vary in accordance with the user's wish to move the apparatus in a specific direction (i.e. Take-off motion, Landing motion, Forward motion, Backward motion, Left motion, Right Motion.)The rotation of Motors changes as per the transmitted signal send from the 6-Channel transmitter.
4. The signal from the microcontroller is sent to the ESCs, which in turn regulate the motor's speed.

Module 2. Calamity Observation

This module is concerned with calamity observation part
We are going to embed Raspberry Pi on our Drone and then Perform gender recognition, count number of people and predict
Their age accordingly.
It is utilized to detect age and age of clients who passes by dependent on online face examinations. The personal perception of one's own sexual orientation is known as the sex character. Sex character may be like or dissimilar from the sex provided to a person during childbirth. Usually, a person's sex articulation reflects their sex character, however this isn't always the case. Even though a person may articulate behaviors, mentalities, and appearances with a particular sexual orientation job in a predictable manner, such articulation may not accurately reflect the person's sexual nature. Robert J. Stoller first used the phrase "sex personality" in 1964[10]. The use of fisher faces in OpenCV for gender recognition is common, and some of you may have tried it or learned about it as well. Yet, I shall use a different approach to deal with and view sex in this model. Two Israeli scientists, Gil Levi and Tal Hassner, introduced this method in 2015. For this model, I used the CNN models that they had created. We're going to use the "Profound Neural Networks" dnn package from OpenCV.

Age estimate is the automatic method of categorizing a face image into a certain age range or the precise age. In general, determining an exact age from a single image is quite tricky because of elements like makeup, lighting, obstacles, and facial expressions. Age estimation from the face is still a difficult topic.

Drones or Unmanned Aerial Vehicles (UAV) can be used to observe or count the population. Drone utilisation allows for a more comprehensive perspective, resulting in time savings and increased efficiency. It would also assist us in estimating the amount of people we will need to rescue from areas affected by disasters like earthquakes, landslides, floods, etc.

V. USES

The usage of Drone can come into various ways including photography which are drone based, in monitoring the traffic and the weather, also it is used in firefighting
But our drone “Garuda” is concerned with Calamity observation as its key principle. So, considering some of the uses are mentioned below:

- Search and rescue.
- Save human life.
- Thermal imaging cameras can be used to identify people who are alive under all the debris.
- Makes Inspections More Efficient.

VI. ADVANTAGES

A Quadcopter drone nowadays offers multiple advantages for example it makes inspection more efficient, it is also used in military, and the most common advantage, capturing

photos and videos more efficiently. Our proposed model "Garuda" is advantageous in calamity observation. Some of the advantages are mentioned below:

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

VII. WARNING

The utilization of drone must be done in a securely or mindfully manner, so that it must not cause any harm to the surrounding consisting of living creatures, the natural environment or any substance that can be harmed. So, to ensure that our drone is not causing any harm to the surrounding environment it must work with the Quick start guide and security measures like giving safe directions to the drone must be done and to not use drone for any unlawful or unapproved practices the parrot advice, and if you do you will be completely responsible to any harm cause by it to the environment.
The usage of drone comes with a high amount of risk. As the drone are more prone to risk so a proper risk management must be done. And one of the key dangers is concerned with the drone falling from a great height, which may be due to:

1.Battery getting discharged
2.Weather conditions causing any damage to such as precipitation or low air temperature
3.Any obstacle hit by the drone such as high voltage lines or building or natural environment like trees.

VIII. CONCLUSION

This paper concludes that disaster being an accident which is sudden or a natural catastrophe that can cause a massive loss to life and a disastrous damage to environment. So, using the Garuda, provides information which is applicable and also assistance, so we have to form a procedure for disaster information collection. It can provide a telecommunication infrastructure which is instant, can also assist in providing medical services, telemedicine enabled, can enhance search and rescue efforts, can assess damage and the people struggling in that damage, can also assess map disaster zone. On this basis we can get an effective information and according to that can perform disaster preparedness and the corresponding response. Our proposed model i.e., "Garuda" has many applications and is also cost effective.

IX. FUTURE WORK

The plans for our proposed system were excessively eager.
The objective of the group was to configuration, manufacture a quadcopter unit, test and plan and execute AI orders for our quadcopter

But shockingly we are unable to fulfil each objective as per defined but if later time license we will investigate fulfilling them with our best. There were various issues we didn't represent all through the venture, but we have realized that we should permit time for taking care of these respective issues later.

There are different plans that will be later incorporate such as getting the video of the area under calamity so we can go through the information more appropriately and can simply access the information gathered by quadcopter.
Improving the drone performance which are currently lacking so it can perform in any environment and under any circumstances by performing the best.

REFERENCES

[1] "Drone Industry Resources",dronedeploy.com, https://www.dronedeploy.com/resources/

[2] Rhett Allain, "How do drones fly? Physics of course",wired.com,https://www.wired.com/2017/05/the-physics-of-drones/

[3] Jack Brown, "How to build a drone: construct your drone from scratch, mydronelab.com, HTTPS://WWW.MYDRONELAB.COM/BLOG/HOW-TO-BUILD-A-DRONE.HTML.

[4] "A Beginner's Guide to Multirotor Systems & Flight Proficiency",uavcoach.com, https://uavcoach.com/how-to-fly-a-quadcopter-guide/

[5] Fintan Corrigan, "How do drones work and what is drone technology", dronezon.com, https://www.dronezon.com/learn-about-drones-quadcopters/what-is-drone-technology-or-how-does-drone-technology-work/

[6] "Unmanned aerial vehicle", Wikipedia.org. https://en.wikipedia.org/wiki/Unmanned_aerial_vehicle