GUARDIAN:AI Supervision Patrol Drone For Defence And FederalSector

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Abstract - *Drones are the future of mankind, drones can easily reach areas that are difficult for humans to approach. The only disadvantage of the current development process of drones is its interventions by humans, which in turn causes delays and possible human errors. We are upgrading manual drones to automated drones, as a result, we are the first responding team to any crisis. As we know the crime rate in the 21st century is higher than ever before, the reason being the officials responsible for security are behindhand, understaffed, and lot of protocols for example if a girl is being harassed or there is a theft taking place until the police arrive at the scene, the damage will be done that in turn leads to delay in time to respond. Similarly, calamities like the spreading of fire (ex: cylinder blast, wildfire, etc.) cause mass destruction. Until the help arrives from the official source the damage will be done, to overcome this scenario we the GUARDIANS take action and act as the First Response Team, we can achieve this feat by implementing an automated UAV (unmanned Aerial vehicle) which shall be equipped with fireextinguishing ball and tranquilizer darts, using this mounting to control the maximum damage until the real helparrives.*

Keywords: UAV, safety, First response team. fire extinguishing ball and tranquilizer darts.

1. INTRODUCTION

Unmanned Aircraft Vehicles (UAVs), are known as drones, air vehicles, and related equipment that fly remotely or autonomously without a human pilot on board. Cyber warfare is the alteration of facts trusted by a target without the target's knowledge, causing the target to make decisions that are detrimental to their interests. The emergence of new technologies, such as drone technology, has made information collection and delivery in unique form. The current study's goals are to investigate the usage of drones in both military and civilian settings. In tactical warfare, drones were employed to gather intelligence from opponents, such as by sending a swarm of drones to the opponent's locations. Drones create a psychological feeling of anxiety, threat, and insecurity.

Data collecting from data sets to analyze and to make decisions at the right time. By Sending drones it has been proven that It is easier and safer than sending humans to record visual images in high-risk regions. As a result of its potential in capturing and recording visual pictures, abuse of this technology would jeopardize national security if laws governing the use of drones are not enforced. The current study was guided by the research framework outlined below, which was later used to develop the study's objectives.

This is an IoT-based drone system that will deliver useful information about the scenario using cameras and sensors. The suggested technology will assist firemen in monitoring the situation, such as checking whether there is a human trapped inside or if there are any explosives near the fire, checking for dangerous gases, and devising an appropriate plan of action. The significant increase in the incidence of fire-related accidents raises the stakes. The drone will aid in improving response to the catastrophe and hence in saving lives. Dropping a fire Extinguisher Ball reduces the burden on firemen.

2. EXISTING SYSTEM

Drones that used for surveillance and to carry out covert military operations.

Drones that are remotely controlled by firefighters to put out the fire (experimental).

Drones are used by police officers to capture culprits without hand-to-hand combat.

ADVANTAGES

The UAV reduces the risk to humans.

To provide cost-effective military options. Drones are Replaceable.

DISADVANTAGES

Data collected from multiple drones cannot be stored together for better situation awareness.

Battery capacity is less.

It is controlled manually for less range.

3. PROPOSED SYSTEMS

Combining drones with AI and completely automating theprocess.

ADVANTAGES:

- Completely automated.
- No human involvement is required.
- Quick response.
- Scalable.
- Increases safety.

DISADVANTAGES:

- Climatic conditions.
- Expensive.
- More drones are required.
- Unpredictable human behavior.

4.HARDWARE COMPONENTS

- 2200kv bldc motor

- Lipo 4S 2200MAH

- Run cam 2

- 50A ESC

- 3X9 GRAM SCRVOS

- GPS

- GSM

- PROPELLERS

FOAM

- FIRE EXTINGUISHER BALL

- TRANQUILIZER DARTS

5.SOFTWARE REQUIREMENTS

PYTHON for AI, machine learning, and deep learning. Java for app development using Android Studio. Arduino for dumping codes into the Arduino board.

5.1 Weapon detection using deep learning

The detection of weapons or anomalies is the discovery of irregular, unexpected, unpredictable, or strange events or items that are not deemed to be a usually occurring event or a regular item in a pattern or objects contained in a dataset and hence differ from current patterns. A pattern that differs from a set of standard patterns is referred to as an abnormality. As a result, anomalies are determined by the phenomenon of interest. Object detection recognizes instances of distinct categories of things by using feature extraction and learning techniques or models.
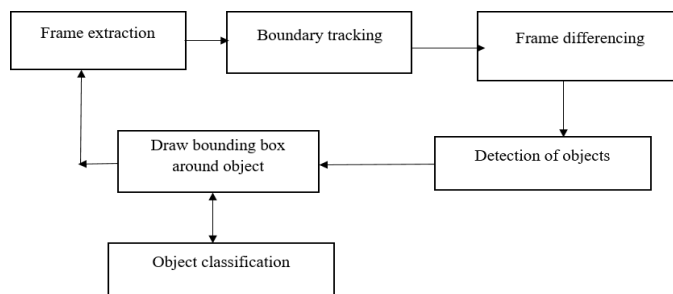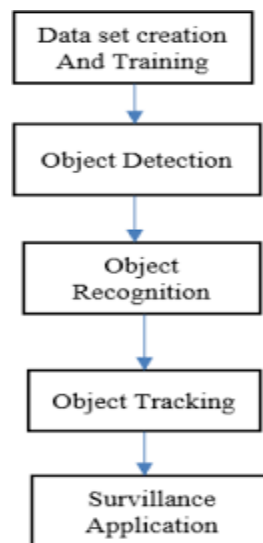

Fig.1 Methodology

Fig.2 Detection and Tracking

Fig.1 Deep learning is used in the detection of weaponry. From the input video, frames are extracted. Before object detection, the frame differencing algorithm is used, and a bounding box is formed.

Fig.2 The dataset is built, trained, and fed into the object detection algorithm. For gun detection, an appropriate detection method (SSD or fast RCNN) was chosen based on the application. The method handles the identification problem by utilizing multiple machine learning models such as Region Convolutional Neural Network (RCNN) and Single Shot Detection (SSD).

5.2 Implementation assumptions and constraints

• The gun is in the camera's line of sight and is fully or partially exposed to the camera.

• There is enough light in the background to detect the ammunition.

• A GPU with considerable calculation power wasemployed to eliminate lag in ammo detection.

• This isn't a fully automated system. A person in charge will confirm every gun detection warning.
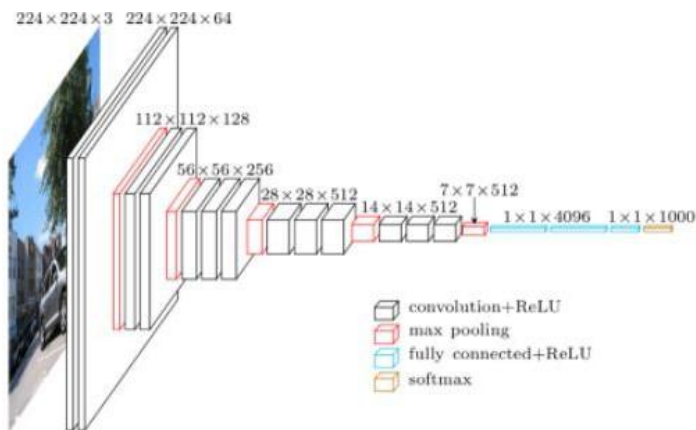
FASTER R-CNN

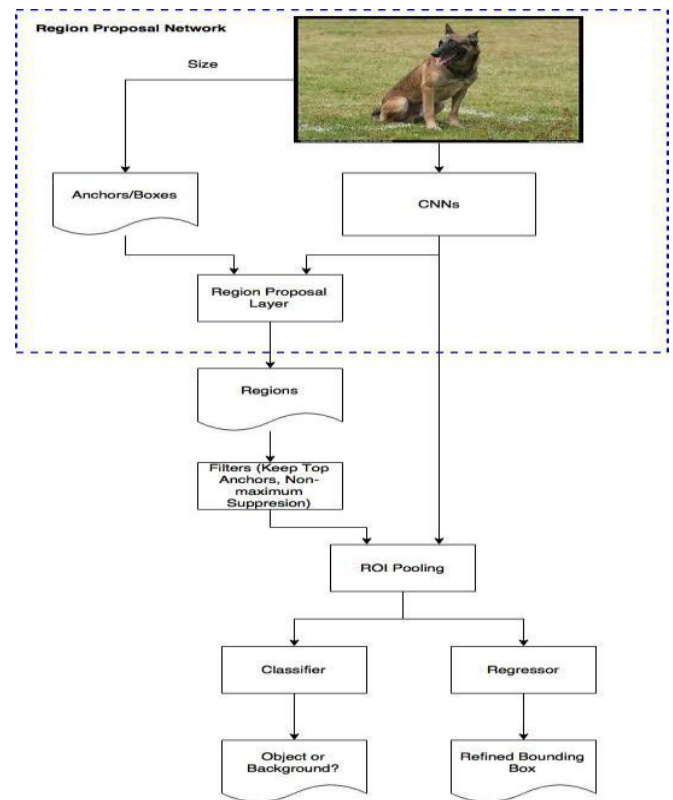**Fig.3** Layers in CNN Architecture

Fig.4 Faster R-CNN

Fig3 and Fig4 demonstrate CNN layers and a faster RCNN architecture, respectively. It has two networks: RPN for region proposal generation and network for object detection. It employs a selective search strategy to create regional proposals. The RPN network ranks anchors or region boxes.

Fig.5 Image along with its label

5.3 Human detection using Artificial intelligence

The human detection technique used in our implementation. This system looks for humans in images by matching edge features to a collection of human silhouette templates. The matching is performed by computing the average Chamfer distance between the template and the target picture area's edge map. The image area in question must be the same size as the template.
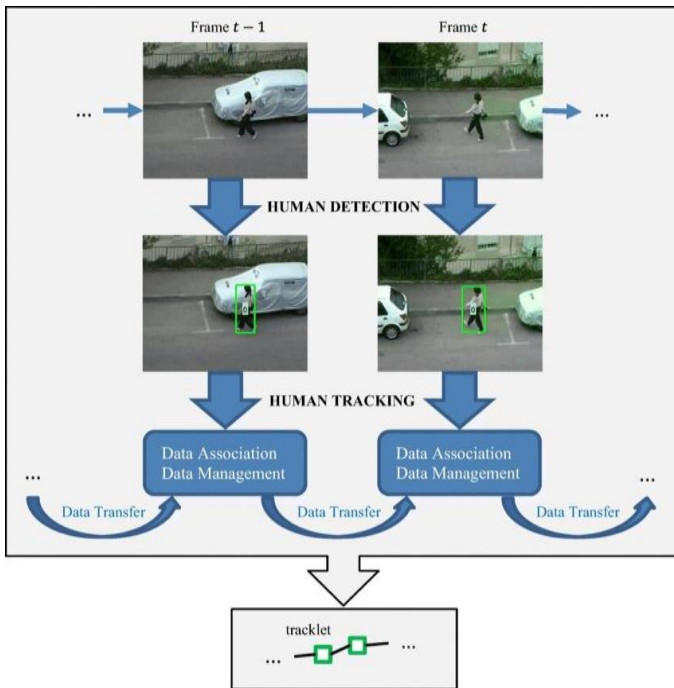

Fig.6 Human detection

Safety is a fundamental human need, so we require a security system that can deter crime. We frequently employ surveillance footage to observe the surroundings and people in a place. The security camera, however, can only be used to record images or videos without any further data. In order to obtain additional information, such as human position and movement, we, therefore, need a more sophisticated camera. This study used a human detection and tracking algorithm to retrieve the data from surveillance video footage. The Deep Learning Convolutional Neural Networks, a very well-liked subfield of artificial intelligence, form the foundation of the human detection framework. Channel and spatial correlation filters are employed in tracking algorithms to monitor Recognized humans.

Fig.7 Human detection

5.4 Detecting objects using the camera module

The drone is outfitted with two cameras: a standard camera and a thermal camera. The standard camera is used for object detection. The camera displays a live feed on a screen on which we run the object detection algorithm. A machine learning model is trained and used for this purpose. The model has been taught to recognize humans, dogs, and specific types of objects that are commonly found in our homes and can explode in the presence of fire. The model has been trained to detect the following objects:

1. Humans

2. Air Conditioner

3. Laptop

4. Dogs

5. Cats

6. Gas cylinder

7. Electric Board

8. Fire Extinguisher

9. Birds

10. Cell phone

11. Television

12. Microwave

13. Refrigerator
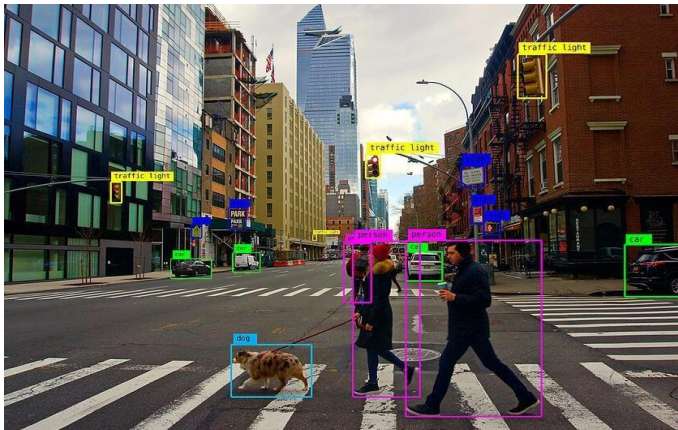
14. Geyser

15. Fire hydrant

Fig.8 Object detection

6. ALGORITHMS

6.1 Bellman Ford's algorithm.

The procedure of Bellman Ford's algorithm

The Bellman-Ford algorithm functions by overestimating the distance between the beginning vertex and each subsequent vertex. Then, by uncovering fresh paths that are shorter than the outdated, overstated paths, it iteratively reduces those estimates. We can ensure that the outcome is optimum by repeating this for all vertices.

Every vertex's route distance must be preserved. That can be kept in a v-dimensional array, where v is the total number of vertices. Not only do we want to know how long the shortest path is, but we also want to be able to find it. Each vertex is mapped to the vertex that most recently changed its path length for this purpose. When the process is finished, we can move backward to find the path by going from the source vertex to the destination vertex.

7. FEATURES

7.1 Equipped with a fire extinguisher and fire extinguisher ball.

Firefighters use fire extinguisher balls to put out fires because they produce carbon dioxide as they burn. This functionality allows it to be loaded onto a drone and then launched. Robotic ARM is utilized to accomplish this loading and release. This robotic arm is actually a robotic gripper that is powered by a regular servo motor and can be controlled by a variety of boards, including the NodeMCU and Arduino.

In most cases, the firemen are unaware of the extent of the fire at the accident scene, and they are also unsure of the best places to enter and escape the area. A heat map of the accident site can be created using a thermal camera to help those doing the rescue. A 3D heat map of the area can be created utilizing image-based modeling and infrared thermal imagery. Firefighters may plan their rescue efforts with the aid of this map, which also shows where the fire extinguisher ball should be dropped first. A thermal camera can aid in the search and rescue effort by identifying trapped people in a fire.

7.2 Equipped with tranquilizer darts to apprehend the culprit

Tranquilizer darts are typically excluded from police less-than-lethal weaponry because a person can be easily wrestled to the ground, the pain caused by the dart may prompt a suspect to draw a weapon or panic and flee until they are far away, a person can have a fatal allergic reaction to a tranquilizer, and because effective use requires an estimate of the target's weight — too little can result in an unconscious target.

The fact that tranquilizer darts could be easily discovered in a public setting like a bar or restaurant means that they are not employed in kidnappings, rapes, or identity theft. Dr. Theodore Davantzis emphasizes that alcoholic beverages are much simpler to hide when they are drunk. Barry Morphew is the only person who has ever been suspected of using one illegally. It is believed that he followed his wife around the house after shooting her with a tranquilizer dart, then killed her before the drugs kicked in to stop her from calling the police.

7.3 Integrated with AI for automatic deployment of drones.

Drones can be fitted with a variety of surveillance tools that can record HD video and still pictures both during the day and at night. Technology that enables cell phone call interception, GPS location determination, and license plate data collection is available for drones. The high payload compatibility enables round-the-clock, low-staffing, and cost-effective usage of various surveying systems, including lidar scanners, multi- and hyperspectral devices, and much more.

Unmanned aerial vehicles (UAVs) are used in drone surveillance to take still photos and videos of specific targets, which could be people, groups, or entire areas, in order to collect information. Drone surveillance allows the covert collection of data about a target as it is seen from a distance or altitude. The covert gathering of data about a target as seen from a distance or altitude is made possible by drone surveillance.

8. LITERATURE SURVEY

8.1 Humanitarian Drones (2022):

By critically analyzing recent and predicted transfers of unmanned aerial vehicles (UAVs), or drones, from the global battlespace to the humanitarian emergency zone,

the emergent notion of the humanitarian drone is examined. They take into account the wider ramifications of humanitarian action, such as the promise of global justice and better aid distribution. Examine the humanitarian drone's most challenging feature, notably its political utility as a "humanitarian weapon" in conflict situations.

ADVANTAGES: Permits the operator to observe precisely and attack with few civilian casualties while fully removingany risk to their own soldiers.

DISADVANTAGES: Combat can't be resolved by technology. Drone strikes' precision has been hotly debated.

8.2 Drone Used In Military And Civilian Application: Risk To National Security(2022): Drones have been used for military purposes, including spying on both local and foreign threats.

The drone created in this study has a variety of uses, including military and non-military security work, policing, firefighting, monitoring flood-affected areas, recording video footage from impassable places, and monitoring flood-affected areas. For real-time audio-visual feedback from the drone and live position tracking of the drone, a GPS-enabled Android mobile device has been employed.

ADVANTAGES: It has the ability to collect effective information and its impact on civilians, and influence decisions on the legality of these weapons. Humans working with robots can maximize effectiveness by combining the strengths of both partners.

DISADVANTAGES: With a fully charged battery, our prototype can fly for up to 25-30 minutes. They cannot operate this vehicle beyond the range of the radio controller, which is approximately 1 km. The aircraft's maximum roll angle is 45 degree. It loses control if it rotatesmore than 45 degrees.

8.3 Fire-fighting UAV with shooting mechanism offire extinguishing ball for smart city(2021):

They hope to aviate the burden on firefighters by making a drone the actual first responder instead of firefighters, potentially saving actual human lives. This is an IOT-based drone system that will provide valuable information aboutthe situation using cameras and sensors. Dropping a fire Extinguisher Ball to control the fire will also assist thefiremen.

ADVANTAGES: Reduce the time required to monitor an area and help a distressed civilian.

DISADVANTAGES: They are challenging to fly, especially in windy conditions, require permission from FFA, can Crash.

8.4 Weapon Detection Using AI(2021): Security is always the main concern in every domain. Due to the rise in crime rate in crowded events or suspicious lonely areas. Abnormal detection and monitoring have the major applications of computer vision to tackle various problems.Due to the growing demand in the protection of safety, security and personal property, needs a deployment of video surveillance system.

ADVANTAGES: AI vision methods are used to recognize knife and guns. The goal to reduce crime and increase safety and security. In traditional video surveillance security agent have to visually detect the presence of weapon manual. Quickly make decision based on it. It has wide variety of weapon in database

DISADVANTAGES: If the weapon does not exist in the database, the AI cannot scan the weapon. Limit on autonomous weapon system.

8.5 Co-existing With a Drone: Using Virtual Reality to Investigate the Effect of the Drone's Height and Cover Story on Proxemic (2022):

While a growing body literature has begun to examine proxemics in light of human-robot interaction. It is unclear how in-sight gain for human-human or human-robot interaction applied in drones. Understanding why and how people locate themselves around drone is thus critical to ensure that drones are socially acceptable. Virtual reality for human drone interaction experiments, further researchmust be carried out to investigate how this finding translate from the virtual to the real world

ADVANTAGES: Helping in providing training. Lowest risk involved. It creates a realistic world and Cost effective.

DISADVANTAGES: Implementation is expensive. Technology is complex. Addiction to Virtual Reality .Impacts on real human body.

9. OBJECTIVES

9.1 Provides safety for every individual in case ofan emergency: The police will make sure the fire and ambulance services are able to perform their duties. They'll block off the catastrophe area, control traffic, and occasionally create a safety zone around it. If casualties can't be located, the police will send out the catastrophe identification team, which consists of specialists gathered on demand. The members of the group of specialists work together in collaboration.
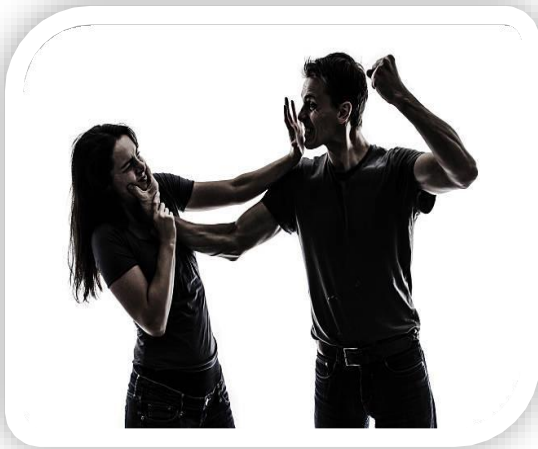
9.2 Gathering information and supplying essentials for disaster management: Since drones can gather information and take pictures covertly, many individuals fear that their right to privacy is being abused. This might occur if federal agencies use drones to survey the populace. Users might accidentally fly dangerously or into a prohibited area, like an airport, if they are not familiar with the technology or the law. Pilots may unintentionally lose control due to human error or a malfunctioning technology. This could harm other aircraft, as well as people, cars, and ground infrastructure.

9.3 All land areas are monitored through satellite: GPS drones have a GPS module that enables them to determine their position in relation to a system of orbiting satellites. The drone can carry out tasks including position hold, autonomous flight, return to base, and waypoint navigation by connecting to signals from these satellites.

9.4 By giving firefighters situational awareness, they can locate hotspots and focus their efforts on putting out the fire: The technology behind Fireball is cutting-edge and offers considerably more sophisticated solutions than portable fire extinguishers. Its development is rooted in the shortcomings and issues with traditional extinction techniques (maintenance, training, etc.).

10. CONCLUSION

To enable the development of safe and customizable drones, in this paper, we have identified the key technologies that are needed. The concept of a fireman drone will aid in improving reaction times and reducing the time required to monitor an area and assist a troubled citizen. The employment of thermal and standard cameras to create 3D area and heat models will provide significant insights that will assist firefighters in devising an effective plan of action, which would otherwise be difficult. In military sector, UAVs or drones are used to safeguard each and every individual. The evolution of drone technology and methods has extended drone use in the swarm to make the job of employing drones in military communication much more efficient.

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