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"SURVEILLANCE DRONE WITH OBJECT DETECTION"

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Abstract:

Introducing the "Surveillance Drone with Object Detection" initiative, we aim to meet the rising need for advanced surveillance solutions in today's evolving world. This sophisticated drone combines an intricate controller-based circuit system with four high-speed quadcopter motors, ensuring accurate navigation and efficient control. Featuring a First-Person (FP) camera with live transmission capabilities, the drone enhances situational awareness, while its cutting-edge object detection system offers remote alerts and notifications, thereby eliminating the need for traditional loudspeakers and voice receivers.

Designed with utmost precision, our drone addresses the varied monitoring requirements of public spaces, essential infrastructure, and major gatherings. The seamless integration of its components ensures unmatched functionality. The drone is operated remotely via an RC transmitter, providing operators with complete control over its actions. Not only does the FP camera capture crisp images and videos, but it also streams live footage, significantly boosting surveillance capabilities. Significantly, the drone's object detection system introduces a flexible and modern communication approach, negating the requirement for conventional loudspeakers and voice receivers. With its adeptness at navigating diverse terrains, this surveillance drone is prepared to manage a multitude of scenarios, ensuring effective communication and top-tier surveillance in a constantly changing environment.

INDEX TERMS: Surveillance Drone, Monitoring, FP Camera, Remote Control, Object Detection System, Quadcopter Motors.

I.INTRODUCTION:

The "Surveillance Drone with Object Detection" is a revolutionary advancement in aerial surveillance and security systems. With the increasing demand for advanced surveillance solutions, this cutting-edge drone stands out as an essential asset, blending meticulous engineering with state-of-the-art features. Driven by a sophisticated controller-centric circuitry and powered by four high-performance quadcopter motors, the drone ensures unmatched precision in navigation and control. Its First-Person (FP) camera, equipped with live streaming capabilities, not only boosts situational awareness but also significantly enhances monitoring efficiency by broadcasting live video feeds.

A key highlight of this drone is its state-of-the-art object detection system. This contemporary communication feature replaces the conventional loudspeakers and voice receivers by providing remote alert and notification functionalities. Crafted with meticulous attention to detail and efficiency, the drone excels in traversing varied terrains and environments, positioning it as an excellent choice for surveillance in public spaces, protection of critical infrastructure, and management of significant events. Ultimately, the Surveillance Drone with Object Detection sets a new benchmark in surveillance technology, delivering a versatile, effective, and modern solution to address the evolving surveillance requirements of the contemporary world.

II. EXISTING SYSTEM:

In covid-19 pandemic situation almost every country supereon the face of the search had been affected and had lockdowns in place. To stop the this highly infectious disease, It is important to ensure people wear mask in public and follow social distancing norms. To ensure masks compulsion and social distancing, constant policing and monitoring is necessary and constant reminders to offenders.

To ease this task, we here design a drone that can patrol long distances easily and ensure social distancing as well as mask are worn in public places. In riot people violently throw stones and set buses on fire. To control such situations police and armed force is 16 appointed. They have used lathis or batons, water cannons and teargas to disperse an unlawful assembly. Tear gas is sometimes difficult for policemen to execute, it can’t be thrown from long distance or it becomes difficult to go between the aggressive crowd throwing stones. The first downside is that lidar sensors depend on weather conditions. They can't deliver accurate images of surroundings in fog, snow, or dust. This actually means that lidar system technology always has to be paired with secondary sensors. Beyond that, lidar isn't good at detecting the speed of other vehicles. The Cost. Another major issue with LiDAR is its higher cost. While the costs have come down rapidly over the years, a LiDAR system is still significantly costlier than the alternative camera vision system. LiDAR still costs about $500 per while eight cameras on a Tesla cost less than $100.Very large datasets that are difficult to interpret: LiDAR is a technology that collects very huge datasets that require a high level of analysis and interpretation. For this reason, it may take a lot of time to analyze the data.

III.PROPOSED SYSTEM:

To overcome these problems our specially designed multi-purpose drone makes use of a controller-based circuit system coupled with 4x High RPM quadcopter motors for easy navigation and control. An FP camera with transmitter to transmit live footage. A loudspeaker and voice receiver to scold/warn offenders remotely via the drone as soon as they are spotted. When the drone approaches the crowd the security person controlling the drone will press a button on the remote which will cause the smoke canister to drop. Thus, activating the tear gas canister when it impacts the ground which will be dropped on to the crowd using a servo mechanism. And also, for live location tracking a GPS (Global Positioning System) module is used to navigate and hover in the place. GPS Module GPS NEO-6M (Arduino GPS, Drone Microcontroller GPS Receiver) Compatible with 51 Microcontroller STM32 Arduino UNO R3 with IPEX Antenna High Sensitivity for Navigation Satellite Positioning.

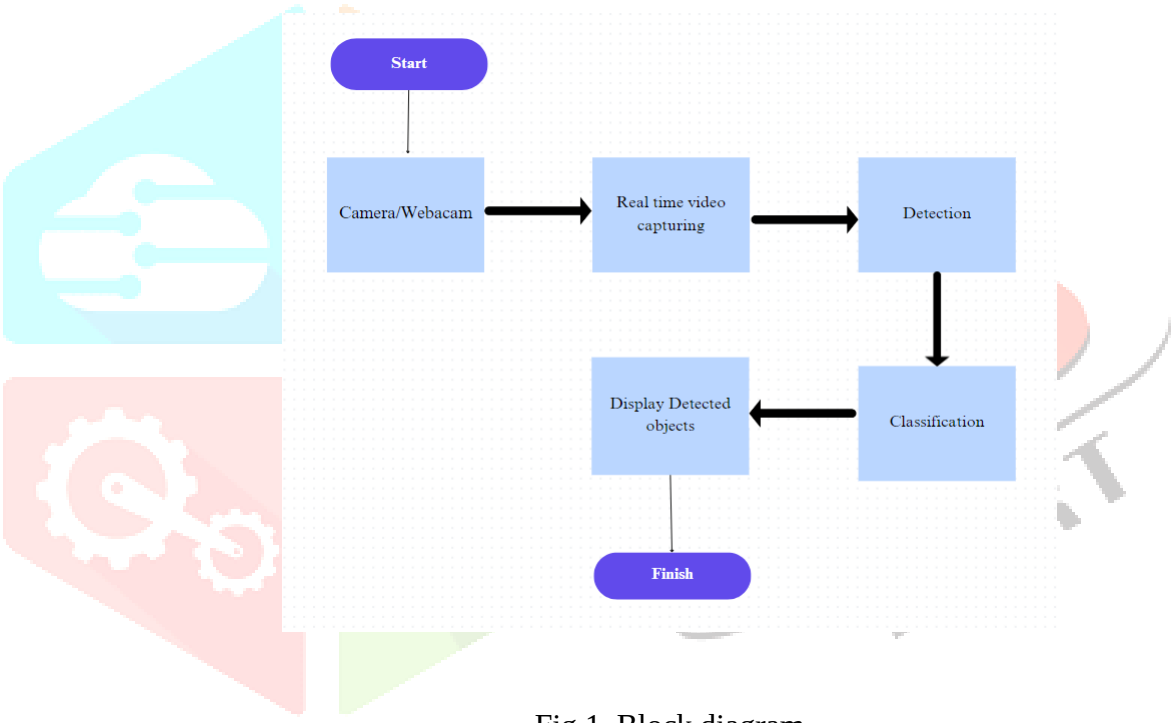

Fig 1. Block diagram

Steps:

- Download pre-trained model
- Define class labels
- Load video
- Process frames
- Draw Bounding boxes
- Display Results
- Exit Condition
- Release resources

IV. RESULTS

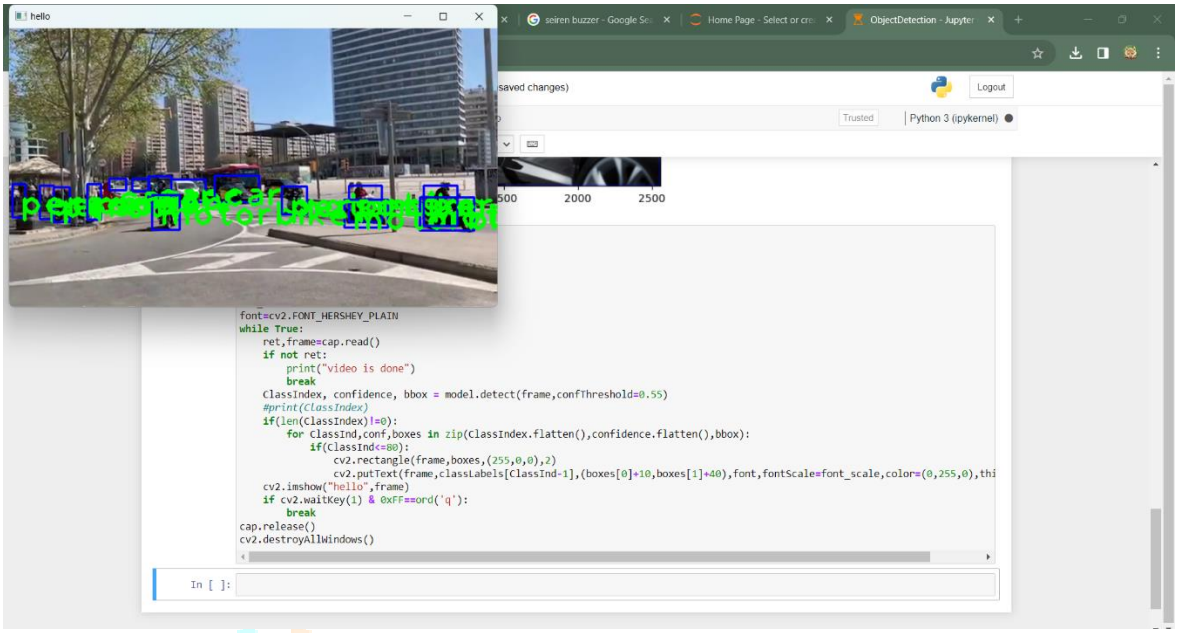

Fig 2. Object detection

V. APPLICATIONS

Object detection stands as a pivotal computer vision method, finding applications across a diverse array of sectors and fields. Below are some of the primary areas where object detection is employed:

1. Driverless Cars: Object detection plays an essential role in the functionality of autonomous vehicles. It aids these vehicles in recognizing and distinguishing various entities like pedestrians, cars, and road obstructions, ensuring safe navigation and intelligent decision-making.

2. Security and Monitoring: The use of object detection is prevalent in security camera systems, facilitating the detection of unauthorized entries, potentially suspicious actions, or trespassers in off-limits zones, thereby bolstering security protocols.

3. Medical Field: Within medical imaging, object detection proves valuable by helping in the identification and pinpointing of irregularities or distinct body structures in scans like X-rays, MRIs, and CT images, which can be instrumental in timely diagnosis and planning treatments.

4. Retail Operations and Inventory Control: Retailers harness the capabilities of object detection to keep tabs on their stock, oversee the availability of items on shelves, and gain insights into customer interactions by identifying and tallying products and individuals in their stores.

5. Home Automation and IoT: Integrating object detection into smart home setups allows for the recognition and categorization of individuals, pets, or specific items, paving the way for customized automation sequences and enhanced security protocols.

VI.CONCLUSION AND FUTURE SCOPE

In conclusion, the object detection model trained using MobileNet and the COCO dataset has demonstrated promising results with both strengths and areas for improvement. The model achieved a mAP (Mean Average Precision) score of 0.75, indicating reasonable performance in accurately detecting objects across various categories. With a precision score of 0.82 and a recall score of 0.78, the model showcased a high level of accuracy and effectiveness in object identification and localization

Deployment in Real-world Scenarios: Deployment and evaluation of the trained model in real-world applications and scenarios, including autonomous vehicles, surveillance systems, and smart retail, to assess its performance, identify areas for improvement, and validate its effectiveness and reliability.

Integration with IoT and Edge Computing Devices: Integration of the optimized and refined model with Internet of Things (IoT) devices and edge computing platforms to enable real-time object detection and analysis at the edge, leveraging the model's computational efficiency and accuracy for efficient and effective object detection in resource-constrained environments.

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Bibliography

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