WS 25/26 PROJECT: INTELLIGENT SYSTEMS

AI-DRONE PERSON IDENTIFICATION BASED ON CLOTHING COLOR

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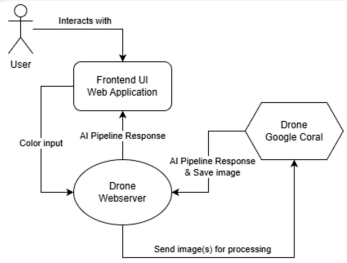
Project Idea

This project explores using autonomous drones equipped with computer vision to locate people based on their clothing colors. The intelligent system combines real-time image processing with flight control, enabling the drone to search areas and identify individuals wearing specific colors, which can be useful for locating missing persons even in larger crowds. The user may interact with an UI to send the necessary parameters for the search, before getting a response and having the possibility to see or download the image for further decision-making, such as activating the servo for item dispatching.

System Architecture

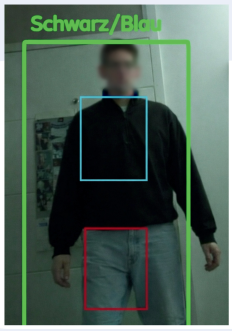


The system consists of a web-based frontend where users input the target clothing color. This request is sent to a drone webserver that acts as the central coordination point. The webserver communicates with the drone (Google Coral) to capture images during flight. These images are sent back to the webserver, which forwards them to an AI pipeline for a clothing-color-based person detection. The AI pipeline processes the images and returns detection results to the webserver, which then displays the findings including the image to the user through the web interface.

Drone Setup

The drone uses a Flywoo GOKU F722 PRO flight controller running iNav on a 3.5" CineWhoop frame. A Raspberry Pi Zero 2 WH handles AI processing, connected to a Pi Camera Module 3 for image capture and a Google Coral USB Accelerator for real-time inference. The system includes GPS for autonomous navigation, ELRS receiver for control, and a servo-controlled drop mechanism for payload delivery.

AI Pipeline



This pipeline integrates a Raspberry Pi with a Google Coral Tensor Processing Unit for real-time person detection and spectral analysis. It utilizes a MobileNet SSD, a quantized convolutional neural network optimized for low-latency inference on edge hardware. Upon person detection, the model generates spatial coordinates to define a bounding box, which is then partitioned into the torso and lower limbs. These sections undergo a colorimetric transformation into the HSV color space, enabling a heuristic classification that decouples chromaticity from luminance. This ensures color identification even under the dynamic lighting conditions.

Future Outlook

The current system performs color-based detection on upper and lower body clothing but has several limitations. It does not differentiate between clothing layers or classify specific garment types. Accessories like hats, scarves, and shoes are not included in the detection. The color palette is currently limited to black, white, gray, red, green, and blue, which restricts detection of individuals wearing other colors like yellow, purple etc. Future iterations could implement multi-layer clothing recognition, garment classification, expanded color detection, and detection zones that include footwear and headwear. Additionally, improving robustness against varying lighting conditions and partial occlusions would enhance real-world applicability for search and rescue operations.

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Repository: https://github.com/Migg3y/BaunDroneAi