Hand Gesture Recognition for Drone Control

Introduction:

Aviation industry has been dependent on Autonomous Vehicles like UAVs heavily in the previous few years. Various methods of drone control have been implemented like radio, remote, mobile applications etc. In this project, we try to implement a hand orientation/gesture recognition system that could be used to maneuver a Tello Drone.

Objectives of the Project:

1. Develop an end-to-end machine learning model for recognizing hand gestures.
2. Incorporating Mediapipe library for dynamic and real time interpretation.
3. Comparing Mediapipe with CNN and see why Mediapipe gives the best results.

Methodology:

1. Use OpenCV library to capture a diverse and vast dataset for multiple hand gestures. Gestures include {'Up', 'Down', 'Right', 'Left', 'Front', 'Back', 'Flip', 'Land'}.
2. Preprocess the data to scale down the images, convert to greyscale and augment using augmentation techniques like blurring, darkening, lightening, rotating by an angle between +15 deg and -15 deg.
3. Research on the Mediapipe docs to find the implementation.
4. Generate a hand landmarker dataset.
5. Preprocess the dataset to remove unused information.
6. Develop an artificial neural network architecture to process the data.
7. Evaluate the results and change the model if required.
8. Fine tune and finalize the model.
9. Integrate the model with a live feed, ROS and Gazebo to test and simulate the drone.

Facilities Required:

1. High quality GPUs for more precise recognition with increased landmarkers.
2. Drones to implement the software on.

Bibliography:

1. https://developers.google.com/mediapipe/solutions
2. https://docs.opencv.org/4.x/index.html

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