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(PEGASUS01)

1.Object Detection, Classification, and Localization:

1.1 System design:

1.1.1 Object Detection:

- PEGASUS used YOLOv8 algorithm.
- After capturing the image, YOLOv8 detects objects and crops the region of interest.

1.1.2 Classification:

- A pre-trained CNN (Convolutional Neural Networks) model then classifies the shape of objects.
- K-means algorithm extracts the color and easy OCR is used for alphabet analysis.

1.1.3 Localization:

- Localization is achieved by synchronizing the image's location with feedback from the camera's hot shoe using the ground shape distance method to find actual distance and Topi library (API library) to calculate geodesic distances.
- They also created a dataset generator that includes a geometric shapes generator and alternate annotations object detection generator.
- A total of 13 classes generated separately each class contains up to 2000 training examples and more than 30,000 images for object detection in order to make the performance more accurate.

2.Obstacle Avoidance:

2.1 System design:

- They developed a Mastermind algorithm to run with YOLOv8 model. The idea of this algorithm is when another aircraft is detected within the 360 degrees camera, the algorithm captures two frames to determine if it is approaching then calculates a root vector and creates a new route so that it does not collide with the other aircrafts.
- The algorithm also prevents the aircraft from flying out of bounds by creating a vector from the battery line

2.2 Testing:

- The team tested the obstacle avoidance feature with their own custom simulator software.
- The mastermind algorithm was tested for over 100 flights on the simulator, and they all passed successfully .

3.Autopilot:

- They created an automated system that reads waypoints from a paper and saves them to a file.
- The system uses an OCR UI based on an easy OCR model allowing for manual editing of waypoints (if necessary).

4.Communication System: