Real-Time Object Tracking for Indoor Drone Navigation

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Abstract*:* This study aims to develop a real-time object-tracking system for drone navigation in indoor environments. The project incorporates modern computer vision and machine learning techniques, focusing on the YOLOv8 architecture for object detection. The research is motivated by the increasing use of drones in civil and commercial applications, which advancements in miniaturization, sensing, and navigation systems have brought about. Combining drones and artificial intelligence for indoor tracking holds excellent potential for streamlining logistics processes, retail, and industry. The methodology uses Python code to operate a programmable drone remotely via Wi-Fi. In the project's initial phase, images of two specific objects - takeoff and landing platforms - were captured. These images were processed using the OpenCV library and manually annotated on the Roboflow platform to construct the dataset. The annotated dataset was then used to train a YOLOv8 neural network using Google Colab. Initial results indicate the approach's feasibility, as the system successfully detects and tracks objects in real-time using the drone's camera. The tests focus on tracking landing and takeoff bases, but the ultimate goal is to detect and track various objects in the environment. Ongoing efforts include a more comprehensive analysis of the model's performance and accuracy. This work has contributed to advancing autonomous drone navigation technologies in indoor environments, with potential applications in logistics, industrial inspection, and other domains. Future challenges include optimizing the model for execution on resource-constrained embedded hardware and enhancing its robustness under varying lighting and background conditions. In conclusion, this work illustrates the potential of integrating advanced computer vision and deep learning techniques to enable new capabilities in aerial robotic systems. The preliminary results are promising, paving the way for future investigations and enhancements in this rapidly evolving field of research.

Palavras-chave: Object-tracking; Computer Vision; Drone; Indoor Tracking; Neural Network.

Agradecimentos: The research is being conducted at the Automation and Robotics Laboratory (LAR) of the School of Science and Technology (ECT) at the Federal University of Rio Grande do Norte (UFRN), with the institution's support for the project's development.