TEAM
M098

Design and Development of a Hybrid Roller-Drone: An Aerial and Ground Mobility System

Ali Alqahtani, Naif Alqahtani, Mohammed Alyousif, Abdulsalam AlThunayyan, Hashim Alramadhan, Marwan Alkhayat
Coach: Muhammad Emzir

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Problem Statement

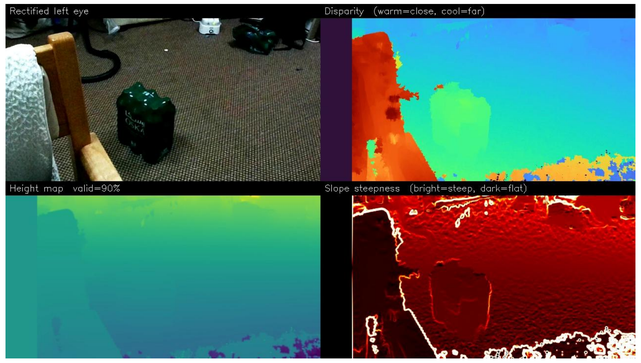
This project aims to design and develop a hybrid roller-drone that enables seamless transition
between aerial and ground mobility to reduce energy consumption and extend mission
duration in complex indoor environments.

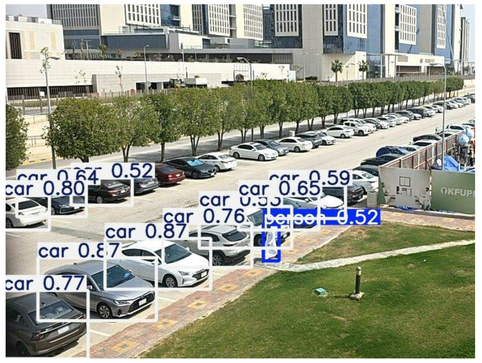
Specification

MTOW ≤ 3.0 kg
Payload capacity ≥ 0.5 kg
Average hover power ≤ 600 W
flight endurance ≥ 12 min
response time ≤ 0.5 s
Stability within ±5° roll/pitch
Telemetry rate ≥ 2Hz
Object detection from 30m with 80% accuracy
Automatic landing spot selection with 10m height
Autonomously land within 2 meters of the selected spot

Prototype Design

Testing / Validation





Constraints

Total project cost ≤ 8000 SAR
Frame must survive 0.5 m drop without failure
Overall frame diameter ≤ 600 mm
Communication range ≤ 1 km LOS
Battery capacity ≤ 10000 mAh
Voltage must be within 5% of nominal.
Hot boot up time < 30 seconds
Maximum firmware size ≤ 1 MB

Conclusions

The final design successfully meets all critical specifications, including portability, durability, stability, power consumptions, responsiveness. With successful integration of object detection and automatic landing. Future improvements and recommendations include deeper validation of power consumption comparing hovering vs rolling, detailed thermal testing for motors, ESCs, and batteries, and structural fatigue analysis of folding mechanism.