

Veículos Aéreos e Terrestres Autónomos para Operações em Ambientes Exteriores

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LARSyS

Laboratory of Robotics
and Engineering Systems

UAV + UGV Outdoor Applications

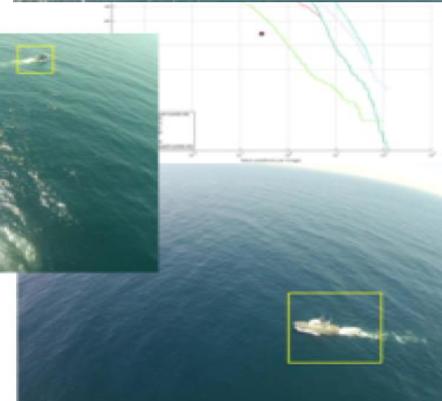
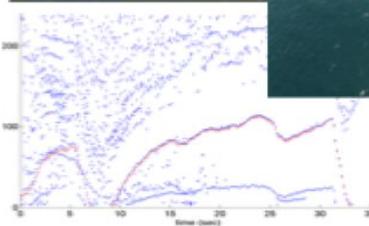
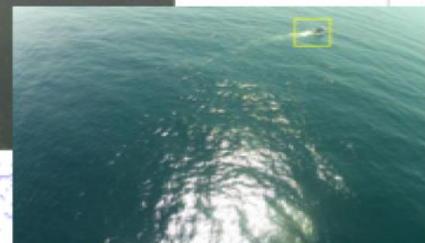
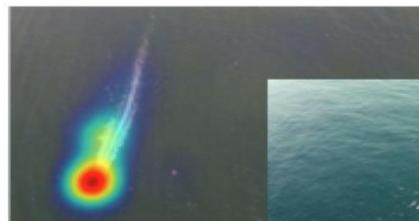
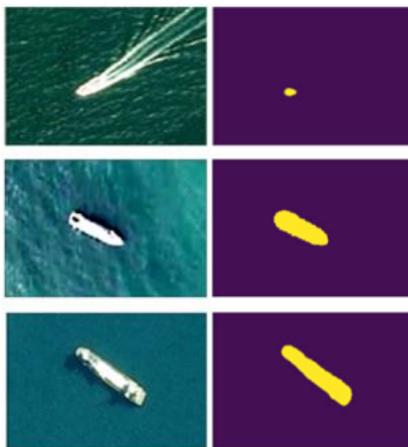
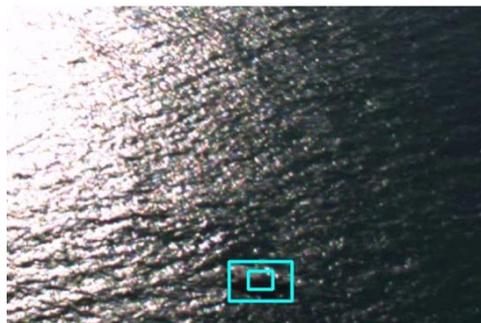
(UAV: Unmanned Aerial Vehicle / UGV: Unmanned Ground Vehicle)

MOTIVATION & OUTLINE

- Displaying some of ongoing ISR/LARSyS projects
- National Projects with Navy + Air Force on
 - Maritime Surveillance
 - Fire Smoke Localization (also with UAVision)
 - UAV landing on ship
- National Project with LNEC + Tekever on infrastructure monitoring
- Successful Participation in International competition with Multipurpose Mobile Manipulator UGV (with U. Seville + CATEC)
- UAVs+UGVs for inspection of photovoltaic farms (with EDP)

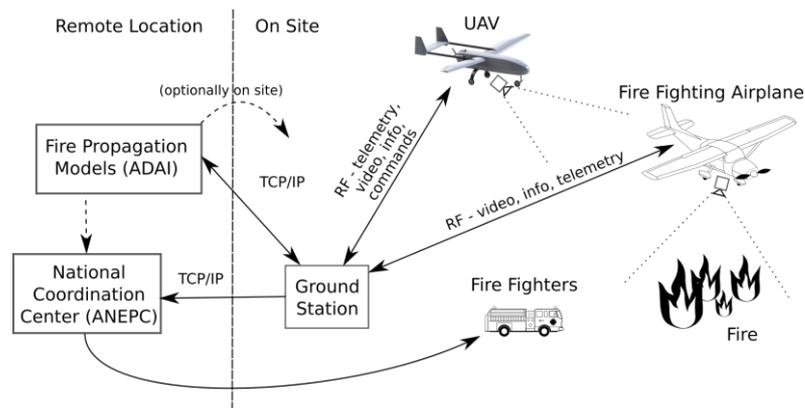
UAV Vision for Maritime Surveillance

- National Project VOAM AIS (with Airforce + Navy)
- www.voamais.pt
- **Airborne (fixed wing drone) computer vision for detection of:**
 - ships,
 - lifesavers,
 - shipwrecks,
 - castaways,
 - pollutants.



UAV Vision for Fire Smoke Localization

- National Project FIREFRONT (with Airforce + Navy + UAVISION)
- www.firefront.pt
- **Airborne (fixed wing drone) computer vision for detection of fire and smoke**
- Georeference detections to ground coordinates using vision, orthophotomaps and DEM.
- Predict fire progression.
- Semi and self supervised machine learning approaches.



UAV Detection from Ground Cameras

- Part of VOAMAS Project, with Portuguese Navy and Air Force.
- Detect the pose of fixed wing UAV's for automatic landing.
- Use camera on ground or onboard ship.
- Can be used for anti-drone applications.



Infrastructure Monitoring with UAV Vision

- National Project ELEVAR with LNEC + Tekever.
- Take panoramas of critical infrastructures (buildings, dams, bridges) from quadcopters.
- Analyse defects.
- Combine Vision with GPS+IMU for improved localization.



Multipurpose Mobile UGV

- International Robotic Challenge in Abu Dhabi, UAE (MBZIRC 2020)
- 3 Challenges
- Participated in Challenge on Wall Construction
- Won Challenge on Fire Detection and Combat



A multipurpose mobile manipulator for autonomous firefighting and construction of outdoor structures

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Mobile UGV for PV Farm Inspection

- INTERREG ATLANTIC Project with several EU partners, including EDP
- Cooperation UAVs/UGVs
- Searching for Defects in PV panels
- UGVs serve as recharging stations for UAVs
- UAVs find defects, UGVs take thermal cam images



Conclusions and Challenges

- Range of applications for UAVs and UGVs increasing
- Multipurpose robots
- Cooperative robot teams
- Interaction with humans, human in the loop
- Other applications: search and rescue, power line inspection, inspection of scenarios with radioactive threats, demining, etc



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