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ABSTRACT

DRONE-BASED ENVIRONMENTAL ODOUR MONITORING: SNIFFDRONE

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Wastewater treatment plants produce gaseous emissions that might be olfactory annoying to the surrounding population. Current odour assessment methodologies use costly and infrequent olfactometry measurements involving human panels and continuous monitoring of few gases using fixed gas detectors installed on the plant. This leads to odour measurements with low temporal and spatial resolutions that do not allow for accurate characterization of the odour emission events.
SNIFFDRONE project developed a drone with olfaction capabilities able to provide spatially dense odour measurements and localize the source of odour nuisances in WWTPs, leading to a drastic improvement in plant management compared to current practices. This development addressed two main research challenges, namely: (i) To design an electronic system that predicts odour intensity from sensor readings in complex and time-varying odorous gas mixtures using machine learning algorithms, and (ii) To produce 3D maps of time-averaged odour distribution, despite the well-known complexity of concentration distribution in turbulent plumes. SNIFFDRONE represents a significant leap forward in several aspects: (i) up to now, odour robots have been tested towards single odorant chemical sources in relatively simple scenarios, and (ii) most research in odour robots has been based in terrestrial robots.
Currently, we have a fully operative drone with an integrated hybrid electronic nose comprising 21 chemical sensors, plus temperature, humidity, and pressure sensors, in a miniature sensor chamber. Additionally, it contains a custom sampling and pumping system to avoid downwash effects, GPS positioning, and a radio connection to a base station for real-time signal processing and data analysis. The system has been calibrated using machine learning algorithms and validated in real operation conditions through several measurement campaigns in a WWTP in Molina de Segura, Murcia, Spain.
Providing real-time odour information to managers will help to make fast decisions, pre-empting potential inconveniences. In a medium-term future, monitoring of odour emissions from a variety of sources like WWTP, landfills or composting plants, using autonomous flying robots with olfaction capabilities will largely improve plant management, thus encouraging implementation possibilities of artificial olfaction systems in broader areas.

Indicate preference of kind of presentation

X Oral Communication

☐ Poster

Indicate topic of your work for the conference:

☐ Policy and associated regulations for odour and air quality.

¤ Odour/VOC measurement, monitoring&sensor technologies.

☐ Odour/VOC perception, impact, formation and dispersion.

☐ GHG emissions particulate matter and industrial emissions.

¤ Source characterization and odour/VOC mapping.

☐ Odour/VOC abatement, mitigation and neutralization.

¤ Odour/VOC from waste water, sewer systems and livestock.

☐ Air emissions and sustainable solutions for waste handling

☐ Community engagement, social media and citizen action.

☐ Other (suggest a new topic):

The scientific committee may change the session where authors propose to include their works.