

RESEARCH ENGINEER POSITION AVAILABLE
ROS & path planning for drones

- **Duration:** 1 year
- **Employer:** University of Haute Alsace
- **Location:** IRIMAS laboratory, Mulhouse, France
- **Salary:** ANR funding (may vary according to experience)
- **Supervisors:** L. Idoumghar, J. Lepagnot & L. Jourdan

1. Context

This research engineer position is part of a joint French–German research project on future security in urban areas, funded by the French National Research Agency ([ANR](#)) and the German Federal Ministry of Education and Research ([BMBF](#)), from 2017 to 2020. This project is entitled “Organized Pedestrian Movement in Public Spaces: Preparation and Crisis Management of Urban Parades and Demonstration Marches with High Conflict Potential” (OPMoPS). The main outcome of this project will be a decision support tool based on mathematical, computer science and sociological research, which will help the forces of civil security (FCS) to prepare and control urban parades and demonstration marches (UPM), to detect risk situations, and to react to possible threats to individuals and civil security fast and efficiently.

In this context, the IRIMAS institute coordinates the work of the French involved partners and leads an optimization work package devoted to solve the following research problems: find good locations for security personnel before and during the UPM, roster plans for security personnel, evaluate suggested and recommend good UPM routes, placement of cameras and drones with automatic detection of main hazardous situations.

The selected candidate will join the IRIMAS optimization group involved in OPMoPS, in order to assist them in the tasks related to automatic path planning of drones. The research works conducted by this group on these tasks have already led to several publications [1, 2, 3].

2. Mission

As a research engineer, your role will be to assist this group in the following possible tasks:

- developing simulations of quadcopter/quadrotor in outdoor/urban environments, in order to avoid obstacles, using robotic platforms (**ROS (Robot Operating System, <https://www.ros.org>)**, V-Rep, etc.);
- modelling and integrating real-world test cases into the robotic platform for these simulations;
- performing experimental studies, then gathering and analyzing the results;
- developing tools to easily create, handle and display test cases and results.

3. Required skills and background

- The candidates must have a Master degree or equivalent in computer science or applied mathematics.
- The candidates should have, ideally, a strong experience with **ROS**, Gazebo, MoveIt, rqt, RVIZ.
- Experience importing street views from Open Street Maps/Google Maps to use as a Gazebo world file.
- Strong **Python and C++** coding skills.
- Familiarity with sensors, such as LIDAR, IMU, GPS, radar, or cameras relevant to drone.
- Hands on experience in design and development of autonomous vehicle/robot modules (like object detection/tracking, localization and navigation, path planning, behavioral planning, SLAM, control system (position, velocity, force control, etc.)).
- The candidates must be fluent in English.

4. Application

To apply to this position, please send to lhassane.idoumghar@uha.fr, julien.lepagnot@uha.fr: **CV, motivation letter, copy of Master degree, transcript of grades from last two years of study**, 2-3 recommendation letters, name and contact information of at least one previous supervisor or teacher that can support your application.

5. References

- [1] Ghambari S., Lepagnot J., Jourdan L. & Idoumghar L. (2018), "A comparative study of meta-heuristic algorithms for solving UAV path planning". *IEEE-Symposium Series on Computational Intelligence (SSCI) 2018*, Bangalore, India, November 2018.
- [2] Ghambari S., Idoumghar L., Jourdan L. & Lepagnot J. (2019), "A* based differential evolution algorithm for UAV path planning problem in urban environment". *Artificial Evolution*, Mulhouse, France, October 2019.
- [3] Ghambari S., Idoumghar L., Jourdan L. & Lepagnot J. (2019), "An improved TLBO algorithm for solving UAV path planning problem". *IEEE-Symposium Series on Computational Intelligence (SSCI) 2018*, Xiamen, China, December 2019.