

## **RESEARCH 2 ENGINEER POSITIONS**

- **Duration:** 2 years
- **Employer:** University of Haute Alsace
- **Location:** IRIMAS laboratory, Mulhouse, France
- **Salary:** ANR funding
- **Supervisors:** L. Idoumghar, J. Lepagnot & M. Brévilliers

### **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 laboratory 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 candidates will join the IRIMAS optimization group involved in OPMoPS.

First results in optimal camera placement have already been published [1], and 2 other journal articles are still under review. Two other articles have been submitted about the automatic path planning of drones.

### **2. Mission**

As research engineers, your role will be to assist this group in:

- The design and implementation of new sequential and/or parallel metaheuristic-based algorithms to solve hard optimization problems related to the OPMoPS context.
- Performing experimental studies, then gathering and analyzing the results.
- Integrating these new algorithms into the OPMoPS framework, so that they will be part of the final decision support tool of the project.

- Modelling and integrating real-world test cases into the OPMoPS framework.
- Developing tools to easily create, handle and display test cases and results.
- Developing the optimization algorithm library of the team by integrating these new algorithms.
- Ensuring the effective functioning of a GPU cluster.
- Developing algorithms to control a fleet of drones using AscTec SDK, and possibly other SDKs from different manufacturers.
- Managing and configuring drone components/equipment.

### **3. Required skills and background**

- The candidates must have a Master degree or equivalent in computer science or applied mathematics.
- The candidates should have good knowledges in optimization and metaheuristics.
- Main programming languages: C/C++, Java, Matlab.
- Good knowledges of development in Linux environment.
- The candidates must be fluent in English.
- One of the candidates should have knowledges in GPU and/or MPI programming.
- The other candidate should have an experience in drone control and algorithm development for drone control.

Additional skills that will be appreciated for this position:

- HTML5, Javascript
- OpenGL, WebGL
- XML
- Base knowledges in 2D/3D geometry
- Experience in 3D modelling (Wavefront file format)
- Experience with the OpenStreetMap data format

### **4. Application**

To apply to this position, please send to [lhassane.idoumghar@uha.fr](mailto:lhassane.idoumghar@uha.fr), [julien.lepagnot@uha.fr](mailto:julien.lepagnot@uha.fr) and [mathieu.brevilliers@uha.fr](mailto:mathieu.brevilliers@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] Brévilliers M., Lepagnot J., Kritter J. and Idoumghar L. (2018), "Parallel Preprocessing for the Optimal Camera Placement Problem", *International Journal of Modeling and Optimization*, Vol. 8 No. 1, pp.33-40.