

Offre de stage / Internship offer

Flying cobot: interactive system for human-drone interaction

Internship location

ENAC (LII - Laboratoire d'Informatique Interactive team), 7 Avenue Edouard Belin - 31055 Toulouse & LAAS (RIS - Robotics and InteractionS team), Avenue du Colonel Roche, 31400 Toulouse, France

Context of the Projet

Drones are steadily becoming ubiquitous and are used in a variety of professional environments such as in firefighting or in police work. Indeed, drone technology offers unique opportunities by bringing bird's eye view situational information, in real-time and at a low cost, which can reduce the risk to human life and properties. In emergency response and Search and Rescue (SAR) missions, drones can directly help first responders and victims alike, such as by establishing a communication network between them or by handing over information and items.

Recently, we are seeing a technological shift with increasing levels of autonomy; with drones that can now perform tasks such as indoor navigation, surveying, filming, or mapping autonomously using embedded sensors. This shift towards autonomy creates new interaction paradigms where drones become fully mobile devices that can interact with people at any time and location. Moreover, recent progress foresees flying co-working robots (cobots) that can support workers in their jobs, such as by performing complex tasks in hard-to-reach places.

We imagine that, in the near future, flying cobots will help people in direct collaborative tasks, such as by carrying equipment and handing over both physical and digital artifacts to first responders and victims. Yet, additional research is needed to support safe close-body interaction between humans and drones. In this project, we will design and develop an interactive system for the flying cobot.

Objectives and Tasks

The objective of the internship is the design and development of a handover system for a flying co-working robot (cobot). The handover will be planned for both physical (tools) and digital (information) artifacts, through a multimodal user interface.

Our initial work on the project has identified factors for safe handover and acceptable drone placement and movement as the first step towards close-body interaction for co-working purposes [Cauchard 2024]. This work has been realized for a co-working drone and their human co-workers (Figure 2) through interviews and video prototypes.

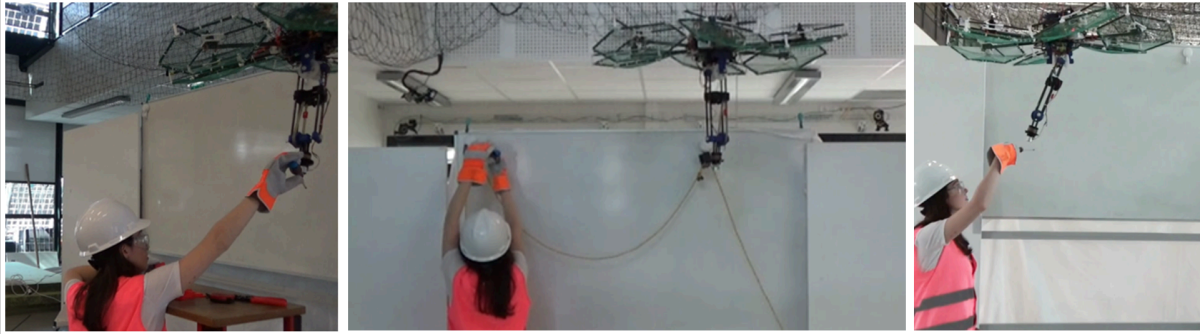


Figure 2: Example interaction scenarios between a user and a co-working drone, as developed in our earlier work: (Left) handover of a tool from drone to human. (Center) collaborative hanging of a cable. (Right) handover of a tool from human to drone [Cauchard 2024].

As a follow up of this prior work, **your task will be to:**

- Analyze existing literature on human-robot co-working techniques, especially on handover of digital information
- Interview potential users and design use case scenarios in the context of search & rescue
- Implement the drone's flight path, behavior, and interactions with the user
- Conduct an experimental study to validate the implementation

Training / Skills

This position is open for a graduate student: M1/2A école d'ingénieur or M2 / 3A école d'ingénieure

Required Skills

- Programming skills: C, C++ or Python
- Interest for scientific research
- English proficiency

Desirable Skills

- User Interface design and User centered-design methods are a plus
- Interest or prior experience with drones, robots, or arduino is a plus

Work Environment

LAAS is a laboratory of the **French National Organization for Scientific Research (CNRS)**. It has a permanent scientific staff of about 320, with on average 260 doctorate students. The Robotics and InteractionS team (around 35 staff, Ph.D. students, and postdocs) is active in a wide spectrum of research on intelligent and autonomous robotic systems, and in particular in aerial robotics. The lab is equipped with one indoor and one outdoor flying arena, with all the necessary logistics and equipment.

École Nationale de l'Aviation Civile (ENAC) – Laboratoire d'Informatique Interactive (LII) :

ENAC is an engineering school specialized in aeronautics and with research laboratories in different domains (data & visualization, optimization, telecommunication, and interactive informatics). ENAC possesses a rich infrastructure including Europe's biggest flight hall for drones, staff dedicated to the development of the Paparazzi platform for drones (<https://wiki.paparazziuav.org>) as well as a drone FabLab.

Additional Information

Duration: 3 - 6 month

Start date: March - but a later start date is possible

Salary : legal salary (around 600€/month)

Location: LAAS / ENAC, Toulouse, France

To Apply

Send your CV and motivation letter by email to anke.brock@enac.fr and jcauchard@acm.org

Contact for more information

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Reference

[Cauchard 2024] Cauchard, J.R., Dutau, C., Corsini, G., Cognetti, M., Sidobre, D., Lacroix, S., Brock, A.M., Considerations for Handover and Co-working with Drones, HRI'24 - ACM/IEEE International Conference on Human Robot Interaction (Late Breaking Report)