

3 months internship: “Ground station developpement for a mixed-initiative target search mission”

Supervisors: Caroline P.C. Chanel, Thibault Gateau, Sébastien Scanella

email: caroline.chanel@isae-superaero.fr, thibault.gateau@isae-superaero.fr

Context

The robots are increasingly led to be used in a wide variety of missions that can be hazardous to an human agent [Schurr et al., 2009]. For instance, we can cite interventions in rough places, inspection of contaminated sites, or surveillance. In such missions the human operator must cooperate with the robot(s) to achieve the mission.

Note that, the robots have more and more autonomous in order to fulfill basic tasks, such as navigating from one point to another automatically [Thrun et al., 2004]. On one hand, poor design of the user interface, the complexity of the automation and high pressure, which is generated in some mission contexts, can leave the human operator devoid or misinformed, specially when mental load exceeds the human capacity to handle multiple tasks [Durantin et al., 2014]. On the other hand, the operator is often seen as providential agent, which have to be responsive to the robot as soon as it encounters a problem.

In our point of view, when designing such a system of cooperation it is extremely important to take into account the asset and weakness of each involved agent (operator and robot). Thus, a promising avenue to address these issues is : to consider that the capabilities of the robot and the human are complementary and are likely to provide better performance when joined efficiently than when used separately. This approach, known as mixed-initiative [Allen et al., 1999, Bresina et al., 2005] define the role of agents (i.e. a preference order to perform a task), in function of their recognized skills.

Projet

In this sense, we are working on the study of the mixed-initiative applied to a target recognition task. A robot and an operator must collaborate to reach this target and recognize, while taking into account the possible failures of the robot and the human agent. This mission has been modeled using a Mixed-Observability Markov Decision Process (MOMDP) [Souza et al., 2015]. In order to continue this study and to validate our approach experimentally a platform for robot operation must be operated.

The internship concerns a system’s integration, i.e. to develop an interface for the robot operation (IHM) with:

- an interface for the robot policy execution;
- an interface for the robot manual control and supervision;
- an interface for the eye tracker and ECG sensors integration.

This IHM should be interfaced with the existing ISAE robot platform, which means deploying (simulated and/or real) robots with:

- an autonomous navigation system;
- sensors: for the obstacle avoidance, for the localization; a video camera, and a wifi communication;
- two modes of operation: manual or supervised;

Note that most of this functionalities are already deployed in our robots.

Unit tests, functional tests and API documentation will also constitute a fundamental aspect of this internship.

Internship prerequisite: programming languages (C,C++,Qt,python), mobile robots, linux, autonomy, motivation, rigor.

References

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