



L'Institut franco-allemand de recherches de Saint-Louis (ISL) est le pionnier de la coopération franco-allemande dans le domaine de la défense et de la sécurité. La mission de l'ISL est d'apporter des innovations technologiques aux forces de défense et de sécurité. Les recherches s'effectuent dans des disciplines multiples et à des niveaux de maturité variant entre la recherche fondamentale et le développement de prototypes préindustriels, intégrables dans des équipements opérationnels.

## Proposition de Stage

**Domaine de recherche :** Robotic, UAV, UGV, Computer Vision

## Self-positioning aerial radio relay

### Contexte

In the field of ground and aerial unmanned systems, the Advanced Visionics and Processing group (AVP) has developed several robotic platforms, notably on the group. We are now expanding our field of applications thanks to the collaboration of unmanned aerial vehicles. The team successfully participated to the CoHoma 2 challenge and secured the second place [1-2]. For this challenge, we developed a remote-control mode for our ground platform Aurochs [3], where the robot is controlled by a human operator located in an armored vehicle. We have experienced numerous communication issues due to the heavy vegetation encountered, forcing the armored vehicle to approach the Aurochs, hence going closer the danger. We aim at improving the robustness of the data link by providing an aerial support for the pilot.

[1]  
<https://www.defense.gouv.fr/terre/actualites/challenge-cohoma-re-tex-2e-edition>

[2]  
<https://www.youtube.com/watch?v=aq-iwJunoS0>

[3]  
<https://www.isl.eu/documents/flyers/FR/isl-STAMINA-UGV-Aurochs-FR-nm.pdf>

### Description du sujet de stage

Nowadays the data link between the Aurochs and the control station is handled by military radios. However, the link is sensitive to vegetation blocking the transmission when the Aurochs is not in line of sight. The used radios are capable of building a mesh network and we would like to exploit this capacity by deploying a UAV to act as radio relay having line of sight to the Aurochs and to the control center.

To that end the UAV should autonomously position itself above the Aurochs as it moves. The UAV should use its on board camera and GNSS but should be robust to GNSS jamming.

The goal of the internship is to visually track the Aurochs from the on-board camera of the UAV and to adjust the UAV's position with respect to the Aurochs. The solution could either use conventional algorithms or exploit new machine-learning approaches. The solution should be embedded on the UAV processing unit (possibly a product from the Jetson series).

Thoughts should also be given regarding the positioning of the UAV in order to maximize the quality of the radio link and mitigate the detectability of the Aurochs.

Notions in Python and machine learning are preferred.

**Niveau :** Master

**Durée :** 6 months

**Superviseur :** Martin Rebert and David Monnin

### Modalité de dépôt de candidature :

Le/La candidat(e) est prié(e) d'envoyer un CV (détaillant le cursus universitaire) et une lettre de motivation.  
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