

Sujet de stage au laboratoire Heudiasyc UMR 7253 :

Titre/Title	Navigation coopérative des véhicules robotisés aériens et terrestres
Encadrant(s) / Supervisor(s)	Pedro Castillo (principal supervisor) Alessandro Corrêa Victorino
Descriptif du sujet/ Project description	<p>Context</p> <p>This master topic deals with the problem related to the cooperative autonomous navigation of intelligent multi-actuated land and air vehicles in interaction, and the development of an on-board module to perform dynamic target surveillance and tracking tasks in a cooperative manner.</p> <p>In recent years, drones have seen significant success and use in several sectors of society. The current big challenge is to make drones even more autonomous in different operating scenarios, overcoming all the constraints and difficulties that may appear in the mission. The scientific community commonly uses homogeneous drones (aerial or terrestrial). However, in recent years, their use as a group has attracted the attention of researchers and industrialists, in order to solve problems that homogeneous drones cannot solve.</p> <p>In this project, we propose the interaction and autonomous cooperation of air and ground vehicles to perform inspection, surveillance or dynamic target tracking tasks. It should be noted that autonomous air and ground vehicles working in cooperation, can offer several advantages to carry out certain missions. Today, only a few missions for this type of heterogeneous vehicles are emerging in real applications; this probably comes from scientific and technological difficulties which still persist, for the perception and the cooperative control of such systems.</p> <p>Methodology and objectives</p> <p>The development of the project involves the design of a cooperative navigation system, composed of robust control algorithms, allowing to move autonomously and safely, in order to achieve the common mission. The cooperative navigation of this heterogeneous robotic system will be based on the perception of the environment provided by both the drone and the land mobile.</p> <p>An initial cooperative navigation methodology was obtained in previous master projects. Firstly, the aerial robot follows the ground robot, that was autonomously navigating among obstacles, using the aerial embedded perception [VENZANO 2022], secondly the aerial robot provides targets' information to the ground robot, that autonomously navigate to these targets [THEUNISSEN 2022].</p> <p>In the present project, and based in these previous developments, the student will propose a cooperative framework where the robots perform the perception and the navigation tasks in a tightly cooperative way.</p>

	<p>References</p> <p>[VENZANO 2022] E. Venzano, H. Pousseur, A. Victorino, P. Castillo, "Motion Control for Aerial and Ground Vehicle Autonomous Platooning", IEEE 17th International Conference on Advanced Motion Control, (AMC 2022), Feb 2022, Padova, Italy.</p> <p>[THEUNISSEN 2022] Mathilde Theunissen, "Navigation cooperative entre robot aérien et robots terrestres". Rapport stage master. POLYTECH SORBONNE, Université de Technologie de Compiègne,. Année universitaire 2021 / 2022.</p> <p>Contact</p> <p>Pedro Castillo: pedro.castillo@hds.utc.fr</p>
<p>Pré-requis / Knowledge</p>	<p>Skills in automatic control, robotics or mechatronics. Knowledge of C++ and Linux programming is highly appreciated</p>
<p>Possibilité de poursuite en thèse/ Possibility of continuing in PhD</p>	<p>YES</p>