



Job Offer - Patrimony of the Royal Military Academy of Belgium
Department of Mathematics
Research Engineer / Scientist (M/F/X)
Project “Enabling operations with multiple heterogeneous unmanned
maritime assets” (DAP/19-08)
Publication: 22 Sep 2020



Job Description and associated tasks

The Royal Military Academy of Belgium (RMA) is a military institution responsible for the basic academic, military and physical training of future officers and for the continuing advanced training of officers during their active career in the Belgian Defense department (www.rma.ac.be). It is fully recognized as a university, fulfilling the same criteria as civilian universities. The Royal Military Academy is also conducting scientific research at university level for projects funded by the Belgian Defense department or external sources.

Context:

In the framework of a triple helix research project between the Royal Military Academy, industry and the Belgian Navy, we are looking for a full-time research scientist/engineer with a master's degree in Applied Sciences / Engineering / Physics / Computer Science / Mathematics in the field of Robotics / Maritime Systems.

You work within the department of Mathematics and in close collaboration with the research cell ‘Robotics & Autonomous Systems’ (<http://mecaatron.rma.ac.be/>) of the department of Mechanics. You conduct scientific research at university level on a project entitled ‘Enabling operations with multiple heterogeneous unmanned maritime assets’. You work within a research team and in close collaboration with the industry on one of their novel products and you will interact often with the Belgian Navy for defining requirements and setting up maritime test campaigns.

Study

Unmanned maritime systems are on the verge of becoming important assets for military operations, not only in tactical roles, but also in logistics and in supportive roles. This also means that an increased number of these systems are being deployed each with their own characteristics and specifications. This variety poses interoperability problems when deploying these assets together for operations, as there is to date no unified command structure for these unmanned assets and there are no standardized data interchange platforms that allow for an easy transfer of sensory information between platforms. The result is that commanders have to work in most circumstances with custom-built solutions that may be good in performing one task well, but that encompass little flexibility and modularity towards upgrading the task for future needs or towards interoperability with other deployed assets. This study proposal aims to remedy that situation by developing an interoperability concept for heterogeneous unmanned assets that allows for the seamless integration of these tools into existing standard operating procedures.

Interoperability is the key to enable efficient multi-robot cooperation between the different units within the team. Seamless and non-ambiguous interaction between different robots of any provider and domain demands a common, well-defined interface. The ultimate goal of the work on the heterogeneous team is to consolidate a common command, control and payload interface to be agreed and adopted by all robotics platforms and control stations involved in an operation.

This approach provides a common framework for the development of collaborative unmanned assets, minimizing the integration time and costs by avoiding ad-hoc implementations.

As a key concept, we are developing a heterogeneous interoperability and collaboration framework which ensures seamless interoperability between the different agents. The interoperability concept consists of a highly modular system of carrier platforms and sensor payloads, enabling straightforward switching of payloads from one system to another. This modular architecture will also ensure the future exploitability of the results of this project on other assets after the end of the project.

In terms of validation, a novel unmanned maritime system (Rubber Hull Inflatable Boat) will be developed within the scope of this project, in order to validate the AI, autonomous surveillance and interoperability capabilities developed within the study.

The research will be performed at the MWMW department of the Royal Military Academy (RMA), in collaboration with the MECA (Mechanics) department. The candidate will be supervised by Prof. Dr Ir R. Haelterman and assisted by Dr. Ir G. DE CUBBER.

The contract will be for **3 years**, with possibility of extension.

Main tasks

Perform research activities in the frame of the study project:

- Integration of dedicated sensors required to execute the surveillance, detection and tracking tasks envisioned. The sensor payloads of the UxV assets depend on the domain they operate in and on their task within the heterogeneous team.
- Perform hardware adaptations to comply with the payload needs and environmental conditions imposed by the scenarios
- Development of control software to provide the basic level of autonomy required to execute the envisioned tasks. This includes navigation, localization & control routines, ensuring robust autonomous operation of the platforms.
- Specific contributions on autonomy to satisfy the operational requirements. This includes the development of AI-algorithms enabling maritime surveillance tasks
- Integrate/adapt the communication systems on the vessel
- Develop and demonstrate a Multi-Agent Coordination framework that allows assets within different domains to operate collaboratively as part of multi-domain network
- Validate the interoperability concept developed in this project and transfer it to fieldable solutions that can lead to commercially or military viable solutions related to maritime surveillance.
- Perform three yearly trial campaigns at sea, gradually increasing the level of difficulty
- Develop an exploitation plan to optimally valorise the Intellectual Property developed within this study
- Report the progress results to the promotor and research team in English.
- Report the obtained results at international conferences and write scientific papers in English.

More information: Rob HAELTERMAN & Geert DE CUBBER: rob.haelterman@mil.be & geert.de.cubber@rma.ac.be

Required skills

❖ Technical skills

The applicant shall have a Master's Degree in Applied Sciences, Engineering Physics, Computer Science, Mathematics.

- Experience in programming is absolutely required.
- Training or experience with MATLAB & Simulink is recommended;
- Training or experience with the C programming language is recommended;
- Training or experience in Robotics is recommended;
- Training or experience in AI is recommended;
- Training or experience in Multi-Agent Systems (Optimization) is an added value;
- Training or experience in Unmanned Maritime Systems is recommended;
- Training or experience with ROS is an added value;
- Training or experience with MOOS is an added value;
- Training or experience in Sensor integration is an added value;
- Training or experience in Perception is an added value;
- Training or experience in applied research and or design is an added value;
- Affinity with maritime systems or maritime operations is an added value

❖ Personal skills

- You conduct scientific research in an independent and upright way within a multidisciplinary environment
- You think in an innovative and creative way.
- You communicate your results in a clear, concise and precise manner.
- You take initiative.
- You are involved and result oriented.
- You are honest, loyal toward the institution and respect confidentiality.
- You plan and manage proactively your self-development, while being critical to your own functioning and striving to your self-improvement.
- You improve the team-spirit and solve interpersonal conflicts.
- You solve problems autonomously and find alternatives or solutions.
- You behave in a respectful way toward the others, their ideas and opinions as well as toward procedures and instructions.
- You are flexible for change and adapt yourself.
- You commit yourself in your job by giving the best of your aptitudes in striving toward the highest quality standards and persevere when needed.
- You will be working very closely together with the industrial partner and will get insight in their proprietary intellectual property. Confidentiality is therefore an absolute must.

- This study calls for both theoretical and practical developments. You will need to integrate new sensors and perform yearly field validation campaigns on Belgian Navy vessels (count a few weeks each year, mostly in summer). A practical attitude and willingness to bring novel scientific innovations into practice is therefore required.

❖ Other skills

- The applicant shall have good knowledge of English (oral / written)
- Minimum knowledge of French or Dutch is an added value for collaboration with peers

❖ Specific requirements

The researcher may be exposed to classified information and will therefore have to obtain the required security clearance. The candidate must consent with the background check required to obtain this clearance, which will be executed by Belgian Defense.

Application

You will be working in a military environment. That is why everyone is expected to undergo a security verification. Please add to your application this filled document: <http://www.rma.ac.be/nl/aanvraag-veiligheidsverificatie>

Applicants shall send

- a motivation letter
- a complete CV
- a copy of their ID card (front and back)
- the request for background check / security verification (see above)

Please mention clearly the reference of the project: **DAP19-08** and send your application to Rob HAELTERMAN (rob.haelterman@mil.be), Geert DE CUBBER (geert.de.cubber@rma.ac.be), and Thierry DEPRez (erm-deao-rsw@mil.be)

The application deadline is October 31st 2020.

A first pre-selection will be conducted based on the received documents. Preselected applicants meeting the requirements will be invited to a face-to-face interview (optional online; depending on the COVID-19 situation) at the Royal Military Academy, rue Hobbema 8, 1000 Brussels. The date and time of the interview will be communicated to the preselected candidates.

Additional information

Contract

- Probable date of recruitment: **From December 1st 2020**, in consultation with the applicant.
- Status: Full-time employment based on an open-ended contract with the Patrimony of the Royal Military Academy (you will *not* be a civil servant).
- Wage scale: A11 (holders of a Master Degree) / A21 (Ir or holders of a Master Degree in Engineering Sciences (Applied Sciences))

Extra-legal benefits

- Possibility to obtain a bonus for bilingualism (Dutch/French);
- Holiday allocation;
- End-of-year bonus;
- Hospitalization insurance;
- Free public transport (home-work commute);
- Free access to the on-campus sport infrastructure;
- On-campus restaurant and cafeteria with discount on the daily menu;
- Stimulating work environment.

Workplace

- Royal Military Academy, Avenue de la Renaissance 30, 1000 Brussels
- A reasonable amount of the work will need to be executed at the premises of the end user partner (Zeebrugge area)
- Occasional travels abroad for scientific conferences, etc.
- Stimulating work environment.

Points of contact:

- Concerning the research project: to Rob HAELTERMAN (rob.haelterman@mil.be) & Geert DE CUBBER (geert.de.cubber@rma.ac.be)
- Concerning the recruitment modalities: Thierry Deprez (erm-deao-rsw@mil.be)
- For more information about the Royal Military Academy, see <http://www.rma.ac.be>
- For more information about the 'Robotics & Autonomous Systems' research unit: <http://mecatron.rma.ac.be/>