Job offer
Royal Military Academy (RMA) - Patrimony

Research engineer / Scientist (M/F)
"Beyond Visual Augmented Reality" (ref: DAP/22-01)
Department MWMW
Date of publication: 03/01/2024

Job description and associated tasks

In the framework of an Augmented Reality research project at the Royal Military Academy we are looking for a full-time research scientist/engineer with PhD degree in Engineering.

Context:
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.
For this project you will work within the XRLab of the Department of Mathematics (MWMW) of the Faculty of Applied Sciences of the Royal Military Academy (https://xrlab.rma.ac.be/). You conduct scientific research at university level on a project entitled '*Beyond Visual Augmented Reality*'. You work within a research team and in close collaboration with the industry and the different components of the Belgian Armed Forces for defining operational requirements and setting up test campaigns.

Study:
There is more than meets the eye. At least, without help. Perceiving beyond the visual spectrum can give soldiers the edge, in cases where items of interest are camouflaged or do not even exist in the visual spectrum such as the hot engine of a recently used car or the radio signals of a suspicious device. With the advent of Augmented Reality (AR) headsets and the ever-increasing rate of miniaturization of computers and sensors, new possibilities arise for the connected soldier. AR has come a long way since the premature attempt that was the Google Glass project. Nowadays the more sophisticated, powerful and user-friendly AR devices are used for a number of tasks in select industries, from increasing the efficiency of the assembly lines at Boeing factories to making the inspection of construction sites more reliable with Trimble. Miniaturization allows the plethora of smart IoT devices to cover more and more aspects of our life, from smart home appliances to large wireless mesh networks of intelligent security cameras. The possibility to combine the latest innovations of both of these worlds creates a unique research opportunity for Belgian Defence: leveraging the new smart sensing capabilities with the most sophisticated AR hardware would effectively push the boundaries of human perception.

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In this study, we propose to extend the operator's vision in two ways: (thermal) infrared (IR), and radio frequency (RF). Thermal or infrared (IR) vision has shown to be effective in many critical (para-) military situations, for example when one needs to detect people in difficult visibility conditions (smoke, fire or camouflage) or carry out inspections of compounds, as the infrared signature of the environment might reveal essential information on the presence of people or substances. On the other hand, radio frequency signals may reveal the presence of other types of potential threats such as remotely controlled bombs, network cameras or any wireless connected device. Detecting these invisible IR signatures and RF signals is important during tactical operations.

The goal of this study is to integrate a) the most recent compact infrared cameras with AR headsets for real-time, wearable and hands-free usage; b) a RF spectrum sensing device together with our AR system. Through the development of ad-hoc algorithms for sensor fusion, threat or anomaly detection and IR/RF signal visualization, we would effectively extend human vision to IR and RF.

This study is aimed at equipping the individual soldier with a proof-of-concept system consisting of portable sensors that see what can't be seen with the naked eye and conveying relevant information extracted from the data in an intuitive way. The work will consist in integrating the AR, IR and RF technologies in an ensemble system that is as accurate, efficient and user-friendly as possible. More specifically, most of the efforts will go into the research and development of image and signal processing algorithms and their adaptation to our sensor setup. These efforts will result in scientific publications and knowledge dissemination in each of the domains touched by the study, namely AR and computer vision, IR image processing and RF signal processing. Besides these scientific innovations, we will also work on the practical integration and optimization of the system. Using prototype-grade methods (e.g. 3D printing for the headset adapters which will receive the IR camera), we will prepare a full-fledged proof-of-concept, ready to be tested by Belgian Defence clients. Integrating the incremental developments in the physical system will happen at regular intervals throughout the study to keep the end-users in the loop, making sure to collect and process feedback as early as possible. Therefore, besides the scientific innovations, we will develop a working system with a target TRL of at least 5, which in a follow-up-study might become the start of a Triple Helix study or might integrate hyperspectral sensing capabilities.

The project will be for 4 years, with possibility of extension.

Main Tasks

- Perform research activities in the frame of the study project: determining user requirements, analysis of the market and interaction with suppliers, integrating system components, testing of the system in controlled, training and (semi-)operational environments.
- Report the progress results to the promotor in Defence in English.
- Report the obtained results at international conferences and write scientific papers in English.

Required skills

Technical skills

The applicant shall have a Doctor's degree in Engineering Sciences. The PhD should be in the domain of either computer vision or radio transmission/reception (or closely related domains). Your publications in peer reviewed journals in one of these domains should be added to your application.
Applicants with a Master Degree in Engineering Sciences (but no PhD) can apply, but will not have priority in the selection process.

- Practical experience in Computer Vision is **<u>absolutely</u> required** (minimum 2 years).

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- Practical experience related to treatment of radio signals is **absolutely required** (minimum 2 years).
- Experience with Augmented Reality is an added value.
- Experience in programming and telecommunication is recommended.

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 and coordinate your initiatives with the team.
- 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 Belgian Armed Forces and will get insight in their *modus operandi*. Confidentiality is therefore an absolute must.

Other skills

- The applicant shall have very good knowledge of English (oral / written). This will be tested during the selection process.
- The applicant shall have very good knowledge of either French or Dutch and a minimum knowledge of the other language in order to allow collaboration with peers. This will be tested during the selection process.

Specific requirement

- 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.
- Due to limitations with the security clearance only applicants with a nationality of a country that is both an **EU member state** and **NATO member state** can be accepted.
- A driver's licence valid in Belgium is **absolutely required**.
- When working for the Patrimony, The researcher is required to live in Belgium.

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Application

You will be working in a military environment. That is why everyone is expected to undergo a security verification. A passport issued by country that is both member of the EU and NATO is required.
Please add to your application the filled out document. The form can be downloaded from: http://www.rma.ac.be/nl/aanvraag-veiligheidsverificatie
Send by email all of the following elements:

- a motivational letter;
- a CV
- a scan of your ID card (both sides);
- the filled out security document
- your relevant publications (a link to an online open access repository is acceptable)

to Prof Rob HAELTERMAN (rob.haelterman@mil.be), Prof Mathias BECQUART (mathias.becquaert@mil;be), Mr Charles HAMESSE (charles.hamesse@mil.be) and to Mrs Helena BRUYNINCKX (erm-deao-rswo@mil.be).

Please mention clearly the reference of the project in the subject line of your mail: "**DAP/22-01**".
(Mails received without this reference or applications sent other than by email to all of the above addresses will not be considered. Applications that do not contain all of the above elements will also not be considered.)
Application deadline: **02/02/2024.**

The interviews will take place at the Royal Military Academy, Hobbemastraat 8, 1000 Brussels in the first half of ovember 2022. In case of access restriction due to COVID-19 or non-Belgian application, on-line interviews will take place. The date and time of the interview will be communicated to the preselected candidates.

Miscellaneous

Contract

- Probable date of recruitment: as soon as possible, 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: NA21 (Doctor's degree in Engineering Sciences).
- Holiday pay.

Extra-legal benefits

- Possibility to benefit from a bilingualism allowance (Dutch/French) following a SELOR test;
- End-of-year bonus;
- Free DKV hospitalization insurance. Possibility of additional affiliation for one or more persons living under the same roof: spouse, child(ren) (50% of the price per additional member);
- Bike allowance / Free public transport (home-work commute);
- Free access to campus sports facilities outside working hours;
- On-campus restaurant and cafeteria with democratic prices (discount on the daily menu);
- Flexible working hours within the 38-hour week;
- Teleworking possible ;

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- Holidays:
    - 29 days holiday / year from the 1st year of contract (then from 45 years: +1 day holiday every 5 years)
    - + 1 week OFF every year between Christmas and New year's Eve (independent of the annual balance of holidays).
- Advantages and interesting offers thanks to the Benefits@work card (discounts, vouchers...) ;
- Entitlement to services offered by the 'Office Central d'Action Sociale et Culturelle de la Défense' (OCASC): among others holiday centres, discount on travel organised by the tour operator...;
- Possibility of benefiting from the nursery funded by Belgian Defence (subject to availability).

Workplace

- Department of Mathematics, Royal Military Academy, Avenue de la Renaissance 30, 1000 Brussels;
- Occasional travels abroad for scientific conferences, etc.

Points of contact

- Concerning the research project: to Prof Rob HAELTERMAN (rob.haelterman@mil.be) & Mr Charles HAMESSE (charles.hamesse@mil.be)
- Concerning the recruitment modalities: Mrs Helena Bruyninckx (erm-deao-rswo@mil.be)
- For more information about the Royal Military Academy, see http://www.rma.ac.be

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