

ESR7

Project title: Mapping, localisation, dynamic object and obstacle detection and avoidance in rough 3D terrain for safe and energy-efficient operations

Place of employment and planned mobility: Tampere University, Finland: 9 months – HIAB AB (Cargotec corporation), Sweden: 17 months – Volvo CE, Sweden: 10 months

Supervisory team: Reza Ghabcheloo, Henrik Andreason, Hans Lyngbäck, Torbjörn Martinsson

Project tasks and objectives: For all autonomous machines operating in a real-world dynamic environment, it is highly important to keep and maintain an up-to-date representations of the environment. Since perception-based localisation system performance depends on the environment, a key component is to estimate the localisation accuracy that can be obtained given a map and the sensory configuration. Note that GNSS works well where perception-based localisation could have difficulties, e.g. in large open areas where there are not many features for localisation. On the other hand, in areas where the GNSS is poor due to the blocking of satellites or multi-path echoes, i.e. close to houses, stone walls, trees, etc., perception-based localisation works well. Most tasks carried out by autonomous machinery repeatedly traverse the same regions, and the key aspect here is to utilise this information to improve the detection range as well as the object size. This also contains the functionality to extract dynamic regions or properties of the environment to be used, e.g. handling gravel. Thus the aim of this project is to investigate perception solutions that can be utilised to increase efficiency and safety in terms of obstacle detection and avoidance.

The scientific objectives include: 1) To provide an expressive yet compact representation of the environment along with localisation and tracking capabilities. The representation needs to be flexible and versatile to also accommodate surface parameters to allow for energy-efficient motion planning and reasoning; 2) To allow for a smooth transition between GNSS and perception-based localisation; and 3) To improve the extraction of dynamic objects and obstacles by utilising previous knowledge from revisited regions.

The ESR will acquire a broad range of knowledge of the state of the art in related fields, such as dynamic mapping and localisation, state estimation.

The ESR will also be involved in dissemination through social media promotion of the network, such as Webropol surveys, and LinkedIn groups, Youtube video channels, Twitter and blogging.

Starting date: January 1st, 2020. Negotiable.

Duration of the work contract: 36 months/full-time contract

Trial period: 6 months

Target degree: PhD degree from Tampere University, Finland

Approximate gross salary: about 3600 EUR/month plus family allowance if applicable

Eligibility: ESR shall at the date of recruitment, be in the first four years (full-time equivalent research experience) of their research careers and have not been awarded a doctoral degree. The researcher must not have resided or carried out his/her main activity (work, studies, etc) in the country of his/her first employer (Tampere University, Finland) for more than 12 months in the 3 years immediately prior to his/her recruitment.



The applicant must be in possession of Master of Science (MSc) diploma in at the beginning of the employment in engineering, mathematics, signal processing, computer engineering, robotics, and automation or similar.

English language requirements: Proficiency in written/spoken English is mandatory. In certain cases, we may ask for a language certificate.

Application

Closing date: 13.11.2019

The applicant must submit the following documents through [LAURA portal](#), only a clear copy of the documents will be considered

1. **Certified copies of the bachelor's and master's degree certificates with the Diploma Supplement (DS)** as approved by the EU Commission for degrees completed in European universities (when applicable) Official translations into English (if the original documents are in a language other than English)
2. **Curriculum Vitae/CV** (preferably in Europass format)
3. **List of publications (if any)**, your contributions in the publication
4. **References:** Contact details of 2 or more referees included in the CV
5. **Motivation letter: maximum 1 page** where you introduce yourself and present your qualifications; you may include also your previous research fields and main research results. Please emphasize your future goals career-wise
6. **Copy of the passport**
7. **Proof of residence:** statement and certificates/documents demonstrating your residence(s) in the last 4 years. [A template is available on the website under How to Apply.](#)

Additional information

Working and living conditions in Finland at the Tampere University - Finland is among the most stable, free and safe countries in the world, based on prominent ratings by various agencies. It is also ranked as one of the top countries as far as social progress is concerned. Tampere is counted among the major academic hubs in the Nordic countries and offers a dynamic living environment. Tampere's region is one of the most rapidly growing urban areas in Finland and home to a vibrant knowledge-intensive entrepreneurial community. The city is an industrial powerhouse that enjoys a rich cultural scene and a reputation as a centre of Finland's information society.

The new **Tampere University** and higher education community began their operations on 1 January 2019. Tampere University of Technology, the University of Tampere and Tampere University of Applied Sciences are building a unique environment for multidisciplinary, inspirational and high-impact research and education, and a hub of expertise in technology, health and society. Read more [here](#).

Working and living conditions in Sweden at HIAB AB - Similarly to Finland, **Sweden** is among the most stable, free and safe countries in the world, based on prominent ratings by various agencies. It is also ranked as one of the top countries as far as social progress is concerned. Sweden is considered the number one pioneer in gender equality. In Sweden almost everyone speaks English fluently and the standard of living is among the highest in the world. Sweden is among the top in PISA school rankings and university education is free of charge.

When working with **HIAB AB** you will be located in Hudiksvall, in Hälsingland on the east coast of Sweden relatively close to Stockholm. The city is located right next to the sea and is surrounded by fantastic nature and archipelago. In the middle of the city is the marina. There are beaches, all within walking distance. Hudiksvall is always close to both sea and forest. During the winter, there are ski stations different sizes -



Hudiksvall, Järvsö and Hassela. They are all less than 1 hour away. There are several light trails for cross-country skiing and pimpling – climbing frozen waterfalls - and ice skating can be practiced in the city centre.

At HIAB, we offer you an opportunity to put your skills and experience into work and make an impact in our global organisation and the cargo handling industry in an eco-friendly way. You will work together with great colleagues from various backgrounds inspired by share and ambitious goals. We value collaboration in our open and inclusive culture. With us, you will have the opportunity to develop yourself professionally. Join us to make a difference - and have fun while doing it. Please, check our [YouTube channel](#) and [home page](#) for more information.

Working and living conditions in Sweden at Volvo CE.

At **Volvo CE**, we have higher ambitions than just providing the world with excellent construction equipment. We want to be a force for good in society and help find new ways to make the world a better place – environmentally, economically and socially sustainable. If you join us on our journey, you will be part of a passionate, ambitious and creative team where your work matters. Respect for people is at the core of our company values. That's why we've put much effort into creating a workplace where everybody feels welcome and where everybody's voice is heard. We cherish all kinds of diversity – from gender, age and nationality to ethnicity, faith and sexuality – not only because it's the right thing to do, but also because it's our firm belief that the more perspectives we can bring to the table, the stronger we become as a company.

