General Information Session
December 16, 2020

Presented by:
Diala Alnajem
Student Advisor

Brechtje de Bruin
Student Advisor

Guest Speaker: Lorraine Donald
Skills Development Advisor
AGENDA

• Overview of the SURE experience
• Student testimonial
• Application form
• Processing, procedures and selection
• Questions
• The Summer Undergraduate Research in Engineering Program is made possible by the Faculty’s generous donors in support of undergraduate student research.

• Approximately 125 students are accepted to this competitive 16-week program each summer.

• Each SURE student receives a minimum of $6,000 as an award.

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<th>Supervisor contribution</th>
<th>NSERC contribution</th>
<th>Faculty contribution</th>
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STUDENT TESTIMONIALS
Daniil Lisus
Department: Mechanical Engineering
Learning Position and Orientation of a Robot Using Ultra-wideband Antenna Received Signal Strength
Danill Lisus, supervised by Professor James Richard Forbes
Department of Mechanical Engineering, McGill University, Montreal, QC, Canada

Introduction
- Ultra-wideband (UWB) technology is widely used for indoor robot positioning by providing range measurements between the robot and multiple known anchors.
- A known problem in the technology is a bias in the range measurements introduced by the orientation-dependent received signal strength (RSS) provided by the UWB antenna.
- This project aims to use the measured RSS to predict the orientation without any additional hardware.

Methodology
- A Gaussian Process (GP) is trained to learn the position and orientation of a robot in 2D based on range and RSS values.
- UWB anchors are positioned at random intervals around the testing area and a motion capture system is used to record ground truth position and orientation data.

Experimental Results
- Mutually exclusive training and testing data were collected and four separate GPs, two for the $x, y$ coordinates and two for $\cos(\theta)$ and $\sin(\theta)$, were trained.

Conclusion and Future Work
- Approximately 5000 training points were sufficient to generate predictions capable of capturing the position and orientation of the robot.
- A trained GP is capable of predicting position and orientation of a robot in 2D using only range and RSS measurements from multiple UWB modules.
- Current confidence bounds on orientation parameters are poor.
- Next steps are to improve the GP by adding bounds to the predicted orientation output.
- Lastly, a similar test with 3D data and an on-line GP are needed for full validation.

Acknowledgements
Thank you to the SURE program and NSERC for providing me with this opportunity and to Professor James Forbes, Charles Cossette, Mohammad Shalaby and other members of the DECAR group for their invaluable guidance.

References
All projects will be listed on the SURE website the week of January 11, 2021: [http://www.mcgill.ca/engineering/current-students/undergraduate/research](http://www.mcgill.ca/engineering/current-students/undergraduate/research)

Projects are listed by department; students can apply to projects from all departments.
AM I ELIGIBLE TO APPLY?

Eligibility: see General Information and FAQ at http://www.mcgill.ca/engineering/current-students/undergraduate/research

- Full-time students (including international)
- At least Year 1
- CGPA of 3.0 or higher
- Available for 16-week period between May-August
• Abstracts & Online Student Application are available at: http://www.mcgill.ca/engineering/current-students/undergraduate/research

• Contact Professor via email to discuss.

• After discussion with supervising professor, complete Online Application form, submit with Transcript of Record to your selected supervisor via email.

• **Definite match**: Should a professor and a student come to an agreement that they wish to work only with each other, then the student should be encouraged to apply only for one project and the professor to rank only one student.
• Maximum of 3 **applications** per student
• Deadline to apply: **Monday, January 25, 2021**
  (Deadline to submit copy of online application & transcript to professor via email)
• Awards decision will be announced the week of **February 22, 2021**
• Only those selected will be contacted.
• Second round matches throughout March
Application form available in January (under “Application”) at: http://www.mcgill.ca/engineering/current-students/undergraduate/research

SURE Student Application

Personal Information  SURE Projects  Print Application  Complete

First Name *

Last Name *

E-mail address *
SURE –
Your Transcript

• SURE program will be recorded on students’ transcripts.

• Specific courses (FACC 351-354 – SURE Experience) will be added to offer students an official record of their participation in the SURE program.

• Courses cannot be added retroactively for SURE participations in previous years.
• SURE positions are **full-time positions** (minimum of 35 hours) for the entire 16 weeks, e.g., SURE participants should **not** be registered for any summer courses.

• Any questions about this policy should be directed to MESC sure-info.engineering@mcgill.ca
SURE EVENTS

1. Orientation – May 4th
2. Engineering at Work Seminar – tbd
3. Poster Design Workshop - tbd
4. Poster Presentation Fair - August 19th
• All SURE participants are expected to attend all SURE events.

• For those that cannot attend an event due to extenuating circumstances, please notify us at: sure-info.engineering@mcgill.ca in advance, include the reason and cc your supervisor.

• Any vacation requests have to be discussed with the supervisor in order to make arrangements to make up for the missed time.
• SURE as experience to later pursue a research Masters, Ph.D.

• McGill Engineering Undergraduate Student Masters Award (MEUSMA)
  – Valued at $17,500+ for two years of research Masters study at McGill in the Faculty of Engineering
  – To qualify: CGPA 3.5+, participation in SURE or other qualifying undergraduate research experiences

More information: graduatestudies.engineering@mcgill.ca
International SURE Travel Stipend, funded in part by

- The Antje Graupe Pryor Foundation (for research in Europe)
- McGill International Experience Awards (MIEA) (for research outside of Canada)
- Enhanced Educational Opportunities (EEO) (Merit-based funding awarded by MESC; need-based funding determined by the Scholarships and Student Aid Office)
- Limited number of stipends are available to students who are accepted to an international research project at another university. Award amounts vary.

Application form available March 1\textsuperscript{st} - March 31\textsuperscript{st}: http://www.mcgill.ca/engineering/current-students/undergraduate/research/sure-international
Would a stipend help you further an engineering related non-profit project you are involved in?

• To help defray the costs of participating in an unpaid service/humanitarian learning opportunity
• Funding for up to 15 student awards valued up to $10,000 each for summer 2021
• Conditions include:
  • Project is not affiliated with a for-profit company
  • 12 to 16 weeks long, mentored experience, with clear plans, learning outcomes and deliverables
• Applications open January 25th, 2021
• More information:
  mcgill.ca/engineering/initiatives/empower

Empowering students to become tomorrow’s globally minded leaders to solve the problems that matter!
QUESTIONS?

Email
SURE-Info.Engineering@mcgill.ca

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