AMRO AL-BAALI

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EDUCATION

M. Eng Mechanical — McGill University
05/2019 - 08/2021

- CGPA: 3.77/4.00. Supervisor: Prof. J. R. Forbes.
- Thesis title: *Augmenting Sensor Measurements with INS Estimates in a Graph Based SLAM Problem*.
- Publication: A. Al-Baali, T. Hitchcox and J. R. Forbes, "Combining DVL-INS and Laser-Based Loop Closures in a Batch Estimation Framework for Underwater Positioning," in *IEEE Journal of Oceanic Engineering*, doi: 10.1109/JOE.2023.3286854.

B. Eng Honours Mechanical, Minor in Computer Science — McGill University
09/2014 - 04/2019

- CGPA: 3.83/4.00. Supervisor: Prof. J. R. Forbes.
- Thesis title: *Parallel Feedforward Control Using Linear Matrix Inequalities*.

EXPERIENCE

Software Developer - Robotics Team — Vention
05/2023 – Present Montreal, Canada

Developed and tested the robot API that allows clients to write custom software that controls the robot operation, both in simulation and on the physical robot. The primary tools used in this job are **ROS**, **C++**, **Python**, **JavaScript**, and **Docker**.

Software Developer - Localization and Mapping — Avidbots
09/2021 – 03/2023 Kitchener, Canada

Developed and tested calibration, localization, and mapping algorithms for a robot equipped with a 2D LIDAR and a monocular camera. The primary tools used in this job are **ROS**, **C++**, **Python**, **OpenCV**, and nonlinear least squares (e.g., **Ceres**). The algorithms were tested in simulation and on robots, both in-house and on clients' robots.

Graduate Student - SLAM — DECAR group (McGill University)
05/2019 – 08/2021 Montreal, Canada

Collaborated with Voyis and Sonardyne to develop a SLAM back-end algorithm for an AUV equipped with a third-party INS treated as a black box and the Voyis Insight Pro high-precision laser scanner. The primary tools used in the project are: Lie groups, state estimation, optimization (convex, on-manifold), **MATLAB**, and **C++**.

Mechanical Engineering Intern — MY01
05/2018 – 04/2019 Montreal, Canada

Designed and executed mechanical tests on the MY01 device to pass the medical certification. This included programming the testing platform using **Python**, which involved designing a GUI for the user. Furthermore, I also customized the CAD storage tool Autodesk Vault using **C#** to generate reports in MY01's standards.

Undergraduate Research Assistant — McGill University
05/2017 – 08/2017 Montreal, Canada

Researched the feasibility of using multiobjective optimization methods, such as genetic algorithms, for design-space exploration (DSE). The tests were carried on **Python** using OpenMDAO and Platypus packages, and the project was supervised by Prof. D. Varro.

AWARDS

- Best Seminar Award 2021
- MEUSMA Award, 2019
- NSERC-USRA Award, 2019
- McGill SURE award, 2017
- Habib Abou-Fayssal Prize, 2018
- Dean's Honour List, 2015, 2018
- Rio Tinto-Evans Exchange Award, 2018

SKILLS

Theory

- **Linear Algebra**
- **Numerical Optimization**
- **Probability**
- **SLAM**
- **State Estimation**
- **Kalman filtering**
- **Particle filtering**
- **Factor graphs**
- **Computer Vision**
- **Multiview Geometry**
- **Matrix Lie Groups**
- **Control Systems**

Programming

- **C++**
- **Python**
- **Julia**
- **Bash**
- **MATLAB**
- **LaTeX**

Software

- **Linux**
- **ROS**
- **ROS 2**
- **Eigen**
- **Ceres**
- **GTSAM**
- **OpenCV**
- **Docker**

LANGUAGES

- **English**
- **Arabic**