Francois van Eeden

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ROBOTICS SOFTWARE ENGINEER

Passionate and focused individual with engineering, design, and applied research experience. Extensive exposure to open-source tools for developing autonomous systems, such as Robot Operating System (ROS), Linux, Python and git. Hands-on experience with autonomous vehicle research, software development and system administration. Avid learner both eager to be a productive team member and willing to take own initiative. Motivated by delivering high quality solutions and able to meet tight deadlines. Looking for an opportunity to contribute to development of robotics systems with real-world impact.

TECHNICAL SKILLS

Programming Languages: Comfortable with multi-paradigm and object-oriented languages such as Python, C++, Java and MATLAB. Experience writing scripts in Bash and exposure to C.

Frameworks/Technologies/Tools: ROS, git**,** Ubuntu Linux, Microsoft Windows. Familiar with agile and scrum methodologies using Microsoft Azure Devops.

WORK EXPERIENCE

Transnet Engineering - Pretoria, South Africa *Feb 2013 – Oct 2021*

Transnet Engineering (Revenue $993M, 9 851 Employees 2020) is a state-owned company providing engineering expertise to Transnet's operating divisions: freight rail, pipelines and ports.

➢ Tech Lead / Manager – R&D Autonomous Port Hauler Project *Sep 2017 – Oct 2021*

- Initiated and managed 3-year autonomous vehicle research project with $84k budget. The goal of this applied research project was to investigate feasibility of internal development of autonomous yard tractors for use in container terminals (aka Port Haulers).
- Determined system architecture for proof of concept vehicle.
- Evaluated and selected software/hardware platforms, development tools and suitable algorithms.
- Designed, fabricated and tested scale prototype to demonstrate capabilities. This included integration, set up and development of components for the complete Hardware/Software stack:
  Sensing - Set up and integrated laser scanner, inertial measurement unit (IMU) and wheel encoder hardware and software components.
  Path planning - Set up and tuned ROS navigation stack, including Timed Elastic Band (TEB) local planner.
  Control - Set up and developed components for embedded controller (PID) and interfaces for the ROS main controller.
  Localization, mapping and sensor fusion - Set up robot localization, Simultaneous Localization and Mapping (SLAM) and state estimation using a Kalman filter.
  Simulation - Developed robot description files and set up simulations for development and testing in gazebo.
  Visualization and remote control - Set up joystick, keyboard and software input devices for remote control and configured real-time wireless sensor data visualization in rviz.
- Selected and prepared technical specifications for prototype components.
- Managed team and project in terms of budget, schedule and task allocation.

➢ Master's Student *Sep 2015 – Sep 2017*

- Completed at University of Miyazaki in Japan as bursary recipient, whilst maintaining position as engineer at Transnet Engineering. ***Thesis topic:*** Coordinating Multiple Robots in Mobile Fulfillment Systems - By tailoring the multi-agent path finding problem to the requirements of distribution centers, a provably safe and deadlock-free algorithm was developed. This work was published in Intelligent Service Robotics **14,** 79–97 (2021). https://doi.org/10.1007/s11370-021-00350-1

➢ **Engineer - R&D** *Feb 2015 – Sep 2015*

- Conducted feasibility analysis for proposed projects.
- Designed prototypes and solutions using CAD (Computer Aided Design).
- Performed structural calculations and FEA (Finite Element Analyses) of designs.
- Researched and applied structural optimization techniques on a container wagon under-frame concept.

➢ **Engineer in Training** *Feb 2013 – Feb 2015*

- Participated in graduate training program and received exposure to projects in various departments:
  - Researched and made recommendations for locomotive windshield glazing materials.
  - Researched, designed, analyzed and drafted locomotive oil cooler removal tool.

EDUCATION & PROFESSIONAL DEVELOPMENT

Master of Engineering University of Miyazaki, Japan *Sep 2015 – Sep 2017*

Participated in the "African Business Education Initiative for the Youth" (ABE Initiative) master's degree and internship program coordinated by the Japan International Cooperation Agency (JICA).

Honours Mech. Eng. University of Pretoria, South Africa *Jan 2014 – Dec 2015*

Modules included: Control Systems, Optimum Design, Numerical Methods, Vehicle Dynamics, Intelligent Systems, Advanced Finite Element Methods, Finite Element Methods.

- The University of Pretoria Honours course prepares students for their Masters' research, exposing them to advanced topics in engineering and requiring critical thinking and hard work.
- Completed part-time as a Transnet bursary recipient and employee.

Bachelor of Mech. Eng. University of Pretoria, South Africa *Jan 2009 – Dec 2012*

NON-DEGREE COURSES

UCSanDiego online (Coursera)

- Data Structures and Performance Mar 2017
- Object Oriented Programming in Java Feb 2017
- Advanced Data Structures in Java Apr 2017

Short courses (Incusdata, South Africa)

- Standard C++ Programming March 2019
- Linux Fundamentals March 2019
- Standard C Programming March 2019
- Python Programming April 2019
- Advanced C++ Programming October 2019

SELF-STUDY AND PROJECTS

➢ **MIT OpenCourseWare 6.004:** Computation Structures (2017)
- Self-study 2021/09-2022/02

➢ **From Nand to Tetris:** Building a modern computer from first principles:
- Completed all projects successfully 2020/12 – 2021/03

➢ **Linux From Scratch (LFS):** Download and compile a working system from scratch.
- Completed on 2020/08
- **LFS ID: 28548**