Marthinus Johannes Nel

marthinusnel2023@u.northwestern.edu 773-739-1853 marnonel6.github.io github.com/Marnonel6

EDUCATION

Northwestern University **Evanston, IL, USA**
M.S. in Robotics *Expected Graduation: December 2023*

Significant courses: Embedded systems for Robotics (ROS2), Robotic Manipulation, Machine Learning, Machine Dynamics, Sensing, Future: Navigation, and Machine Learning for Robotics (SLAM)

Stellenbosch University **Stellenbosch, South Africa**
B.S. in Mechatronic Engineering *Class of 2021*

Significant courses: Mechatronics, Electrical drive systems, Electronic design, Computer systems

PROJECTS

7-DOF Robot Arm for Autonomous Air-hockey opponent *Fall 2022*
- Led a team of 4 to develop a Python ROS2 package for a Franka 7-DOF robot arm to autonomously play air-hockey
- Developed a puck trajectory prediction Python script to enable the robot arm to hit the puck
- Created a Python ROS2 API wrapper to plan and execute trajectories through MoveIt2 with post plan processing
- Head of version control for the project repository

Computer Vision Pen grab challenge *Fall 2022*
- Performed background subtraction and color thresholding with a RGBD camera to determine the 3D location of pen
- Coded a Pincher X100 4-DOF robot arm in Python to grab the pen through inverse kinematics

Thrust vector controlled scaled rocket *Jan - Dec 2021*
- Invented, built, and tested a thrust vector controlled scaled rocket
- Implemented a PID controller and a state machine in C++ for autonomous active orientation control in-flight and recovery
- Formulated and constructed a custom flight controller PCB
- Designed the rocket body, thrust vector control mount and parachute deploy system in Inventor/Fusion360
  - M.J. Nel, "Design of a Thrust Vector Controlled Model Rocket", 2021.

Unmanned Aerial Vehicle *Winter 2019*
- Designed, and built a UAV with a pixhawk cube orange flight computer
- Planned flight paths and preformed autonomous flight tests through the utilization of Ardupilot

Autonomous beverage cooler *Summer 2019*
- Programmed a Raspberry Pi for autonomous control and user interface in Python
- Accomplished optimal pump times for keeping beverages at desired temperatures
- Utilized peltier modules, a peristaltic pump and food grade tubing to design a drink cooler
- Developed a touchscreen user interface in Kivy for user control

PROFESSIONAL EXPERIENCE

CranioTech, Inc. **Stellenbosch, South Africa**
Biomedical Engineering Intern *Dec 2020*
- Executed viability tests on a 3D orthodontic surgery software for implant design
- Created 3D patient specific implants and preformed titanium 3D printing

(DOT) Seedmaster, Inc., (OMNiPOWER), Raven, Inc. **Regina, Canada**
Test Engineering Intern *Jun 2019*
- Collaborated with the assembly team to assemble an autonomous robotic farming platform
- Coordinated a team of 3 to conduct uphill seeding field testing on the autonomous platform for data collection
- Resolved problems with regards to power loss to the wheels by locating faulty pressure relieve valves

Bronberg Dynamics (Pty), Ltd. **Pretoria, South Africa**
Mechatronics Engineering Intern *Dec 2018*
- Programmed a PID controller in C++ for turbine blade orientation at different wind speeds for rotation speed control
- Devised, constructed, and tested a low cost functional prototype single blade wind turbine for remote environments to improve electricity security
- Coordinated wind-tunnel experiments to ensure correct PID controller response

SKILLS

- **Programming:** Python, C++, C, Bash, R, Assembly Language
- **Robotics:** ROS2/(ROS), Gazebo, MoveIt, Machine Learning, OpenCV, SLAM, Computer Vision, Control systems design, Embedded systems
- **Manufacturing:** Inventor, Fusion360, SolidWorks, Rapid Manufacturing, Machining, EAGLE, PCB Design
- **Software:** Linux, Git, CMake, Unit Testing, Ardupilot, MATLAB