Ernest Wang

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647-806-2268

Skills

Languages: Python, C++, C

Technologies: Keras, OpenCV, NAV2, SLAM, Jupyter Notebook, PostgreSQL

Education

University of Waterloo | BASc. in Mechatronics Engineering Co-op | GPA: 3.8 Sep 2022 - May 2027

Courses: Data Structure & Algorithms, Statistical Analysis, Design (SolidWorks, AutoCAD), Digital Logic (VHDL, FPGA, PLC)

Certificates: Udemy - Machine Learning A-Z, Udemy - The Complete Self-Driving Car Course

Work Experience

Mechatronics Engineer Intern | Paragon Systems - Toronto, ON May 2023 - Aug 2023

- Designed, manufactured, and assembled 3 automated testers for acoustic testing of car seats for Chrysler and Ford.
- Boosted capability analysis efficiency by 100% with a Python script, streamlining calculations and visualization.
- Developed a car seat clamping fixture using Festo pneumatic-electro components and proximity sensors for accurate and smooth movements during testing.
- Fabricated and soldered four pneumatically moved contact boxes, enabling car seat movements during testing.
- Devised and implemented a sensor mounting system using extrusions, ensuring 100% accuracy in sensor readings.
- Conducted and analyzed data for a 2-hour performance testing session, collaborating with the control engineer to resolve issues.

Student Design Team

Connected and Autonomous Vehicles Member | UW Alternative Fuel Team - Waterloo, ON Jan 2023 – Present

- Developed autonomous vision models for road signs to support self-driving technology.
- Accomplished a 95.8% accuracy in autonomously differentiating between over 40 types of road signs by designing and implementing a road sign classification system. GitHub
- Applied advanced image augmentation techniques to enhance the performance of the road sign classification system.
- Collaborated with Mechanical and Electrical teams to achieve optimal detection of road signs by strategically positioning cameras.

Projects

Autonomous Vehicle Development Project | Python, Keras, Jupyter Notebook | GitHub

- Developed an autonomous vehicle using behavioral cloning techniques with Python and Keras.
- Ensured balance and quality of the dataset by collecting and preprocessing driving data from the Udacity Car simulator.
- Achieved turning accuracy of 100% by training a deep learning model based on NVIDIA architecture

Premier League Soccer Table Prediction | Python, Keras, Jupyter Notebook | GitHub

- Explored Premier League Soccer Table prediction using various machine learning models.
- Implemented data wrangling to calculate each team's key metrics such as Home Average Scored, Home Average Conceded, Away Average Scored, and Away Average Conceded.
- Achieved the highest accuracy of 65.7% by applying 5 different models to predict outcomes.

Trackr (Stock Prediction Web Application) | Python, Keras, PostgreSQL | GitHub

- Created a stock portfolio website with all generic portfolio features such as tracking prices and viewing different stocks with an included prediction feature to predict selected stock.
- Developed and trained a stock prediction model using long short-term recurrent model (LSTM).
- Assisted the backend and frontend development using Flask, PostgreSQL, and React.

Portfolio

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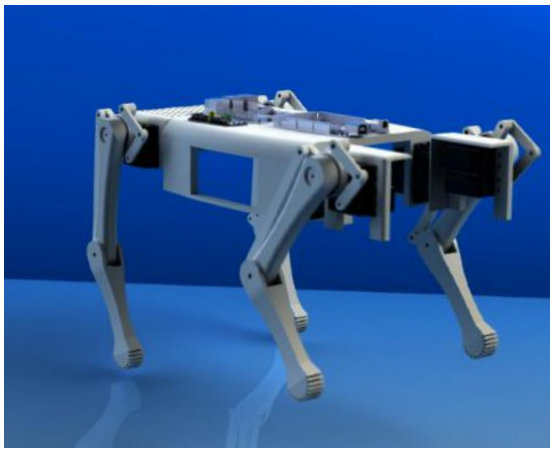
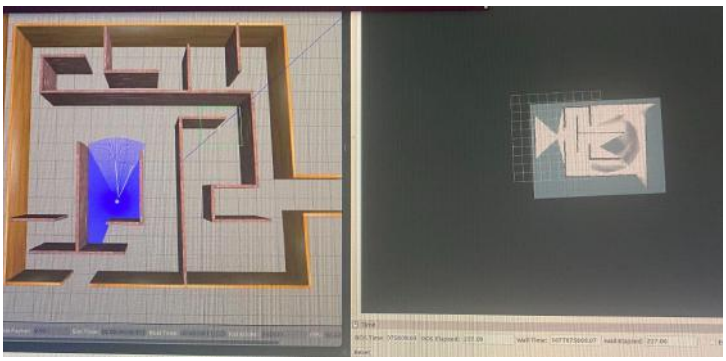
Maze Solving Robot Dog



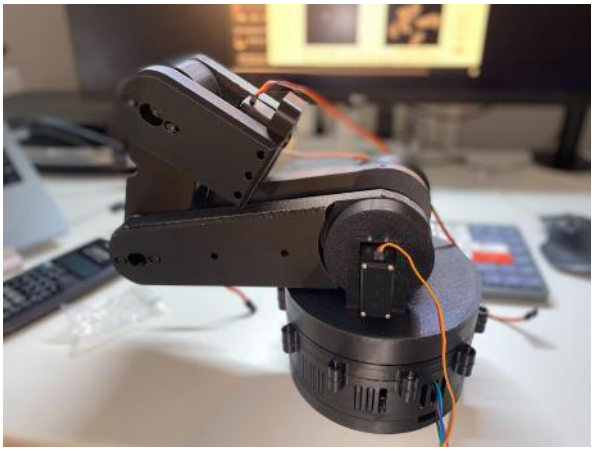
Mechanical Design of Robot



Room Mapping with SLAM and Gazebo Simulation

- Designed a robot dog using Solidworks, adhering to GD&T principles to ensure precise manufacturing and assembly processes.
- Successfully programmed the robot with ROS2 to enable dynamic movement functionalities.
- Leveraged SLAM (Simultaneous Localization and Mapping) technology to enable autonomous mapping of unknown environments.
- Integrated NAV2 stack to solve mazes and to autonomously plan its path with accuracy and efficiency.

Autonomous Robotic Arm



Physical Robotic Arm

Exploded View of Arm Design

- During my last internship, I identified significant post-testing handling and transfer challenges related to car seat sorting. Determined to find an innovative solution, I designed and developed an Automated Car Seat Sorting Robotic Arm, showcasing my proficiency in SolidWorks, 3D Printing, Arduino, ROS2, C++, and OpenCV.
- Incorporated computer vision with OpenCV, recognizing different colors of pallets, allowing the robot to sort car seats autonomously.

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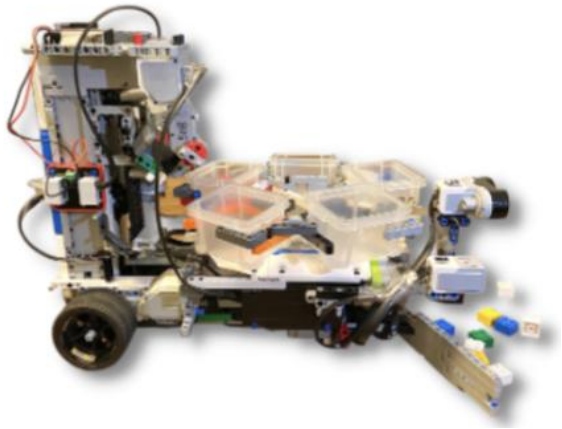
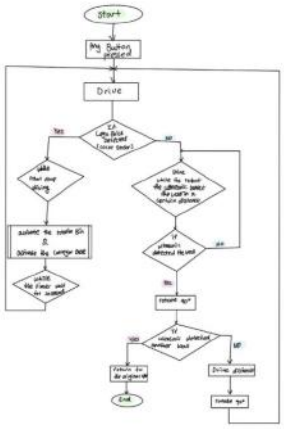
Robot LEGO Cleaner



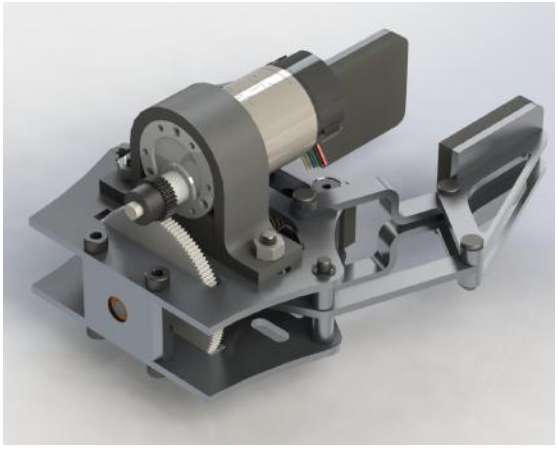
Physical Mechanical Design of Robot



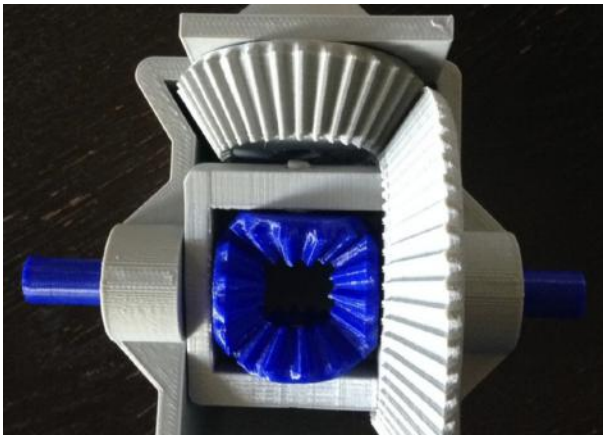
Software Flowchart

- Autonomous Navigation and Precise Sorting: Developed an autonomous LEGO cleaner robot with color, ultrasonic, and touch sensors for precise sorting and navigation in cluttered environments.
- Redesign for Improved Efficiency: Redesigned the intake mechanism with a conveyor system, achieving a remarkable 100% improvement in brick pickup success rate.
- Enhanced Driving Accuracy with PID Control: Incorporated a PID control system to enhance driving accuracy, ensuring smoother movements during cleaning and sorting.
- **Technical whitepaper available here, code available here.**

UW Robotics Team: End Effector & Differential Wrist



End Effector (Claw)



Differential Wrist

- Designed an end effector using SolidWorks, following team naming convention for each component and design principles. Sourced pre-manufactured parts from McMaster-Carr.
- Designed a differential wrist assembly that allows the end effector to move accurately and freely.

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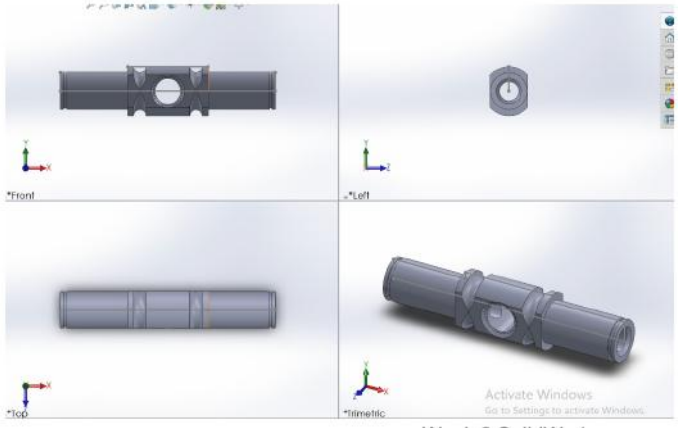
Brake Balance Bar System Design

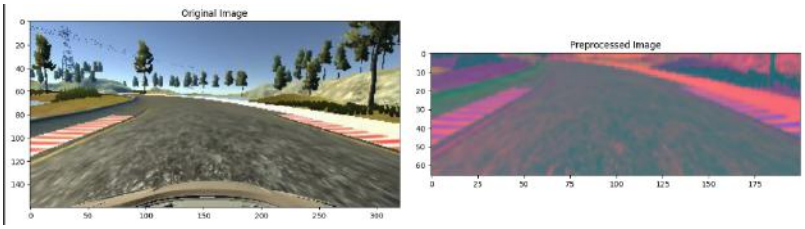


Balance Bar Center Trunnion

Shaft Guide

- DFM and DFA Principles: Designed a balance bar for brake pedals with meticulous Design for Manufacturing (DFM) and Design for Assembly (DFA) considerations using SolidWorks. Employed DFM principles to streamline manufacturing, reduce costs, and ensure high-quality standards. Implemented DFA techniques to simplify assembly and enhance product efficiency.
- Manufacturing Process: Closely monitored the fabrication process, collaborating with manufacturers, production teams, and suppliers for successful realization. Made prompt redesign decisions to optimize manufacturability and assembly without compromising performance or safety.

Autonomous Car Simulation



Data Augmentation

Simulation

- Developed an autonomous vehicle using Python and Keras, implementing state-of-the-art behavioral cloning techniques. The vehicle is capable of autonomously navigating through various scenarios and environments.
- Ensured the high quality and accuracy of the dataset by meticulously collecting and preprocessing driving data from the Udacity Car simulator. This process involved rigorous data cleaning and augmentation to create a robust training set for the deep learning model.
- Achieved outstanding turning accuracy of 100% by training a sophisticated deep learning model based on the NVIDIA architecture. The model's exceptional performance allowed the autonomous vehicle to make precise and reliable turns in diverse driving situations.