Terry Tao

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Formula Electric Racing (MRacing) | Autonomous Director SEPT 2022 - PRESENT

- Started and leading the development of the first ever autonomous car at MRacing
- Managed sponsorships of over $30,000 worth of sensor / processing hardware
- Branch and pruned my way to the current architecture - I had to research and test and fail and make compromises until I landed on a super good enough solution for each of these questions:

Processing power	Should we use a Jetson or x86? What's the GPU vs CPU load for our algorithms?
Lidar selection	How does resolution affect cone detection range? Can we trust intensity measurements at any distance?
Camera selection	Is a stereo camera needed or is it extra mass? At what distance does accuracy decline? Is global shutter needed or does the car go too slow to warrant it?
Cone detection	Is YOLO the best? How does it perform with low horizon sunlight? Do we need keypoint detection for PNP or can we use bounding box size for monocular distance? Does patchwork++ work or can we RANSAC? What clustering thresholds work best for a typical Formula Student track?
Controller selection	Should we use auto differentiation MPC or sampling based MPPI? How can we validate our vehicle model using real car data and simulation? Cross-track error or distance from cones for track limit constraints?
GNSS	How reliant should we be on the data from our INS sensor? What happens when we lose RTK service? How can we operate the INS outside of the MDOT CORS network?
E-brakes	How do we ensure at least 50% braking functionality in case of a single point failure?
Power steering	Torque and power for the actuator? How do we keep the disengagement mechanism rules compliant?
Car interface	Should we use the existing pedal map and send the ECU a single throttle command or send one per wheel?
Creativity	Where should we strictly follow the rules and where can we bend the interpretation?

H3D Gamma | ANN ARBOR, MI MAY 2024 – PRESENT
SLAM Intern

- Automated extrinsic lidar-camera alignment for H3D's Jetson environment using a targetless method.
- Compared different GNSS receivers and evaluated the viability of using GNSS as a source of odometry within Cartographer
- Decreased Cartographer CPU runtime by 50% by building OpenBLAS from source with ARMv8 optimizations
- Fixed inconsistent ORBSLAM3 orientation on initialization, fixed ORBSLAM3 segfault bugs.
- Used Nav2 and gazebo to make a radiation simulator for a future radiation mapping robot. Developed a frontier exploration policy to search any indoor environment for radiation in simulation.

Ford Motor Company | ALLEN PARK, MI MAY 2023 – AUGUST 2023
ADAS L3 Self Driving Intern

- Developed a kinematics-based model to flag Duty of Care (safety envelope) violation events during L3 test drives
- Developed safety metrics used to compare different driving policies based on DOC violation frequency
- Automated data acquisition and post processing to compare CAN logs with GNSS-RTK logs with MATLAB

University of Michigan | ANN ARBOR, MI AUG 2022 – APRIL 2025
B.S. Robotics Engineering

Ground Effect Plane Controls | Class Project 2023-PRESENT

- Used MATLAB and Simulink to create a 6DOF EOM solver with additional ground effect dynamics
- Designed decoupled altitude, airspeed, and heading controllers, tuned nested PID controllers
- Applied waypoint following, result is a plane capable of navigating any set of waypoints in order, at a setpoint altitude of 5m above water under reasonable wave and wind disturbances

SLAM Robot | Class Project 2023-PRESENT

- Tuned wheel velocity PID and trajectory following PID, applied differential drive wheel odometry
- Applied action model state estimator, LiDAR occupancy grid mapping, particle filter for fusing

Java | Python | C++ | OpenCV | ROS1&2 | Julia | Git | MATLAB | Pytorch | Simulink | LaTeX
Solidworks | Siemens NX | Fusion 360 | YOLO | Jetson OS | Canalyzer | Ubuntu
CAN | RTK GNSS (RTCM) | SSH