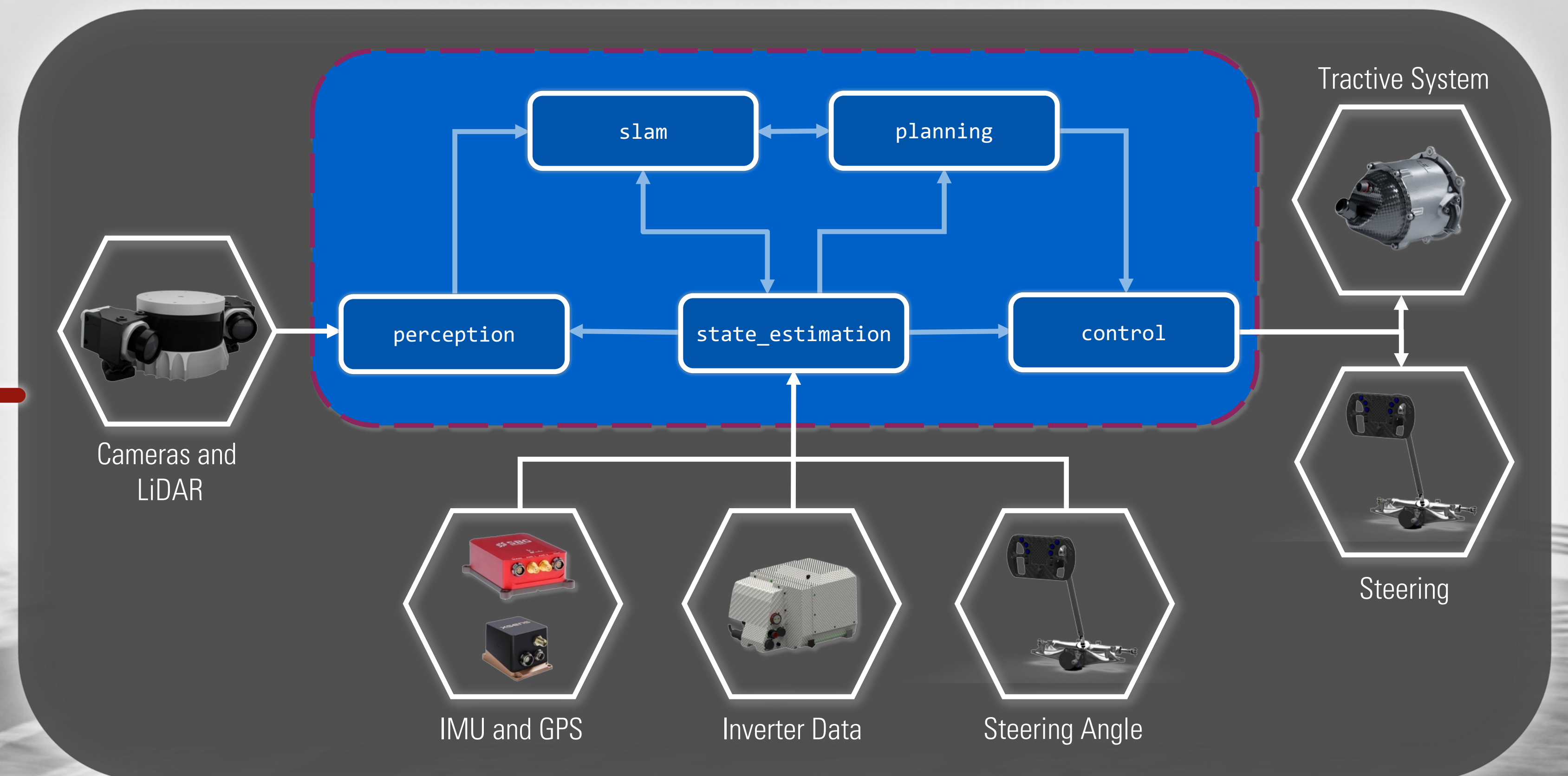


> on track

hardware

- Cameras: Basler ACE 2
- LiDAR: Ouster OS1 32 Rev 6
- APU: Zotac ZBOX EN374070C
- IMU: SBG/XSENS
- Steering Motor: Maxon



perception

- Sensor Fusion: Lidar Pipeline & YoloV5s Vision
- Multi Ransac Ground Removal, DBSCAN & heuristics
- Detections up to 60m
- Sensor Redundancy

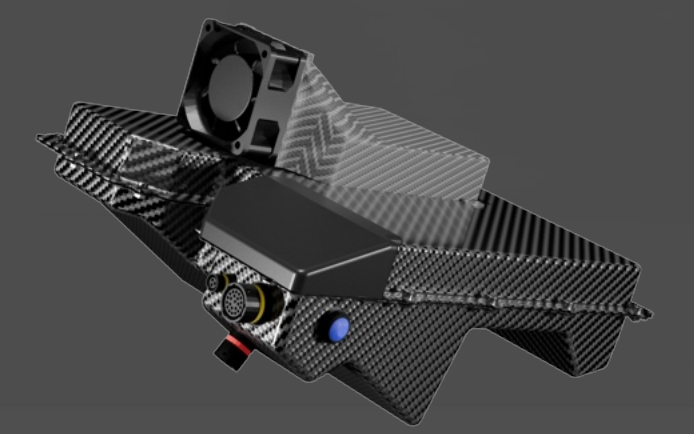
slam

- Memorize Track for **planning**
- Landmark-Based Graph SLAM using G20
- Robust Kernel against Outliers
- Multiple Association Methods possible

state_estimation

- Sensor Fusion into EKF (Robot Localization)
- Developing own UKF with custom Vehicle Model
- High Accuracy with low latency (~200Hz)

car_pc



planning

- Delaunay Graph Search, Rule-based Graph Reduction
- Model-based Velocity Profile generation
- NURBS Smoothing
- First Lap: Min-curve Geometric Approach
- Second Lap: Time-Optimal Approach

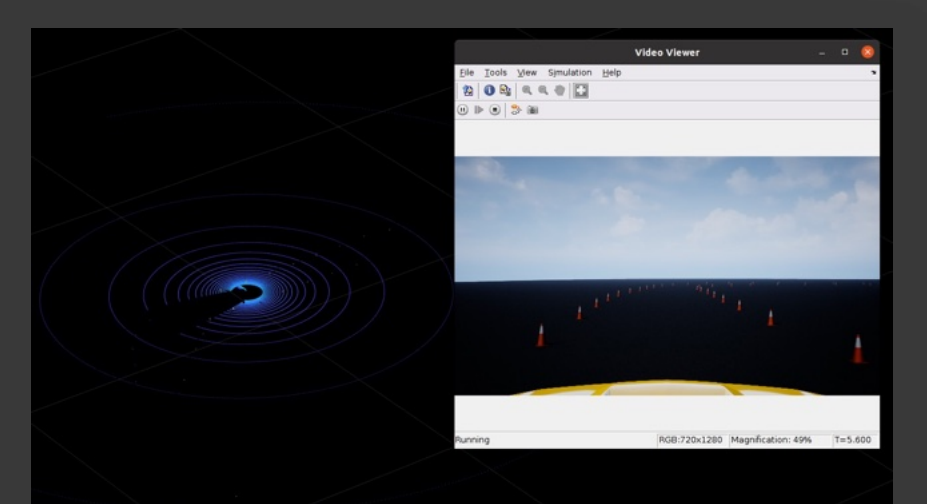
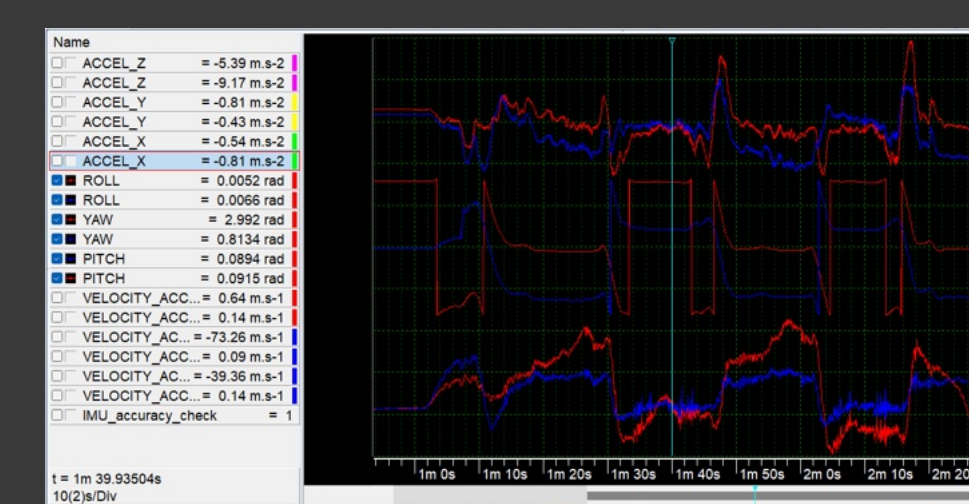
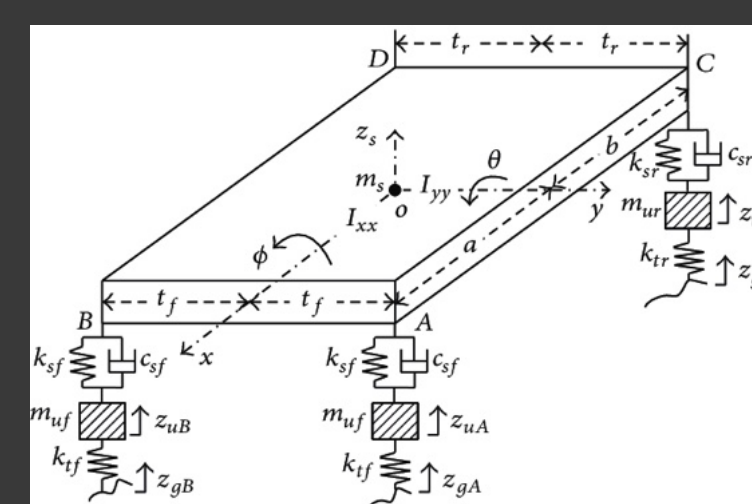
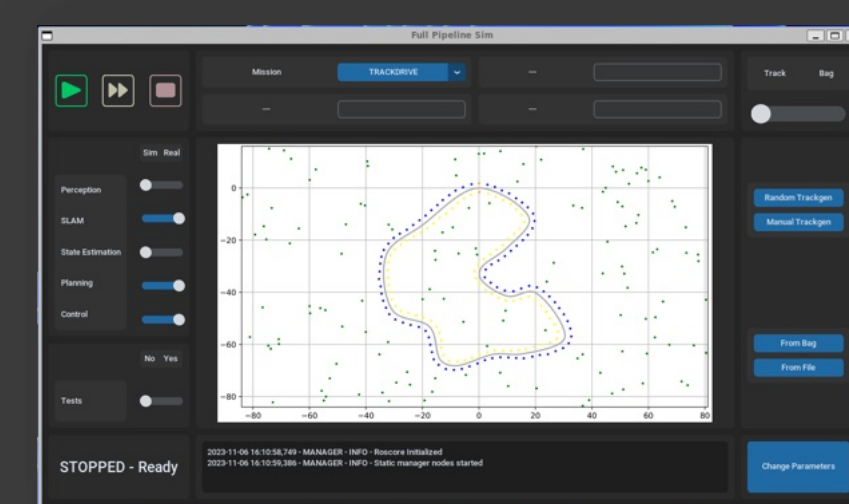
control

- Interchangeable between Disciplines
- Torque Vectoring
- Target slip feed-forward controller
- Accel + Skidpad: Pure Pursuit (adjustable Lookahead)
- AutoX + TD: Lateral MPC (Bicycle Model)

> simulation & validation

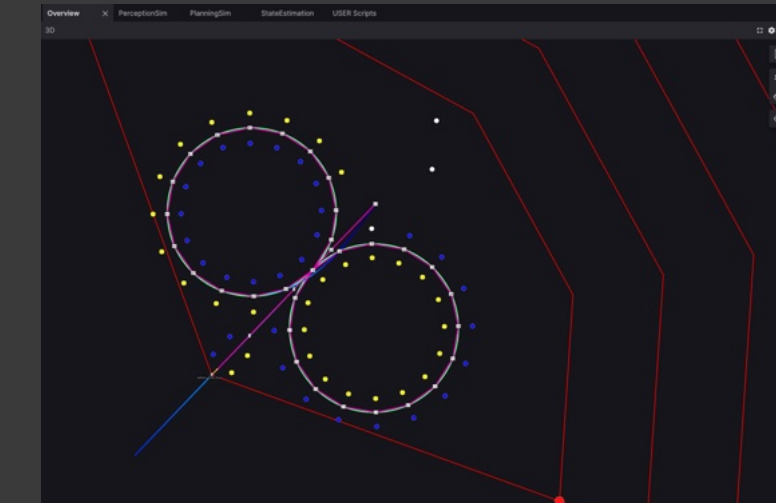
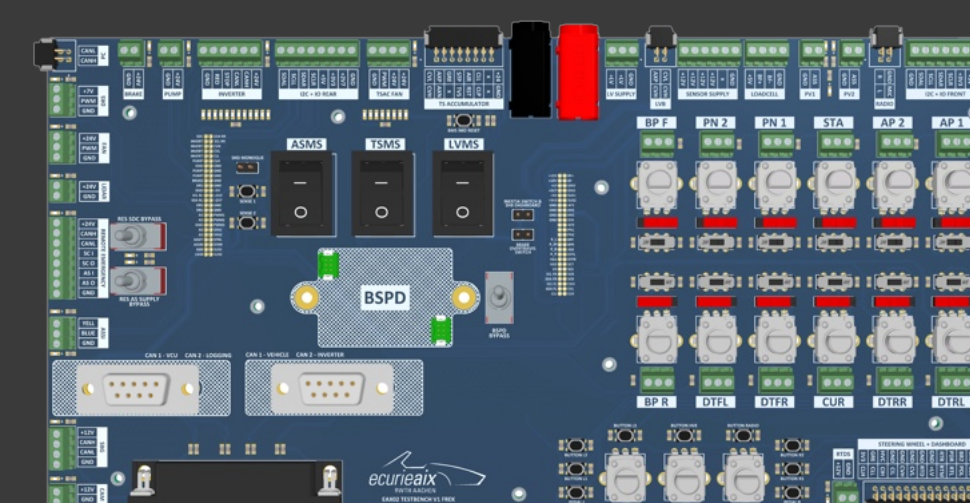
simulation

- Custom Simulation Pipeline
- Custom Vehicle Model + IMU Simulation
- Ongoing Perception Simulation
- Random Track Generation



validation

- Speedgoat Real-Time HIL Testing
- Steering Motor + Car Testbench
- Evaluate Rosbags + Synchronized VCU Logdata
- Planning validation on random Tracks



Check me out!