Tahsincan **Köse**

Senior Robotics Software Engineer

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"My story is a lot like yours, only more interesting 'cause it involves robots."

Summary

Robotics Software Engineer with 8 years of experience at Aeolus Robotics. Specialized in humanoid robots and industrial manipulators, with expertise in UAVs, manipulators, and humanoids. Proficient in ROS/ROS2, C++, and Python, with strong CI/CD capabilities. Open-source contributor on MoveIt and ROS comm packages. Focused on manipulation motion planning.

Work Experience

Aeolus Robotics Inc.

Ankara, Turkey

Senior Robotics Software Engineer, Manipulation

Oct. 2019 - Present

Behavior Design

- Extended the reactive-action-processor behavior-tree mechanism with new manipulation nodes (grab, dispose, swing-door open/close, sliding-door open/close, button-push), sustaining fleet-wide skill success rates **> 95%**.
- **Owned manipulation pipelines** for fetch-and-delivery, disinfection, door manipulation, and elevator interaction, enabling reliable multi-floor autonomous missions.
- Played a significant role in the invention of a **novel UVC disinfection** device from the manipulation perspective.

Learning

- **Created the online planning/execution pipeline** to expose trajectory rollouts and reward signals, enabling on-robot learning experiments.
- Integrated **cuRobo GPU planner** to generate expert trajectories in an accelerated fashion.

Motion Planning

- Enabled *articulated collision objects* concept that lead to the productization of **aeo delivery**
- Created the **online replanning infrastructure** for the whole-body motion planning problem, which enabled the body collision avoidance during navigation.
- Introduced optimization-based planners via **MoveIt**.
- Created **custom MoveIt plugins** with significant speed-ups tailored to voxel filtering and collision-checking.

Benchmarking & Tooling

- **Built a skill-benchmark suite** tracking success rate, execution time, and planning time, now used as a regression gate in CI and for customer acceptance.
- Developed RViz/PlotJuggler plugins for **task replay and heterogeneous planner comparison**, reducing debug time from 4h →15-min.

Safety & Certification

- Integrated the **manipulation recovery infrastructure** to the whole system.
- Authored ROS package for structured control identification; enhanced current & force prediction mechanisms critical to the safety-certification process.

Scalability & Quality

- Removed the barrier on product scalability through an autonomous Robot Framework test suite, which verified the **manipulative feasibility** of all robots at the factory stage, resulting in a practical increase in numbers from 20 to 200+
- Played a significant role in the creation of an autonomous robot pose adjustment process at the factory level, resulting in the utmost manipulation quality at the customer sites.
- Eliminated regressions on manipulation capabilities by covering every use-case with Gazebo integration tests in CI.
- Added task-specific automated calibration procedures for fine manipulation tasks (e.g., button pushing), improving end-effector accuracy to sub-centimetre level.

MilSOFT

Ankara, Turkey

Robotics Engineer

Mar. 2018 - Oct. 2019

- Cut down the compilation time to 1/12 with cross-compilation of heterogeneous **Catkin** workspace from Linux to **ARM** as an installable **Debian** package.
- Increased overall software quality by producing automated coverage reports using **LCOV** and **CMake**
- Written **Boost RTree**-based N-dimensional **RRT** library in C++ (C++14, also compatible with C++17), supporting discrete and continuous spaces with 4 different algorithms.
- Leveraged Gazebo simulation by creating a set of ROS packages for **DJI M100** hardware stack so as to increase the test throughput.
- Released open-source DJI M100 Gazebo stack.
- Built an ad-hoc mesh network of Raspberry Pi's using BATMAN-Adv mesh protocol using onboard wifi modules and wrote automation scripts to swiftly handle *drop-from-network* issues.

Projects

Aerial Manipulator

Proprietary Project *Jan. 2021 - 2023*

- Modelling, simulation, system identification and control of a quadrotor equipped with a 3DOF manipulator.
- Implementation of a custom software stack built on top of PX4 for whole-body motion primitives.
- Development and implementation of use-cases particular to agricultural context: orchard surveillance, fruit monitoring, fruit harvesting and more.

Hector-Moveit

Hobby Project on Precision Agriculture *Aug. 2018 - Dec 2020*

- Integration of MoveIt Motion Planning framework with Hector Quadrotor model.
- Implementation of an Exploration package, which works independent from the environment.
- Development of an Object Recognition system specifically trained for the object classes in the agricultural context.

OSIS

Research Project on Swarm Quadcopter Systems *Mar. 2018 - Oct. 2019*

- Development of a software architecture for a swarm of quadcopters to fulfill Search and Track Missions, which operate in a completely autonomous manner such that outputs of Perception and Motion Planning pipelines are transmitted to their team members in order to optimize tracked entities/time of flight.

Collaborator

Undergraduate Research Project with UR5 Robotic Manipulator *Oct. 2017 - Jun. 2018*

- Development of a system that adds perception to a UR5 Robotic arm through Kinect2 camera, which in return harmonically collaborates with a human operator through proper motion planning to fulfill a task (e.g. fruit packing) that requires both delicate and heavy sub-tasks.

Education

METU (Middle East Technical University) *Ankara, Turkey*

M.S. in Computer Engineering *Sep. 2018 - Sep. 2021*

- Research Topics: Robotics, Classical AI, Deep Learning, Reinforcement Learning
- **CGPA**: 3.63/4.00

METU (Middle East Technical University) *Ankara, Turkey*

B.S. in Computer Engineering *Sep. 2015 - June 2018*

- **CGPA**: 3.57/4.00

ITU (Istanbul Technical University) *Istanbul, Turkey*

B.S. in Computer Engineering *Sep. 2013 - June 2015*

- **CGPA**: 3.68/4.00
- Transferred to METU in 2015.

Publications

[1] Tahsincan Kose. “Autonomous Fruit Picking with a Team of Aerial Manipulators”. MA thesis. Middle East Technical University, 2021.

[2] Tahsincan Kose et al. “Energy Efficient Smart Buildings by Occupany Prediction”. In: *DTSS* (2018).

Writing

Medium

Writer *Dec. 2018 - Present*

- A Decent Integration of VSCode to ROS
- Cross Compiling ROS Project for ARM
- Implementing DJI M100 Emulator in ROS-Gazebo for HITL
- Setting up an Ad-Hoc Mesh Network with Raspberry Pi 3B+ using BATMAN-Adv
- Custom Manipulator Simulation in Gazebo and Motion Planning with MoveIt!
- Relationship Between Plücker, Screw, and Twist Coordinates

Abilities

Theory:	Optimization-based motion planning, sampling-based motion planning, joint control, forward&inverse kinematics, forward& backwards dynamics, intrinsic & extrinsic calibration, rigid-body transformations (Lie group & algebra), manipulation theory, state machines, behavior trees
Programming Languages:	C, C++, Python
Robotics-General:	ROS, ROS 2, Rviz, RQT tools, PX4, PlotJuggler, MATLAB
Robotics-Manipulation:	MoveIt, MoveIt 2, cuRobo, KDL, various IK libraries
Simulation:	Gazebo, Ignition
Learning:	PyTorch, Scikit, Tensorflow, Octave
Parallel Programming:	CUDA, C/C++-OpenMP, Python-multiprocessing
Testing:	GTest, PyTest, Robot Framework, rostest
GUI:	Qt *(mainly for Rviz plugins)*, OpenGL
Computer Vision:	OpenCV
General-Tools:	Git, VSCode, Jenkins, AWS, LaTeX, Doxygen