Nan Wang

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ACADEMIC EXPERIENCE

University of California, Santa Cruz, *Santa Cruz CA* *Sep 2018—2023 (Expected)*
Ph.D. in Computer Sci. and Eng., **GPA:** 3.85/4.0, **Emphasis:** motion planning, hybrid systems, MPC.

Tongji University, *Shanghai China* *Sep 2015—Jun 2018*
M.E. in Control Sci. and Eng., **GPA:** 4.33/5.0, **Emphasis:** trajectory planning, autonomous vehicles.

East China Univ. of Sci. and Tech., *Shanghai China* *Sep 2011—Jun 2015*
B.E. in Automation, **GPA:** 3.50/4.0, **Emphasis:** path planning, tracking control.

SELECTED PROJECTS AND RESEARCH

Hybrid Systems Lab (UCSC, PI: Ricardo Sanfelice) **Graduate Student Researcher**

- MPC-based Tracking Control for Hybrid Systems Mar 2022 - Present
  - Designed a **model predictive controller** for hybrid systems to track motion plans with proven **asymptotic stability** property.
- Robotics Applications Projects Sep 2021 - Present
  - Implemented a tracking controller for **self-driving vehicles** with **global invariance** property.
  - Implemented a set-based planner for **drones** considering obstacles exhibiting **hybrid dynamics**.
- RRT Motion Planning Algorithm for Hybrid Systems Sep 2021 - Mar 2022
  - Designed an **RRT-based** motion planning algorithm for hybrid systems, called HyRRT, with the proven **probabilistic completeness** property. Implemented a HyRRT software tool that improves the computation performance by **95.5**%.
- Feasible Motion Planning for Hybrid Systems Sep 2018 - Mar 2021
  - Mathematically defined the motion planning problem, systematically formalized the **propagation**, **reversal**, and **concatenation** operations for hybrid systems, and designed a motion planning algorithm template for hybrid systems with proved **completeness** properties.

Lab of Vehicle Control & Networking (Tongji, PI: Jun Wang) **Research Assistant**

- Autonomous Vehicle Development Jan 2018 - Aug 2018
  - Led a team of three to develop the Decision Making, Planning, and Control Module on a **full-size autonomous vehicle platform**.
  - Developed a **finite state machine**-based decision making module using **Stateflow**.
- Flow Field-guided Trajectory Planning for Ground Vehicles Mar 2017 - Jul 2018
  - Developed a novel trajectory planning algorithm for the unmanned ground vehicles which navigates the vehicle using the **fluid field** information.
- Path Planning for Autonomous Parking Systems Jul 2015 - Dec 2015
  - Developed a **geometric** path planning method for autonomous parking systems that decreases the **minimal length** of the feasible parking lot by **7**%.

ADDITIONAL INFORMATION

Skills: MATLAB/Simulink, Python, C/C++, C#, CarMaker, CarSim, ROS, Git, HTML/CSS, LaTeX

Teaching Assistantship: Analysis of Algorithm, Database Systems, Robot Automation, Computer Systems and C Programming.

Award: Chancellor's Fellowship. **Academic Service:** Technical committee member in IEEE CSS Technical Committee on Hybrid Systems

SELECTED PUBLICATIONS

[1] **N. Wang**, and R. Sanfelice, Motion Planning for Hybrid Dynamical Systems: Framework, Basic Operations, and Algorithm Template, in 26th ACM International Conference on Hybrid Systems: Computation and Control, 2023. (submitted)

[2] **N. Wang**, and R. Sanfelice, Rapidly-exploring Random Tree Algorithm for Hybrid Dynamical Systems, in 61st IEEE Conference on Decision and Control, 2022. [**Link**]

[3] A. Ames, **N. Wang**, and R. Sanfelice, A Set-based Motion Planning Algorithm for Aerial Vehicles in the Presence of Obstacles Exhibiting Hybrid Dynamics, in 6th Conference on Control Technology and Applications, 2022. [**Link**]

[4] **N. Wang**, M. Song, J. Wang, and T. Gordon, A Flow-field Guided Method of Path Planning for Unmanned Ground Vehicles, in 56th IEEE Conference on Decision and Control, 2017, pp. 2762-2767. [**Link**]

[5] M. Song, **N. Wang**, T. Gordon, and J. Wang, Flow-field Guided Steering Control for Rigid Autonomous Ground Vehicles in Low-speed Manoeuvring, Vehicle system dynamics, vol. 57, no. 8, pp. 1090-1107, 2019. [**Link**]

[6] M. Song, **N. Wang**, J. Wang, and T. Gordon, A Fluid Dynamics Approach to Motion Control for Rigid Autonomous Ground Vehicles, in Dynamics of vehicles on roads and tracks: Proceedings of the 25th International Symposium on Dynamics of Vehicles on Roads and Tracks (IAVSD 2017), 2021, p. 347. [**Link**]