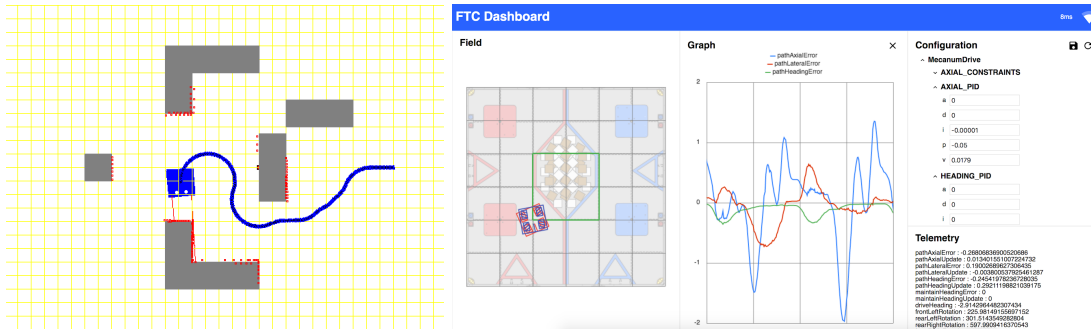# Sandy Spring Friends School Robotics

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## Lecturer Information
Hanke Chen - Email: [hanke.chen@ssfs.org](mailto:hanke.chen@ssfs.org), [i@chenhanke.me](mailto:i@chenhanke.me)

## Workshop Description
Format: Lecture + Project-based learning
Location: TBD (Yarnall Library, Science Hall)
Time: March.06 - May Wednesday 2:35 pm - 3:45 pm. Friday 3:05 pm - 3:45 pm
People: 3~6 learners
Programming language: the first half of the workshop will use Python and the second half of the workshop will use Java
Credit: This lecture is not a part of the SSFS education and therefore no credits are awarded, but this workshop will prepare you to be a strong Programming Lead of the SSFS Robotics Club.

## Workshop Goals and Learning Outcomes
This advanced-level lecture and the project-focused course will prepare students in industrial robotics programming techniques and the 2021's robotics competition. Students will learn topics from the basic Python and/or Java data structure to advanced Finite State Machine, Search Algorithms, PID Control, and Computer Vision systems. Students will program the Hamster robot and the BeestBot to do tasks like detect and moving blocks in simulation and on real robots. There is no required test in this workshop.

## Recommended (but not required) Prerequisites
- Proficient in at least one programming language OR special approval by the lecturer.
- Enrollment in Robotics, AP Computer Science OR other offline, online classes that cover basic engineering or programming skills.
- Enrollment in Algebra II, Pre-calculus, AP Calculus OR other offline, online classes that cover basic mathematical skills.

**Topics and Schedule (subject to change due to students' progress and special events)**

| Week | Date | Topic |
|---|---|---|
| 0 | March.02 Tue. | Poster, Presentation in MFW |
| 0 | March.04 Wed. | Come and ask me questions about the workshop |
| 0 | March.06 Fri. | Github & Introduction to Robotics Programming (Lecture / Project) |
| 1 | March.11 Wed. | Basic Motor Control, Looping, and Sleep (Project) |
| 1 | March.13 Fri. | Basic Programming Method and Data Structure (Threads & Queues) (Lecture) |
| 4 | March.18 Wed. | Localization & Sensor Noise  (Project) |
| 4 | March.20 Fri. | Modeling and Simulation (Lecture) |
| 5 | March.25 Wed. | Finite State Machine (Lecture) |
| 5 | March.27 Fri | Graph and Search (Lecture) |
| 6 | April.1 Wed. | Graph and Search (Project) |
| 6 | April.3 Fri. | Motion Planning: C-Space, Voronoi Diagrams, Cell-decomp., RRT (Lecture) |
| 7 | April.8 Wed. | Motion Planning: C-Space, Voronoi Diagrams, Cell-decomp., RRT (Project) |
| 7 | April.10 Fri. | Path Finding: Dijkstra, A* |
| Other | TBD | Other Topics Taught in Java on our competition Robot<br> - Localization with Encoders<br> - Introduction to Computer Vision Systems<br> - Ports and Hardware Management<br> - Handy Libraries<br><br>Additional Advanced Topic:<br> - Multi-robot motion planning<br> - PID Control |

**Territorial Acknowledgement**
We acknowledge that we are occupying the space of the SSFS Yarnall Library and/or SSFS Science Hall classrooms. There might be changes in the workshop location and/or canceling of workshop events.