

# Teaching Statement

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## 1 Philosophy

In my time as a student I have experienced some classes that had significantly more impact on my knowledge than other classes and I reflected on the difference between a good and a great class. Two aspects in particular motivated me as a student: The professor was able to show a connection that made a topic relevant and useful to me beyond the classroom. The other aspect was that a hands-on project led to a deeper and more permanent understanding of topics covered in lecture since there was more ownership of a project. In many successful projects the application and hands-on aspect were connected and I intend to draw on these aspects in my teaching to motivate students.

Robotics and flying vehicles in particular are a great tool for teaching because the results are tangible and feedback of successful algorithms is immediate. In my teaching I intend to integrate unmanned aerial vehicles as test platforms and have several ideas of how to include some unmanned aerial vehicle control, planning, and sensing labs in undergraduate courses. Also I have been designing a curriculum for a graduate course on unmanned aerial vehicles that covers specific aspects of 3D planning, SLAM and perception for unmanned aerial vehicles with a group project that implements the ideas on an actual vehicle.

## 2 Experience

### 2.1 Teaching

I have had the opportunity to work as a teaching assistant with Michael Erdmann and Roy Maxion at Carnegie Mellon University. As a teaching assistant for the course “Math Fundamentals of Robotics” I gave held office hours, gave several lectures, and corrected assignments. It was very interesting to see the effectiveness of the lectures in the feedback I received in the office hours and assignments. Also since there were students of different backgrounds the knowledge gained varied significantly. In the class students were exposed to a set of good techniques from a variety of mathematical areas and each topic gave at least one useful technique that is useful.

For Roy Maxion’s dependable systems class I have designed an assignment and a Robotics project to design a robot that can tolerate failures. This project taught me how to manage expectations of class projects and in future projects I will be more careful to allocate the limited project time to more focussed questions.

### 2.2 Mentoring

In the past I have mentored two students on UAV projects, which was educational for me and the students. The task we gave the first student I mentored was to design the hardware and software for a state estimator and controller for a quadrotor helicopter. We underestimated the effort and skill necessary to achieve such a goal for a new student. The result was impressive because the student prototyped the hardware system and was able to stream all necessary sensor information to the ground basestation. However, since the task was too big for the allotted time he never was able to work on the interesting questions of state estimation, and control. Another mistake I made was to get too involved in telling the student how to solve the problem, which caused a loss of ownership of the solution and lead to less motivation.

This summer I have had the opportunity to mentor another student and we were able to have a productive project that had very clear and realistic goals. I tried to give the student guidance when asked and this

resulted in a more self-motivated “pull” for knowledge. He did not develop any hardware and only focussed on the algorithm and had a specific problem from the start. Furthermore since he was able to use prior data he was able to develop and test algorithms for a ladar based online SLAM in a short time.

### 3 Goals

With some preparation I am eager to teach a range of computer science, introductory control, and robotics courses. In particular, I would enjoy teaching an introductory robotics course or an advanced course on perception and planning for unmanned aerial vehicles. Beyond the theoretical contents of a course, it is my goal to include hands-on experimentation that will show real world applications and problems of system integration. I value good presentation and writing skills since they are essential for effective communication and in my courses I will encourage project or paper summary presentations and reports. Teaching these courses will provide me with an opportunity to connect my teaching and research goals of designing unmanned aerial vehicle systems for real-world applications.