Personal Statement

Rather than saving up my allowance for comic books, I would patiently budget my earnings for electronics project books and components. Though I enjoyed building the projects, I was not satisfied with just knowing all of the circuits by heart. I wanted to combine them in new ways to solve problems around me. This spark of innovation grew into a passion for acquiring, applying, and sharing knowledge. Nothing gave me more pleasure than engineering devices that made my life and the lives of those around me better. My passion for applying science and technology to solve useful problems has motivated me to spend as much time as possible invested in learning. For me, acquiring a new skill, understanding, or perspective is not about receiving a grade or paycheck. Rather, I believe knowledge has the greatest value when used to alleviate human suffering, spread information, improve our use of natural resources, or enable the discovery of new knowledge. I want to spend my life working on leading-edge technology for the betterment of society, and I feel the best next step for me is continuing with graduate education in robotic systems engineering. By becoming a subject matter expert, I can have the greatest impact improving our fundamental understanding and mastery of technology as a community.

My undergraduate education was an important foundational step in becoming a field expert. Perhaps my favorite part of acquiring this knowledge was putting it to the test in labs and projects. Because I want to contribute to enabling practical technology, I am not truly satisfied with my understanding of a concept until I have successfully implemented it in a proof-of-concept demonstration. The Carnegie Mellon Robotics Club served as an excellent proving ground for the material I learned in classes. By participating in several student-led Robotics Club projects, I was able to gain an appreciation for the insights offered by a theoretical approach to system design, and how complicated it often is to approach those theoretical ideal conditions. Most importantly, my experiences in the Robotics Club have motivated me to improve the state of the art for robotic system design.

The Robotics Club also provided multiple opportunities to exercise my cooperative problem solving and leadership skills. Looking back on my progression through the Robotics Club, I see it as a microcosm of a professional research career. I started out as a Colony Project member and engaged in research that allowed me to learn the development tools used for small mobile robots. After establishing myself as an expert at using Colony robot platform I became a leader of a project within Colony, coordinating several members to work improving autonomous recharging hardware and algorithms. I then led the entire Colony project, which involved guiding the direction of research by writing research proposals and integrating the work of several sub-projects. Finally, I served the Robotics Club as its president. I was responsible for keeping several independent projects running smoothly by maintaining the facilities, funding, and equipment of the club. I also organized training sessions, community outreach events, and guest speakers to help club members learn and grow as a community of roboticists. I was even able to share our accomplishments and lessons learned to by speaking about undergraduate robotics research at the University of Pennsylvania DuBois Umbaugh Lecture Series. Through these experiences, I gained an appreciation for the time and commitment it takes to keep a successful research organization running, as well as strong sense of community shared with people who are passionate about technology.

I am able to practice everything I have learned from Robotics Club on the research staff of the CMU Robotics Institute Biorobotics laboratory. As the *de facto* technical director of the

lab, I coordinate the work of undergraduates and staff with the research goals of graduate students, grant proposals, and industry interests. I lead weekly research meetings, making sure that all of the work going on in the lab is aligned with our broader research goals and setting deadlines for tasks to make sure we reach our goals. I handle publicity for our lab, which involves demonstrations of our snake robots to representatives of funding agencies, visiting dignitaries, and high school students at engineering outreach events. By operating the snake robots for photo and video shooting sessions, I contribute to our robots exhibited in science museums, newspapers, and on television shows such as "Sci Fi Science" and "The Colbert Report". I am ecstatic that research I am part of is considered interesting and innovative by not just academic programs but nationally popular media. I hope that somewhere a budding engineer is as fascinated by our robots and as inspired as I was to learn everything they can about science and technology.

I recognize that I have been extraordinarily lucky to have so many opportunities to explore my passion for learning. As a way of giving back, I enjoy sharing the things I have learned about technology, especially with people not normally exposed to robotics. For five semesters, I was the instructor of a university course called "Fun with Robots". This semester-long course teaches undergraduate and graduate students of all majors to build and program a simple robot. It introduces the basics of robot movement, using sensor readings, and programming. Through teaching this class, I have learned to formalize and organize my understanding of robotics into a form that newcomers can use to understand complicated and non-intuitive concepts. Using a combination of this curriculum and the Colony Project robots, we were able to teach a troop of Girl Scouts to navigate a simple maze with the robot in a single afternoon. From these experiences, I know that I want to stay involved in technology education. While I certainly see professorship as a career possibility to strive for, along the way I plan to stay involved by as a mentor for programs that promote robotics education such as FIRST robotics.

All of these experiences have given me valuable perspectives on the field of robotics and motivated me to continue specializing my knowledge. By trying out cutting-edge techniques on robotic hardware, I have developed an intuition for what parts of the robot development process could use the most improvement. I am most interested in studying the relationships between the algorithms used in robotic applications and the computational hardware used to run those algorithms. By looking at the optimality of different computing architectures with respect to computation time, I hope to inform the robotics community how to choose the best computing architecture to achieve their goals. In the short term, this accomplishment would allow research in robotics applications that currently prohibitively slow or expensive, and in the long term, it will make robots more accessible to researchers and the public in general by using hardware more effectively. Becoming an NSF fellow would give me the freedom to explore research that may not even exist yet, or cross boundaries of existing pioneers' fields of expertise. For me, this would be the best possible application of everything I have learned and practiced, and it would allow me to work further towards my goal of contributing to society by engineering solutions for a better world.