

Statement of Purpose

Shankar Kulumani

From a young age the belief that an education is most valuable when it is used to serve ones community has been instilled in me. This conviction and a natural aptitude for science and mathematics has convinced me that astronautical engineering is the most fitting career for me. As a result I have pursued an undergraduate and graduate degree in this field. I hope to continue my goals and earn a PhD in Aerospace Engineering. Achieving this high level of scholarly work is not simply a culmination of a goal, but rather the first step of a lifetime of service. A doctorate in my field would allow me to teach, conduct world-class research, mentor and develop a new generation of engineers, and finally make significant contributions to the technical development of our nation and the state of human knowledge. These goals have been fueled by my collective experiences and have shaped the direction of my preparation and future aspirations.

My education at the United States Air Force Academy exposed me to the wide field of astrodynamics and I became very interested in control theory, dynamics, estimation, and orbit mechanics. I had several opportunities to apply this knowledge to problems beyond the textbook during the course of the senior rocket design class. However, it was only after becoming an officer and working that I received a chance to observe the state of the art in astronautical engineering. As an Engineer at the Air Force Research Laboratory (AFRL) I have been exposed to the current technical challenges to the guidance, navigation, and control community. I worked on the orbit determination and space sensor characterization problem through the AFRL science experiment. In addition, I have extensive experience in the issues of implementing control and estimation algorithms on hardware; I use these skills to integrate a motion capture system, inertial measurement units, and momentum wheel actuators onto a spherical air bearing platform. I am very fortunate to have been able to work on such relevant technical challenges and deal with the current state of the art problems in the field. My work with the United States Air Force exposed me to the challenges of both

operational flight hardware but also the research and development of future technologies. I have experience in transitioning topics and concepts from textbooks to operational systems. I integrated my knowledge of spacecraft subsystems to ensure the successful test and launch of the ORS-1 (Operationally Responsive Space) Satellite. In addition, I transitioned my knowledge of attitude dynamics and control to the Attitude Control System Proving Ground (ACSPG) which is the largest spherical air-bearing testbed in the world. The ability to fuse education and current technical problems would be a huge benefit to my future graduate studies.

I further supplemented this education by pursuing a Master's degree from Purdue University. Focusing my coursework on control theory and dynamics have further cemented my desires to further my education. Completing a challenging graduate program while simultaneously working full time at AFRL was far from ideal. The pursuit of any graduate degree is a challenging process and ideally, one is allowed to focus completely on the academic challenges. In my case, I was driven to not only pursue my continued education in a challenging field but also complete my duties as an officer and practicing engineer. However, I was determined to supplement the hands-on experience gained from the laboratory with a quality education. As a result, I gained a level of discipline and work ethic that can only be gained by completing two full time professions, a graduate student and commissioned officer, at the same time. This experience will only serve to aid my future endeavors as I continue to pursue research and development in the astronautics field.

I plan to continue my education, gain experience, and continue research in this field by completing further graduate education. My interests and experiences have led me to apply to Vanderbilt University. The work of Professor Eric Barth is of particular interest. The current research in single and multiple autonomous vehicle control is a very relevant problem. In addition my work at AFRL with spacecraft proximity operations have given me relevant experience with the current research in autonomous vehicle control. I have seen the current state of the art in the guidance, navigation, and control research and hope to improve upon that with a doctorate. The combination of former laboratory research experience combined with further education would enable me to best serve the technical community.

The skills and experiences I have gained have not only prepared me to become a successful doctoral student, but also a competent leader. Whether leading a research group, a classroom, or a group of peers, I have gained the experiences and knowledge to be successful. My past collective experiences have given me the determination and skills to deal with the

many challenges that I am sure to face on the road towards a doctorate. I hope to join your institution and continue to learn and grow as I work towards my PhD.