Thesis Project Portfolio

Linting *roslaunch* Static Transforms

(Technical Report)

Using Stories to Build Stronger Communities

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Michael Chinn

Spring, 2020

Department of Computer Science

Table of Contents

Sociotechnical Synthesis

As Zora Neale Hurston, the acclaimed American author, declared: “there is no greater agony than bearing an untold story inside of you.” In many ways, individuals, communities, and cultures define themselves by the stories they tell. When social groups lack the societal power to have their stories heard, these groups will be unable to affect local development, disadvantaging themselves and distancing themselves further from society. Within my sociotechnical synthesis I face this problem head on, as I consider exclusionary storytelling mechanisms and propose a technological intervention which could provide a more inclusive method to share stories. In my computer science capstone, I researched safety in autonomous drones and other robots. Autonomous drones are a component of a modern storytelling platform which may present urban landscapes from new aerial views, be used for collection of data, or even serve as surveillance. Sufficient thought must be given to how these new stories may perpetuate existing social inequities.

My STS thesis focuses on approaches to making storytelling mechanisms more inclusive such that disadvantaged social groups are empowered to affect local planning and political processes. I examined two existing storytelling projects: StoryCorps and Mapping Prejudice. StoryCorps provides a comfortable environment for intimate interviews. Excerpted stories resonate with listeners due to significant emotional value connections to a shared human experience, opening the national narrative to new discussions of hardships which are often invisible in society. Mapping Prejudice is a much more focused project, which provides a foundation for dismantling barriers to racial and social equality in Minneapolis. The project pairs geographic data concerning racial housing covenants with personal stories so that residents can gain an understanding of the challenges faced certain social groups. After analyzing these projects, I consider the design of a digital mobile storytelling application that might enable disadvantaged social groups to better influence local planning processes.

In my technical computer science capstone, I worked on three projects concerning the safety of autonomous systems. First, I enabled the flying of autonomous drones within the confines of the AutoSoft Lab in Rice Hall so other lab researchers could more easily access the platform. My next two projects involved errors in reference frame transformations. Robotics systems often contain several references frames, which are independent coordinate systems developers use to provide context to data. To interpret data, developers must supply transformations from each frame to others. As I learned first hand working with autonomous drones, errors in these transformations can lead to very erratic behavior which is hard to diagnose. In my second project, I created a dynamic testing algorithm which allows developers to determine if their systems exhibit transformation errors, and if so, what the error is. Following this, I performed analyses to determine the frequency at which developers experience these errors and began working on software to detect these errors statically. This is the work I documented in my technical report.