**Name:** Spencer McKean

**Thesis Title:** Realistic Ocean Rendering and Simulation

**Synopsis:**

Drawing inspiration from the game Sea of Thieves by Rare, I set out to make a highly realistic ocean simulation that was accurate both in behavior and appearance. Over the course of nine months I explored different methods for simulating waves, experimented with different ways to achieve a realistic looking water surface using DirectX 11’s shader pipeline, and ultimately discovered the minute intricacies of how ocean water behaves. Throughout the process I discovered that the most effective way to simulate waves was the same method that Rare used in Sea of Thieves, that being the use of the Fast Fourier Transform. This method is used in the statistical modeling of ocean waves and by making adjustments to allow for simulation at interactive speeds, this was a very effective method to use. With many different variables to define behavior and appearance, the simulation allowed for the creation of unique and complex water surfaces. On top of this was the need for additional in-depth rendering techniques. Using the Fresnel equations to simulate the reflectivity and transmissivity, the water quickly began to actually look like water. While exploring the topic I realized that there was more to gain from this undertaking than just the experience with water simulations. As games become more realistic I believe there will be more of a need to implement real world math in games with each implementation having its unique problems. Through my experience exploring the topic of wave simulations I will be better equipped for the future of game development.