CS189A, F22

# Synchronous Remote Maintenance Systems

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14 October 2022

## 1 Abstract

### 1.1 Team Name

Our team name is **OverSEA**.

### 1.2 Problem Statement

On the topic of the remote maintenance problem. Eliminate the need for transportation of specialized individuals to naval ships for maintenance. Our intent is to save time and resources by allowing specialists to work remotely while still following maintenance procedures. Several challenges are evident, including the navigation of the complex environment of a navy ship, limited bandwidth in remote locales, and the necessity for secure, encrypted communications. Other points of contention include the difficulties of communication over long distances through virtual means. Network latency and communication throughput are also important to consider.

### 1.3 Problem Relevance

Routine maintenance of naval ships and systems is of critical importance. The expected lifetime of these systems being in the decades provides unique challenges to maintenance personnel. Current implementations involve sending experts and specialists to on-site locations, which is resource intensive, especially in combat environments. Modern implementations of augmented reality focus on ideal environments; however, outside of a lab environments will be more complex, and may be unsuitable to maintenance in real-world scenarios.

### 1.4 Current Methodologies

Currently, mixed reality models are unable to adequately address the unique issues present during remote maintenance. While existing platforms use similar technologies and platforms, they do so in a way that does not meet the needs of the end-user. Most current methods are not error-tolerant, and therefore cannot be used in a rapidly changing environment like that of a navy ship. Moreover, user-friendliness is not often a concern with emerging technology, and this application is no different. Existing AR maintenance practices are not friendly for the layman to use, and can often confuse anyone not already invested into using the technology.

## 2 Expected Outcome

Our expected outcome is meant to demonstrate how the HoloLens and other AR/VR technologies can be implemented to aid remote maintenance. By the end of this quarter, we expect to have a minimal viable project showcasing a possible solution to the remote maintenance problem, with minimum requirements involving successful execution of remote maintenance procedures through the project.

# 3 Milestones

**1.** Learn to use Unity and HoloLens. Use tutorials provide by Microsoft and Unity Learn

**2.** Stream video data from technician to specialist, using a standard network connection.

**3.** Allow the Hololens User to have an (optional) interface to read/watch instructions

**4.** Allow the PC user to interact with the video stream of the HoloLens.

**5.** We would like to test on simplified versions of NAVSEA machines in order to demonstrate if our implementation would interact and be able to provide AR guided instructions successfully before moving onto more complicated machines.

# 4 Implementation

- AR representation of surroundings using HoloLens
- 3D modeling and rendering using Unity
- Remote network connectivity between specialist and technician
- Dynamic visualization of required maintenance tasks using Augmented Reality

## 4.1 Platforms & Technologies

- Unity ( C# ) / Unreal Engine (C++)SE
- Microsoft Hololens
- LIDAR 3D Scanner

## 4.2 Process Model

We plan to implement the Agile Development Methodology in order to fulfill our goals.

# 5 Contact


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