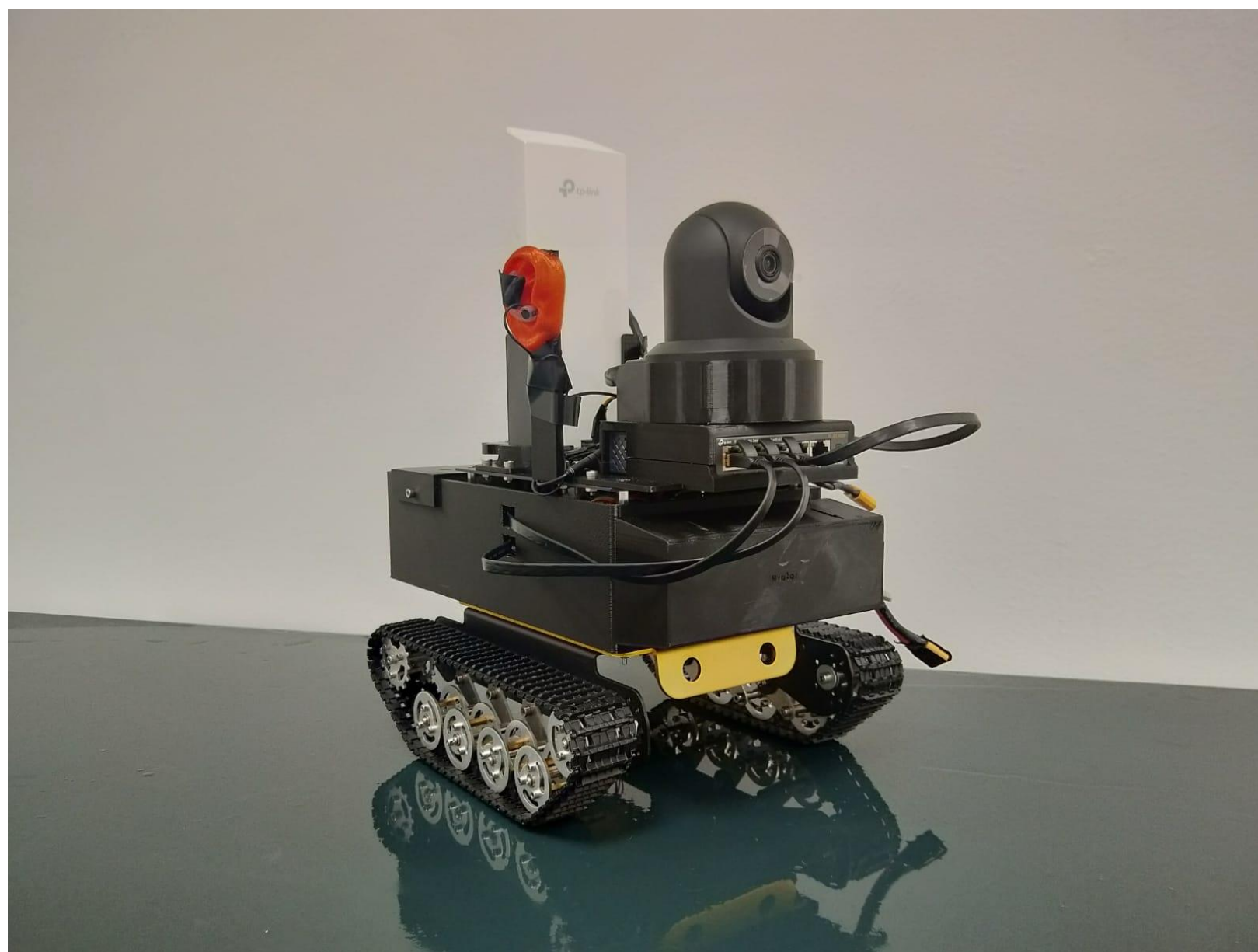


INTRODUCTION

Our bimodal telepresence robot has vision and hearing similar to humans owing to the high resolution of live-stream footage provided by the camera and binaural audio recorded by the binaural microphones. Binaural recording is a method of recording audio that uses two microphones, arranged with the intent to create a 3D stereo sound sensation, allowing one to distinguish the sound nearer to the left ear as compared to the sound nearer to the right ear. This results in accurate localization of sound by listener. Both visual and acoustic abilities make the robot useful for remote surveillance such as during disaster relief situation and military reconnaissance.



Final Product (Avatar)

DESIGN & SPECIFICATIONS

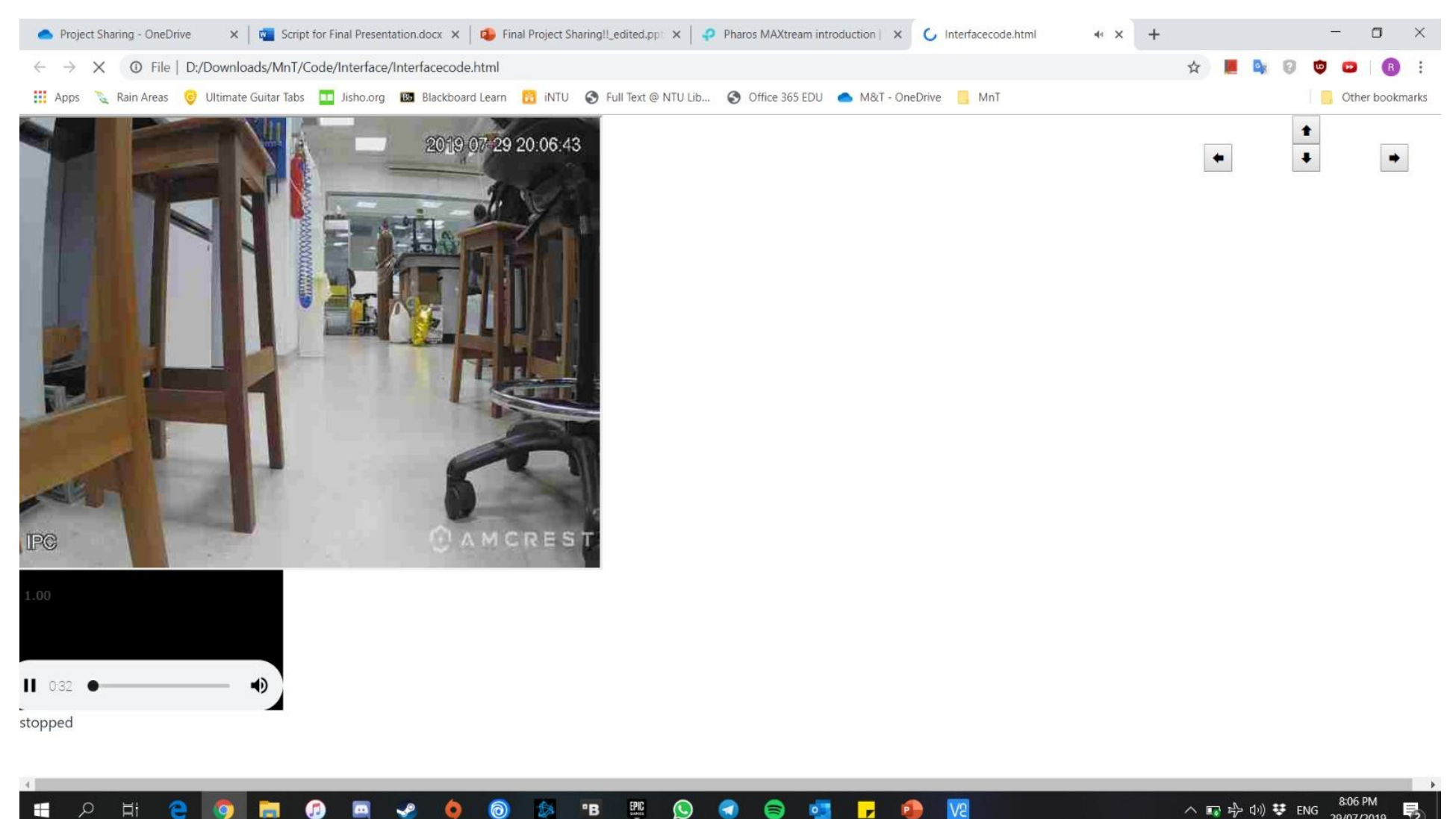
- **Size of Final Product:** 35.6(cm) x 25.8(cm) x 41.5(cm)
- **4S 5000mAh Lithium-Polymer (LIPO) Battery:** Higher milliampere hour (mAh) allows for longer operating time of at least 2 hours and stand-by mode of at least 5 hours
- **Live-stream video footage:** Resolution of 1920*1080p with pan & tilt
- **Live-stream audio feed:** Good audio quality with less than 2s latency
- **Manoeuvrability:** Support different terrains with the usage of tracks
- **Modular System:** Allow different functions to suit different tasks

CONTROL & NAVIGATION SYSTEM

- **TP-Link CPE510 Transceivers:** 5GHz 300Mbps 13dBi Outdoor (more than 15km wireless transmission with clear line-of-sight)
- **L298N Stepper DC Motor Driver:** Strong driving ability, low heat and strong anti-interference ability
- **Web Browser:** “One-Stop” Platform making it more convenient for user with first person view by Internet Protocol (IP) camera

RESULTS

- **Prototype 1:** Successful in manoeuvring with 4 main directions: Forward | Backward | Left | Right, unable to stop moving when connection is lost between the access point and the robot.
- **Prototype 2:** Successful in manoeuvring with additional 4 directions. Forward-Left | Forward-Right | Backward-Left | Backward-Right. Robot managed to stop moving after losing connections with access point. Live-stream video footage with approximately zero latency. Moderate quality of binaural recording with slight lag time of 4 seconds.
- **Final Product (Avatar):** Improved quality of binaural recording with reduced latency of 2 seconds. Integrated motor controls, live-streaming of video and live-streaming of audio on “One-Stop” webpage.



Web Browser as “One-Stop” Platform

FUTURE WORK

- **Higher quality** of live stream video footage integrated on webpage
- **Zero to minimal latency** of live audio feed
- **Omni-directional** transceivers with **longer range**

ACKNOWLEDGEMENTS

Our group would like to express gratitude to Dr Ho Shen Yong, Assoc Prof Domenico Campolo, Mr Tony Gan Eng Swee, Mr Lee Kelvin, Yeow Qi Jie, Tham Guo Yao and Lim Zhi Yuan for their invaluable guidance and patience. We would also like to thank our batchmates who were not mentioned for their assistance and support throughout the project.