

Project No.	Project Title	
2021-01-108	Drone Search and Rescue: Drone-Human Voice User Interface (VUI)	
Academic Advisor		Co-Advisor
Dr. Jessica Cauchard		-
Team Members		
Yosef Cohen	Ofir Avigad	-
yosef1@post.bgu.ac.il	ofiravig@post.bgu.ac.il	-

Abstract

Drone are increasingly used in SAR missions where they must interact with a person. In prior Human-Drone interaction research, it was shown that people naturally communicate with drones using both gestures and voice. However, various challenges prevent the use of voice interfaces on drones – among them, the noise of the propellers and environmental noises (e.g., wind).

These challenges make it difficult to identify a person's voice, and are more pronounced in autonomous drones - as the system must be capable of communicating with a person at a high-level of voice recognition. Several studies have investigated solutions via the implementation of noise filtering algorithms. In this project, we have taken a different approach, and we chose to focus on existing hardware capability.

We examined three different types of microphones (omnidirectional array, directional, and unidirectional), positioned at three different angles and two different distances between the microphone and the drone (0, 45, and 90 degrees; 1 and 3 meters), when the microphone hanging beneath it. In our experiment, a number of sentences (recorded by male and female participants) with about 90 words were played in 18 different configurations. This, while hanging the three types of microphones under the drone, at two different distances from it and at three different angles relative to it. Thus, we received 360 sentences (samples) – 10 sentences multiplied by 18 configurations for females, and the same number for males.

We then analyzed the voice recognition quality for each configuration, and found an optimal configuration that enables a voice-based dialogue between a person and an autonomous drone. This configuration is based on the use of a unidirectional microphone, while the distances and angles of the microphone in relation to the drone had little effect on the results obtained (although it seems that a 90 degrees angle between the drone and the microphone is preferable). This result offers an effective solution for SAR missions using existing off-the-shelf hardware – with more than 95% average recognition present.

Keywords: Human-Drone Interaction, Search and Rescue, Voice-User interface, Microphone Arrays.