

Smart Combat Helmet with Real Time Evaluation

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Abstract

The Smart Combat Helmet was developed as a wearable microsystem to current combat helmets. The system is comprised of three MEMS microphones, four CMOS cameras, and an LED array for visual use. All components are connected to a Raspberry-Pi 4. The microphones provide localization of the shot. The LED array will indicate the area of the shot origins. As well the camera array provides a wide field of view for review from intelligence. This technology will aid military personnel in the line of duty and noticeably reduce the amount of casualties in the field.

Introduction

The Smart Combat Helmet utilizes all of the components to relay the sound localization of the projectile to display onto the LED array. This system will find the two best impulse responses and transmit the digital signal output to the Raspberry-Pi. The triangulation program will calculate the last angle. This angle is related to the direction the user is facing and a signal is sent to the corresponding LED on the LED array. With the use of a gyroscope, the device will be able to track changes in the direction the user is facing and switch to the correct LED to match the triangulated source. The camera array will snap photos during the impulse signal and store the files onto a specified drive for further analysis from intelligence.

Methods and Materials

The Smart Combat Helmet uses a body that fits around existing ACH and ECH combat helmets. The systems hold all components inside; away from the elements in their frame. The frame will be made from alloy metals to be thin and light for soldiers in combat zones. The device uses three microphones around the helmet to locate the shot for the user to see. The camera system will take a full view of the battlespace when shots are detected.

Results

The frequencies of passing bullets were found using a spectrum analyzer with recordings found online. The results are shown in fig. 1.

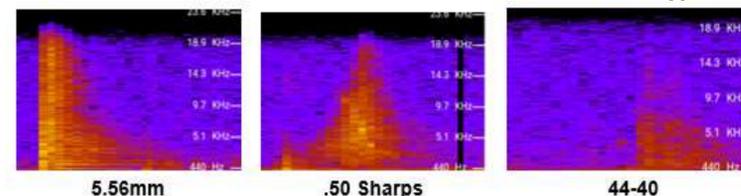


Fig 1. Bullet Spectrographs

The prototype shown in fig 2. was 3D printed and fitted with LEDs. This prototype hinges and locks around a helmet and has spaces meant to be used to hold the cameras and microphones.



Fig 2. Prototype

Discussion

In order to provide a 360-degree view of the battlespace, four cameras had to be fitted to each side of the device. The Raspberry Pi only allows one camera at a time, so functionality was accomplished using an IVMech multiplexer board. Fig 3. shows the images captured by each camera.



Fig 3. First Person View

Conclusions

The Smart Combat Helmet provides users with a secondary sense that will assist in determining the position of the enemy fire. The camera system will provide a field of view, that would allow intelligence revision of information for future operations. The system will increase survivability on the battlefield and combat awareness.

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