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Summary

The research was worked with 4 teams as IoT, Computer Vision, Sound detection and Paper. IoT team set the development environment to test the proposed work. Computer Vision team researched about the OpenCV in shooting situation, including archery. Sound detection team collected the gun sound dataset. Paper team reviewed the abstract section of the paper.

What SharpShooter completed this week:

- Installed LoRa and Pycharm in Raspberry Pi 4B
  Python code and LoRa communication should be performed on Raspberry Pi. However, the development takes place on the local computer. So, the code must be transferred to Raspberry Pi. Therefore, the local computer development environment and Raspberry Pi were linked.

- Researched about OpenCV and Gunshot sound classification
  In order to detect difference the images in archery similar to shooting, a case in which computer vision was applied was investigated [1]. Additionally, a python library called librosa is generally used for sound data analysis. Also, to learn the CNN model with sound data, the spectrogram technique must be applied [2].

- Reviewed abstract part of the paper. However, it should be modified

- Collected the sound detection dataset
  In order to create an ML/DL model that distinguishes gun sound, data related to gun sound is required. Dataset is being collected in [*].

Things to do by next week

- Add the introduction section contents that the proposed research can be applied, and get confirmed the modified abstract section and draft of introduction section
- Research some papers, and start to write literature review section
- Configure dataset about the gunshot sound and Implement the Sound Detection Model [2]
- Write a code that calculates the pixel difference between the two images and extracts the coordinates where the difference occurs using Raspberry Pi camera [1]
- Transmit and receive data (coordinates, images, etc.) via LoRa communication

Problems or challenges:

- In order to obtain a target image outdoors, light or wind must be controlled [3]. So, this research proposes that put the camera in the box to get image.

References
[1] D. Andreea, "OnTarget: An Electronic Archery Scoring," 2021, *arXiv preprint arXiv:2104.01622*.
[2] A. Morehead, L. Ogden, G. Magee, R. Hosler, B. White and G. Mohler, "Low Cost Gunshot Detection using Deep Learning on the Raspberry Pi," *2019 IEEE International Conference on Big Data (Big Data)*, 2019, pp. 3038-3044, doi: 10.1109/BigData47090.2019.9006456.
[3] T. T. Zin, I. Oka, T. Sasayama, S. Ata, H. Watanabe and H. Sasano, "Image Processing Approach to Automatic Scoring System for Archery Targets," *2013 Ninth International Conference on Intelligent Information Hiding and Multimedia Signal Processing*, 2013, pp. 259-262, doi: 10.1109/IIH-MSP.2013.73.