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From: SharpShooter

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Summary

The research was continued with 3 teams. The IoT & Computer Vision team succeeded in calculating the pixel difference between the two images in Raspberry Pi and transmitting the shooting point using LoRa communication. The Sound detection team collected the gun sound dataset and converted MP3 format file to WAV format. Paper team reviewed the Abstract and Introduction section of the paper.

What SharpShooter completed this week:

- Collected the sound detection dataset
  In order to create an ML/DL model that distinguishes gun sound, data related to gun sounds are required. The dataset is being collected in [1] and collected by actual shooting. The MP3 file format uses a lossy compression while encoding. However, the WAV file format uses a lossless compression [2]. Therefore, the file obtained by MP3 was converted into a WAV file format.

- Calculate and transmit the data by using Raspberry Pi and LoRa
  Shooting point coordinates can be calculated by comparing the image pixel difference within the Raspberry Pi, and these coordinates can be subsequently transmitted using LoRa. It was confirmed in an indoor test at KSW. It was verified that LoRa transmitter can transmit the data to LoRa receivers up to 240bytes.

- Reviewed and wrote paper
  The introduction section and modified version of abstract of the paper was reviewed. Additionally, researched some papers to make a source to write the relative work section.

Things to do by next week

- Test the LoRa network in an outdoor environment
- Write a code that can calculate the difference of pixels after recognizing a target that is located in an image
- Research more papers to write relative work about LoRa, sound detection through spectrograms, and Computer Vision
- Organize dataset lists into Excel files and gather continuous data
- Convert sound data to spectrogram to create images needed for deep learning models

Problems or challenges:

- There is an issue with recognizing the shooting point. Because the calculation is conducted by using a difference of image pixels, the point outside the target was also recognized as a shooting

point. To solve this problem, images that are composed of RGB must be changed to be Grayscale or YCbCr scale [3].

- There are some problems with collecting the sound data. It is hard to collect high quality data in public without limiting the type of arms being recorded. Also, there may be issues in converting the sound data to a spectrogram.

References

[1] J. Salamon, C. Jacoby and J. P. Bello, "A Dataset and Taxonomy for Urban Sound Research," Nov. 2014. [Online]. Available: https://urbansounddataset.weebly.com/urbansound8k.html

[2] Lindawati and R. Siburian, "Steganography implementation on android smartphone using the LSB (least significant bit) to MP3 and WAV audio," *2017 3rd International Conference on Wireless and Telematics (ICWT)*, 2017, pp. 170-174, doi: 10.1109/ICWT.2017.8284161.

[3] S. Pei and C. Lai, "A morphological approach of target detection on perspective plane," *Signal processing*, Vol. 81, 2001, pp. 1975-1984, doi: 10.1016/S0165-1684(01)00027-5.