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From: SharpShooter

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## Summary

The research was continued with 3 teams. IoT team confirmed that image transmission as well as coordinates is possible through LoRa communication. Sound detection team conducted gunshot sound classification through the CNN model. Paper team constructed and reviewed the Related work and Motivation part.

## What SharpShooter completed this week:

- Set up PM2 for automation
- Checked the LoRa image transmission  
Image transmission through LoRa is possible, and the exact packet size is 238 bytes.
- Conducted the second outdoor test  
LoRa test implemented outdoor. LoRa transmission succeeded at the distance of 870m. The experiment was conducted at 10.19.22 3PM (Temperature: 8 °C, Humidity: 44%, Wind: 7km/h)



Fig. 1. Conducting LoRa communications outdoor

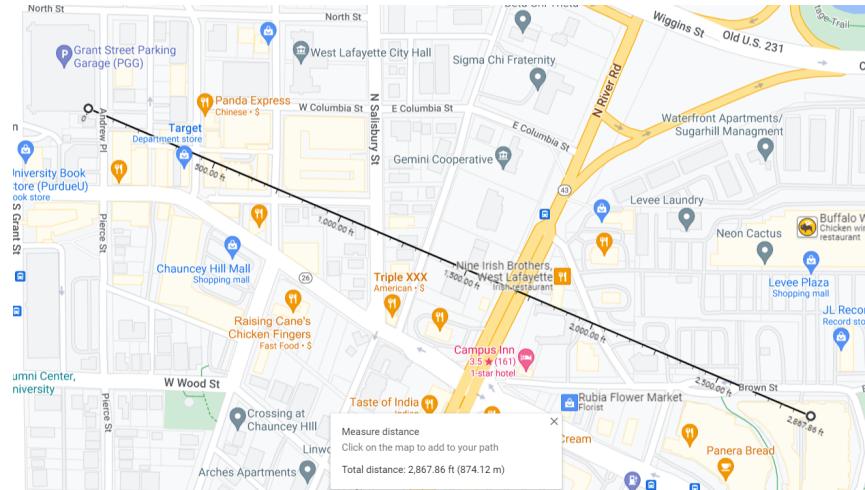


Fig. 2. Distance measured using GPS after performing LoRa transmission

- Pre-processed Sound data

Audio dataset was preprocessed to have a sampling rate of 44,100 Hz and 1 audio channel. The preprocessed dataset was converted into a Mel-spectrogram [1].

- Pre-processed Image data

To transmit the initial target image to the shooter, background of the image was removed. In addition, perspective transformation was applied so that the target can be viewed as a upright image [2].

### Things to do by next week

- Augment data to prevent overfitting in sound classification
- Perform perspective transformation after taking an initial target image with Raspberry Pi camera
- Revise the paper

### Problems or challenges:

- Until now, the image was taken with a cell phone. This part will be changed to Raspberry Pi camera. To obtain a suitable target, the target must be fully adhered.
- Image transmission should be done after image compression because of the image size. To compress the image, some research is needed.

### References

- [1] Z. Razak, N. J. Ibrahim, E. M. Tamil, M. Y. I. Idris and Z. B. M. Yusoff. "Quranic Verse Recitation Feature Extraction using Mel-Frequency Cepstral Coefficient (MFCC)," in *4th International Colloquium on Signal Processing and its Applications*, Kuala Lumpur, Malaysia, 2008.
- [2] K. Wang, B. Fang, J. Qian, S. Yang, X. Zhou and J. Zhou, "Perspective Transformation Data Augmentation for Object Detection," in *IEEE Access*, vol. 8, pp. 4935-4943, 2020, doi: 10.1109/ACCESS.2019.2962572.