

Report Date: 06/03/2022

To: [ematson@purdue.edu](mailto:ematson@purdue.edu), [ahsmith@purdue.edu](mailto:ahsmith@purdue.edu), [lhiday@purdue.edu](mailto:lhiday@purdue.edu) and [lee3450@purdue.edu](mailto:lee3450@purdue.edu)

From: K2S3

- Dongwhan Lee (Leader) - [derick\\_lee@khu.ac.kr](mailto:derick_lee@khu.ac.kr)
- Yeeun Heo (Member) – [gjdpdms2005@soongsil.ac.kr](mailto:gjdpdms2005@soongsil.ac.kr)
- Youngseo Kim (Member) - [201910787@sangmyung.kr](mailto:201910787@sangmyung.kr)
- Juann Kim (Member) – [201920951@sangmyung.kr](mailto:201920951@sangmyung.kr)
- Heeyeon Shin (Member) - [567didi@khu.ac.kr](mailto:567didi@khu.ac.kr)

## Summary

During this week, the third draft of the Abstract and the Introduction is written. Also, the first draft of the Literature review is done. Besides, the indoor test data was trained using the MFCC feature map.

Throughout the next week, for collecting the first outdoor data, the specific environments that are needed will be set up. After collecting data for the outdoor test, the result will be analyzed by all members. Also, to understand the algorithms and related papers better, audio and image studies will be presented by the team members. The presenter will be randomly selected on the presentation day.

## What K2S3 completed this week:

- Finishing with the third draft of the Abstract and the Introduction of the paper
- Writing the first draft of the Literature review of the paper
- Preparing acoustic feature map data for CNN-based Deep learning algorithm
  - As the acoustic data were collected with a microphone, the MFCC features were extracted from audio data.
  - The MFCC features values are processed to the MFCC feature map.
- Training data of MFCC features
  - There were several methods to train the data including SVM, KNN, and Random Forest.
  - Not only an ML experiment but also a DL experiment with MFCC feature map was conducted.

## Things to do by next week

- Setting up for an environment test
  - To collect data for the outdoor test, it is necessary to set up specific environments. For example, various vertical ranges and altitudes will be decided for testing. Also, the minimum distance between two drones before colliding should also be decided.
- Collecting data for the outdoor test

- After setting up for the outdoor environment test, the experiment with two drones will be conducted.
- Preparing for the audio (Friday) and image (Tuesday) study
  - Image study: studying for Fast RCNN, Faster RCNN, and FPN (Feature Pyramid Network)
  - Audio study: studying about topics of extracting audio features and understanding time-domain audio features

### **Problems or challenges:**

- Finding appropriate References for the paper.
  - As writing the paper for the second draft, it was challenging to find appropriate references.
  - The previous research about position estimation of UAV using a multi-modal method were rare.
  - We should figure out the format of an online offered report and the author.

### **References**

- [1] H. Liu, Z. Wei, Y. Chen, J. Pan, L. Lin and Y. Ren, "Drone Detection Based on an Audio-Assisted Camera Array" *2017 IEEE Third Int. Conference on Multimedia Big Data (BigMM)*, pp. 402-406, 2017
- [2] Lai, Ying-chih, and Zong-Ying Huang, "Detection of a Moving UAV based on Deep Learning-Based Distance Estimation" *Remote Sensing*, 2020
- [3] Leong, Wai Lun, et al. "Vision-based sense and avoid with monocular vision and real-time object detection for UAVs." *2021 Int. conference on unmanned aircraft systems (ICUAS)*. IEEE, 2021
- [4] S. Al-Emadi, A. Al-Ali, A. Mohammad and A. Al-Ali, "Audio Based Drone Detection and Identification using Deep Learning," *2019 15th Int. Wireless Communications & Mobile Computing Conference (IWCMC)*, pp. 459-464, 2019