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To: ematson@purdue.edu, ahsmith@purdue.edu, lee3450@purdue.edu
From: The Team Gangsture (Gesture Drone Control)

- Hyeongbin Park (The Leader / mtanger@kw.ac.kr)
- Seunghwan Kim (franz0602@stu.jejunu.ac.kr)
- Yujin Lee (yj5878@kw.ac.kr)
- Soeun Lee (thdms8477@jejunu.ac.kr)

Summary

Static gestures were designed. Sample datasets were collected, thus, machine learning and deep learning model are being built. A lot of effort is underway to study the server and an iOS application with CoreML.

What "Gangsture" completed this week:

- **Designing static gestures**
  - First of all, designing gestures was a very important part to start overall development process. After designing gestures, researchers collected some datasets to test the AI model.
  - When designing gestures, researchers had to think about the most efficient and ideal gesture to build robust models and manipulate the drone.
- **Collecting sample datasets**
  - This project collected its own dataset using Mediapipe. Therefore, the code written should be used continuously.
  - It was possible to collect data features such as 3D normalized coordinate systems, relative 3D coordinate systems from the wrist landmark and information of which hand was used (left or right).
  - If someone pressed the button '1', the image and tabular dataset were collected. The first test dataset was consisting of 2,400 images and 8 tabular datasets.
- **Building machine learning and deep learning model**
  - The machine learning model would be trained based on the tabular datasets, and deep learning model would be via the image datasets.
  - The first machine learning model was Random Forest and its accuracy was 85%. It was evaluated on total 10,080 tabular datasets.
  - AutoML Library PyCaret was used for comparing algorithms. The top 3 models were Extra Tree Classifier, Random Forest, and Cat Boost Classifier.
  - The first deep learning model was built with PyTorch library. Unfortunately, it needed more CPU and GPU resources for training the CNN model. The training code hasn't been completed and should be adjusted for using an extra GPU device.
- **Studying and searching about the server and iOS**
  - A sample server was run, and a function of client connection was made.
  - Studying pipeline between AI model and iOS with CoreML has progressed.

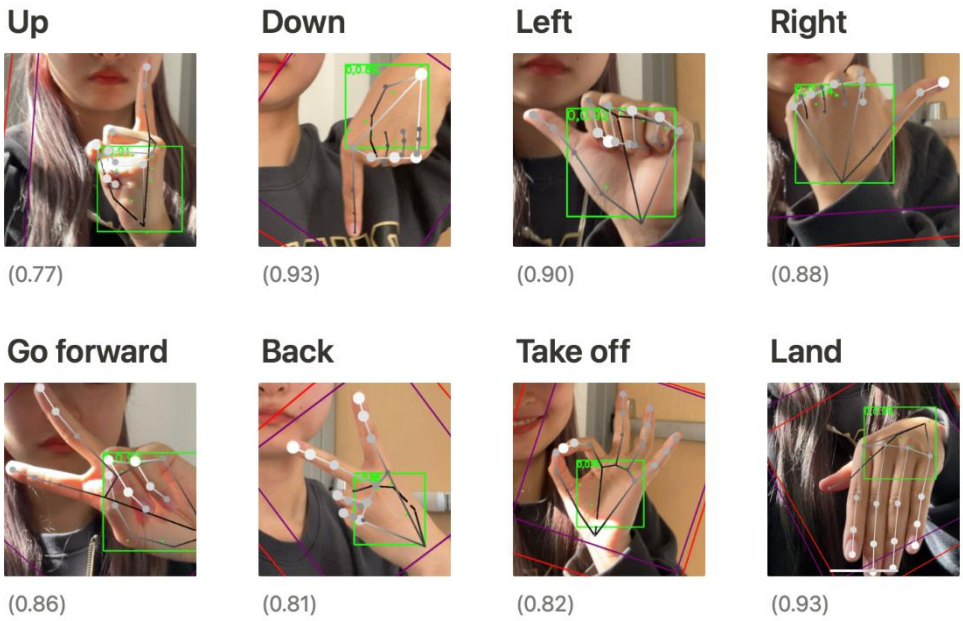

Fig. 1. The accuracy and guideline of eight static gestures

Things to do by next week

- Strengthen the model and record how to improvements and performance to be made
- Packing and conveying the model to iOS platform part for testing
- Developing sample app that shows the results of putting the images obtained from the camera into AI model
- Studying about Node.js and building a server

Problems or challenges:

- **How to collect uniform and good quality of dataset**
  - The environment conditions play a significant role and lead to the quality results of AI.
  - There are so many factors which will affect the result of datasets such as, lightness, background of frame, hand size and hand direction (front or back).
  - It was decided to make a log of the collecting environment whenever a dataset was collected. After comparing the conditions, the analysis of those would be applied to the next experiment.
- **How to improve the AI model**
  - The accuracy of more than 80 is evaluated as a high one, but this project aims to achieve near 90 accuracy because of stability and safety of the drone.
  - The solution of this challenge is similar to the upper one. Researchers would record and analyze various parameters and results.
  - Furthermore, exploratory data analysis and feature importance analysis were also conducted to improve the accuracy of model. Machine learning model is not only for higher accuracy but also for this purpose.

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