Visual-Object-Detection-Based Wireless Charging Alignment System for Unmanned Aerial Vehicle

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SUMMARY

In recent years, Unmanned Aircraft Vehicle(UAV) technology has become more and more mature, and many related applications have also been increasing. However, the disadvantage of UAV is the short flight time. A proposed method is to use wireless charging in intermediate places. In order to have the highest charging efficiency, the accuracy of coil to coil relative positions must be high (close to centimeter level), which is not reachable by a conventional GPS positioning system. Although RTK (Real Time Kinematic) technology can reach the centimeter level accuracy, the cost is high (more than 3-30 thousand US$). We proposed a visual based object detection method to align the wireless coils in addition to help the UAV landing positioning.

The process of our method follows a conventional object detection approach. First of all, we collect and label the pictures including our target object, representing the charging station/coil, as in Fig.1. Then, we use a software, labelImg[1], to mark the position of the target object. After that, using the Faster R-CNN[2] algorithm, we modify the corresponding category to be 1, and train the Faster R-CNN model.

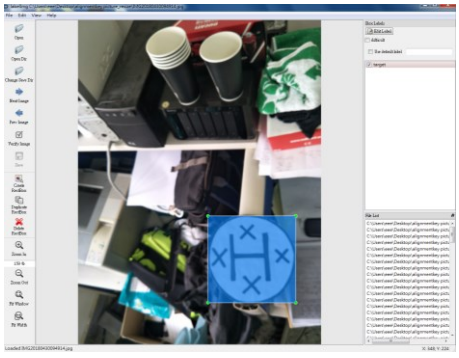

Fig.1. Labeling the position of target by labelImg.

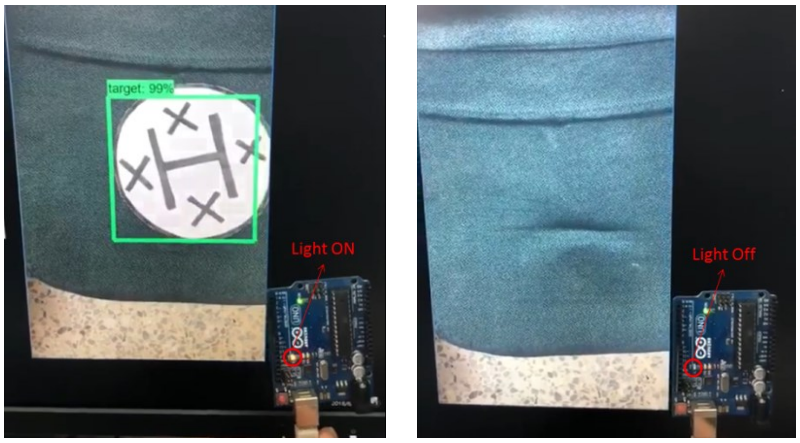

Fig.2. A found target enables an LED on (left figure). Otherwise, the LED is off (right figure)

After training, we use a webcam as a UAV camera, if the target is found, an LED is turn on through an Arduino interface [3] as shown in Fig.2. We will continue to develop our approach to a real UAV wireless charging system later.

REFERENCE

[1] tzutalin. labelImg.(2017) [Online]. Available: https://github.com/tzutalin/labelImg

[2] S. Ren, K. He, R. Girshick, and J. Sun. Faster R-CNN: Towards real-time object detection with region proposal networks. In NIPS, 2015.

[3] MrYsLab. pymata-aio.(2015) [Online]. Available:https://github.com/MrYsLab/pymata-aio