**Memo: F1Tenth Lab8 - April Tags & YOLO**

Date: 23rd Jan 2022

Subject: Detailed Comparison of using April Tags vs YOLO

**Introduction**

This memo summarizes the performance for both April Tags and YOLO model in terms of their detection accuracy, average speed of detection and their memory requirements.

**Data**

1. Accuracy vs Distance  
   April Tags:

|  |  |  |
| --- | --- | --- |
| Actual Distance (m) | Measured Distance (m) | Percentage Error (%) |
| 1.25 | 1.225 | 2 |
| 2.50 | 2.438 | 2.48 |
| 3.75 | 3.674 | 2.03 |
| 5.00 | 4.918 | 1.64 |
| 6.25 | 6.183 | 1.07 |
| 7.50 | 7.440 | 0.8 |
| 8.75 | 8.679 | 0.81 |
| 10.00 | 9.913 | 0.87 |
| 10.80 (maximum range) | 10.815 | 0.14 |

1. YOLO:

|  |  |  |
| --- | --- | --- |
| Actual Distance (m) | Accuracy (Yes or No) | Confidence |
| 3.75 | 1 | 0.93 |
| 5.00 | 1 | 0.92 |
| 6.25 | 1 | 0.92 |
| 7.50 | 1 | 0.90 |
| 8.75 | 1 | 0.87 |
| 10.00 | 1 | 0.83 |
| 11.25 | 1 | 0.70 |
| 12.50 | 1 | 0.81 |
| 13.75 | 1 | 0.54 |
| 15.00 | 1 | 0.41 |
| 16.25 | 1 | 0.80 |
| 17.50 | 1 | 0.65 |
| 18.75 | 1 | 0.65 |
| 20.00 | 1 | 0.50 |
| 21.25 | 1 | 0.50 |
| 22.5 | 1 | 0.50 |
| 23.75 | 1 | 0.60 |
| 25.00 | 1 | 0.70 |
| 26.25 | 1 | 0.60 |

(Farther distances are not measured)

1. Average Speed of Detection (based on node publishing speed)  
   April Tags: 13.39Hz  
     
   YOLO: 12.50Hz
2. Memory Requirement (out of 16GB RAM)  
   April Tags: 1.21%  
     
   YOLO: 1) 20.45%

2) 1.6GB (GPU Memory)

**Possible modifications**

1) Use stereo-camera models so depth information can be obtained using camera.

2) April tag requires the tag to be printed and attached to all objects for detection, which is not really practical in real-life situation.

**Risks**

**Conclusion**

After analyzing the data, we recommend using YOLO as it is more robust with a farther range of detection compared to April Tags. Despite having a 20x memory requirements, a camera sensor can be generalized to work on more tasks other than just object detection. Moreover, we can’t expect to put an April tag on all of our opponent's car so we have decided to use YOLO.