Achieving high QoE (Quality of Experience) for AR applications on a mobile device is challenging because the required advanced computer vision and machine learning algorithms are computationally intensive by nature. Hence, some task for AR applications must be offloaded to more powerful remote servers. Offloading for mobile applications remains an active area of research. In the context of mobile AR applications, which requires continuous processing, offloading algorithms must be applied with care due to the high wireless network latencies. In fact, there are only a few mobile AR QoE frameworks to take wireless network latencies into consideration, and none of them studied the relationship between mobile AR QoE and wireless channel status that impacts each other along the time scale. In this project, we propose Q-CARS system, which will provide real test results that facilitate the design of the wireless network conditions that enhance the support of QoE in AR systems.

Preliminary Results and Conclusion

We first conduct an experiment to determine the desired QoE by judging the trackability of our mobile AR system. We use intersection over union (IOU) as the measure. For certain object $i$ the IOU is calculated based on the intersection area between ground truth bounding box and the predicted bounding box divided by the union area of these two boxes.

Based on our preliminary results (shown in Fig. 4), we observe that the tracking performance of AR application decreases when the network delay increases. We further conduct an experiment to test the tracking performance for multiple mobile AR clients under different scheduling algorithm. As shown in Fig. 5, the overall tracking performance decrease when the number of node increase, this is due to the wireless interference between each AR clients. Among these three scheduling algorithms, the smallest first algorithm provides a better result when the total number of the AR clients is less than 6.

Future Research

There are two future research directions. First, we will focus on the cross layer optimization which generate best strategies for individual AR devices and algorithms that optimizes network resource allocation, while considering malicious and greedy users.

Second, we will deploy the real system that allows us to measure the real impact from wireless network to AR systems in various scenarios (indoor, outdoor) and verify our proposed cross layer optimization algorithms.