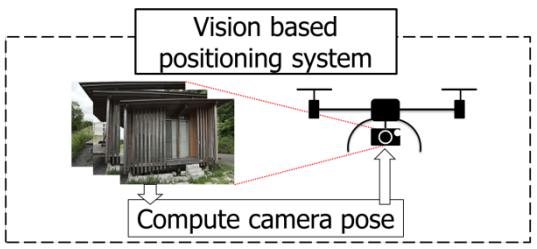
# 3D Interior Point Checking and Saturated Linear Function Segmentation Based GPU Acceleration of Localization for ORB-SLAM

修士課程卒業　胡淵

## Background




Chosen positioning technology

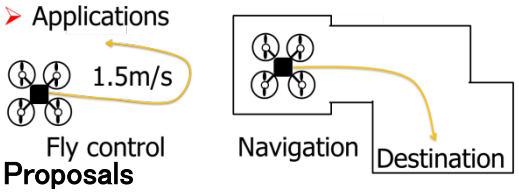
**ORB-SLAM**

### Challenge

Low speed
Runs on desktop CPU, 10Hz update rate

**Need GPU acceleration**

### Applications




### Problems

When transforming to parallelized GPU version

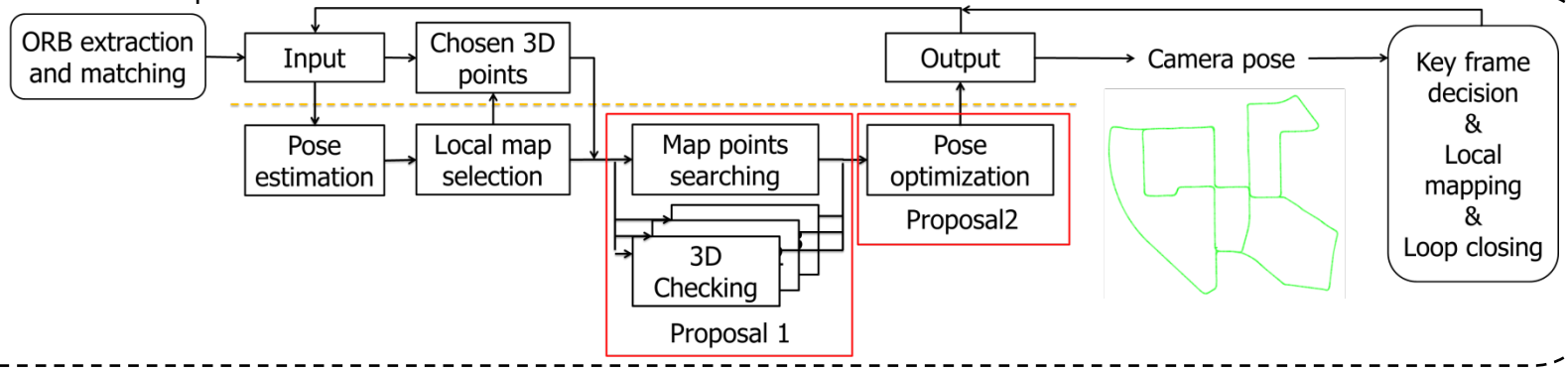
**Not** suitable for GPU parallel processing

- **Data-dependency**
- **Branches**
- **Non-linear function**

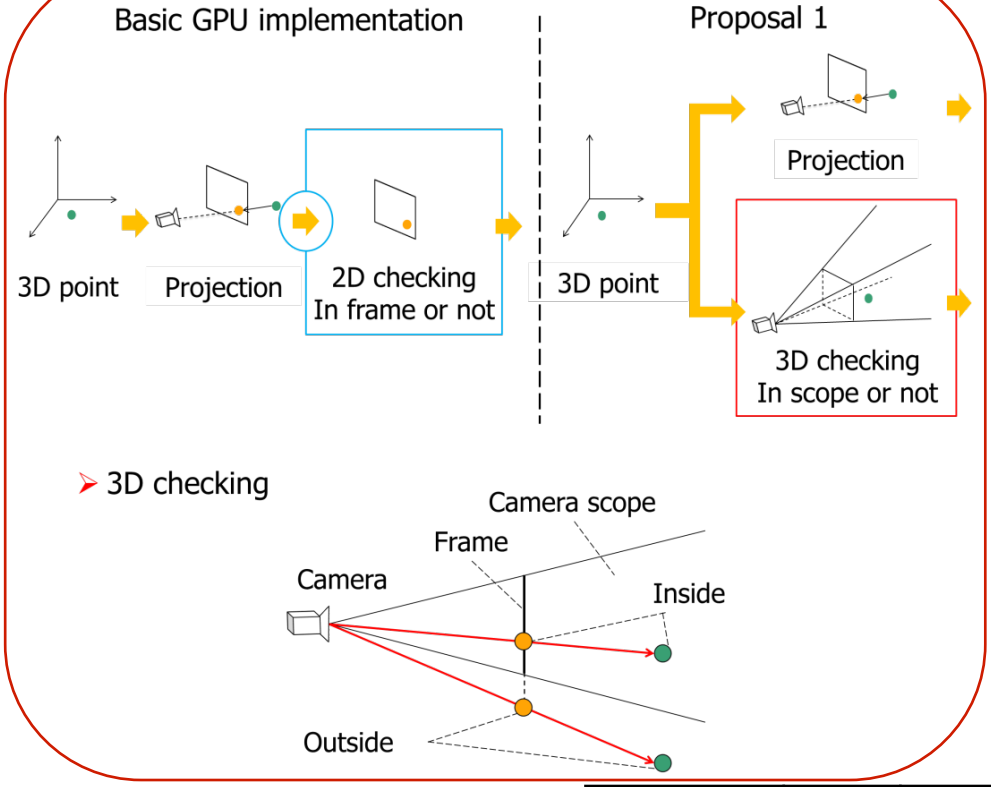
**Solve those problems to achieve more parallel**

## Proposals

Framework of localization part



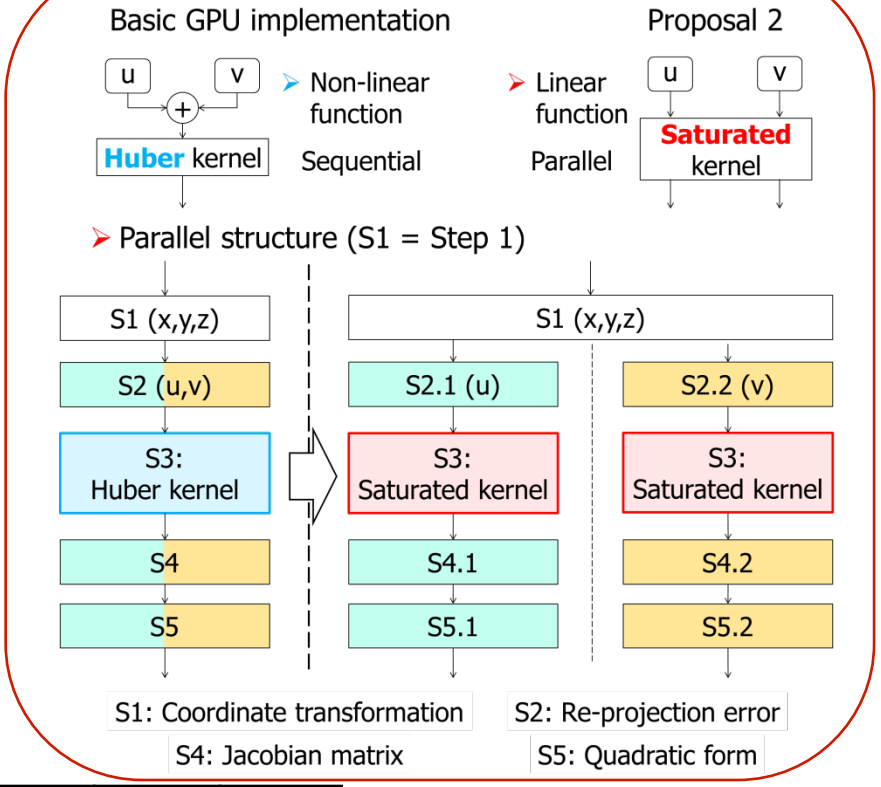

### P1: 3D interior point checking



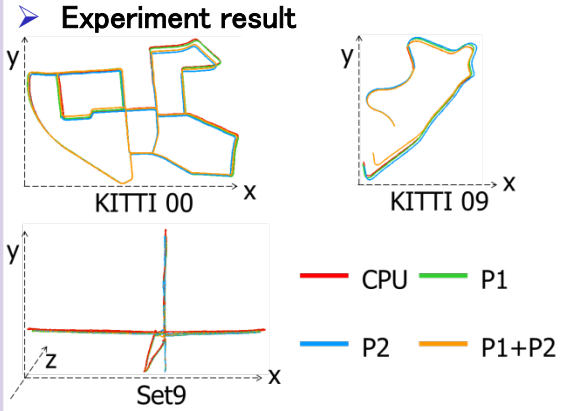

3D checking




### P2: Saturated linear function segmentation




## Experiment result




| Time consuming | CPU | Basic GPU implementation | Proposal 1 | Proposal 2 |
|---|---|---|---|---|
| Data transmission | | 0.122 | 0.122 | 0.122 |
| Pose estimation | 0.006 | 0.011 | 0.011 | 0.011 |
| Local map selection | 2.287 | 0.199 | 0.199 | 0.199 |
| Map points searching | 10.922 | 0.306 | 0.213 | 0.213 |
| Pose optimization | 3.645 | 0.263 | 0.263 | 0.210 |
| SUM | 16.860 | 0.901 | 0.808 | 0.755 |

## Conclusion

**The proposed methods run on the GPU with the time saving of 16.20% compared with the basic GPU implementation without significant loss of accuracy.**

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