Visual-SLAM based indoor navigation

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Background

It is easy to get lost when you are in the environment without enough sign.

- Navigation without GPS signal
- With the your smart phone's camera

What You See Is What You Are Suggested navigation system

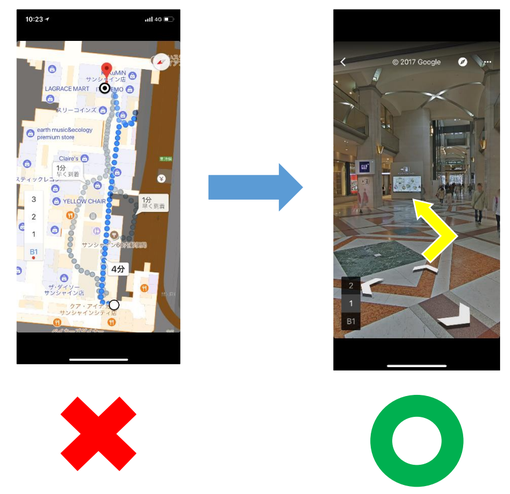

Fig1. examples of navigation

Process Overview

Preparatory stage

- Detect the feature points
- Fit with the map image
- Floorplan from the 3D model

Execution stage

- Detect the feature points
- Localisation
- Compute the route

Feature Matching & Get map points

ORB (Oriented FAST and Rotated BRIEF)

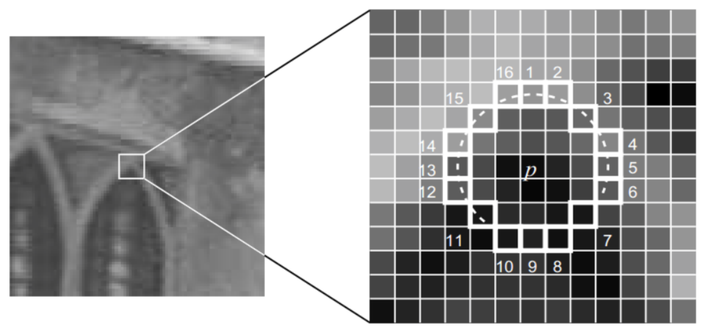

Fig2. FAST feature point

Fig3. Matching result using ORB on real-world images

2D-2D matching

$$x_2^T E x_1 = 0$$

Where x_1 , x_2 is the coordinate of feature points, E is Essential Matrix.

Triangulation

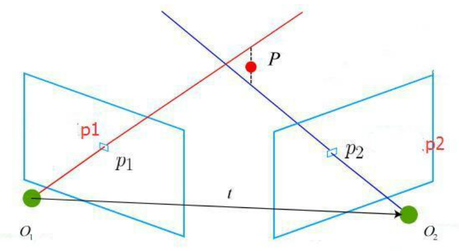

Fig4. get 3D information by triangulation

Camera pose

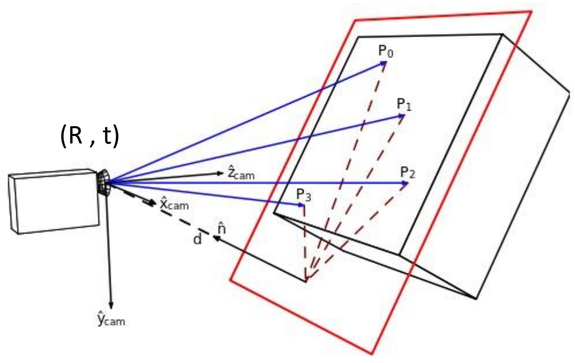

Fig5. camera pose in 3D space

R : Rotation Matrix , $R \in SO(3)$
t : Translation vector , $t \in R^3$

Localisation & Navigation

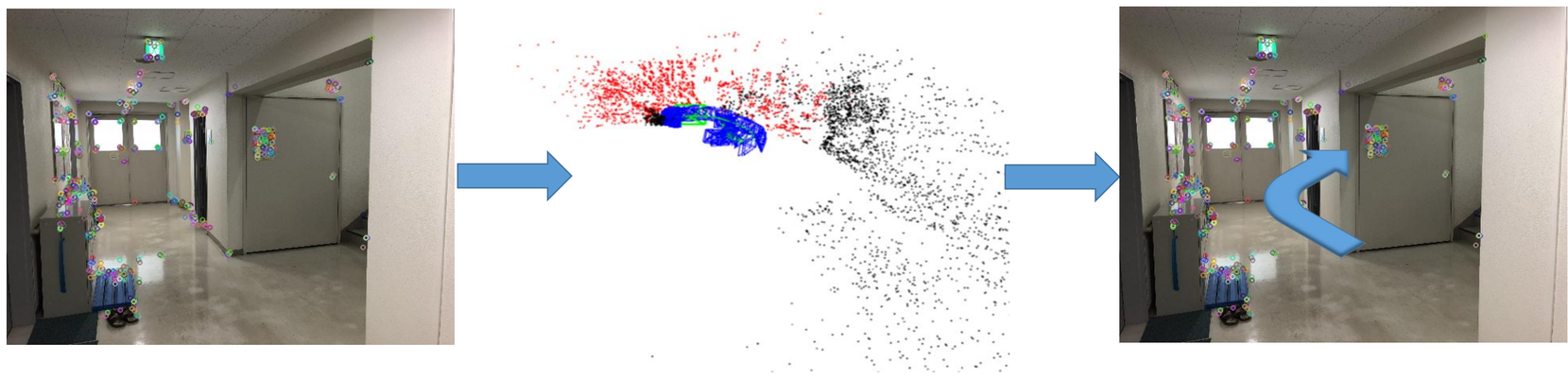

Fig6. The example of localization and navigation

- Localise by match the feature points and map points
- Compute the route
- Display marker less AR real time

Future Works

- Fast relocalisation
- Detect the obstacles by images processing
- Robust to dynamic objects