

3D object recognition used by team robOTTO: Effectivity and Efficiency

Presentation

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1. Profiling
2. Test Conditions
3. Efficiency
4. Effectivity

Profiling

Profiling with the help of callgrind

- Callgrind records the call history among functions in a program's run as a **call-graph**.
- The collected data consists of the **number of instructions** executed, their relationship to source lines, the **caller/callee relationship** between functions, and the numbers of such calls.
- The profile data is written out to a file at program termination.

Profiling with the help of callgrind

For graphical visualization of the data, you can try [KCachegrind](#).

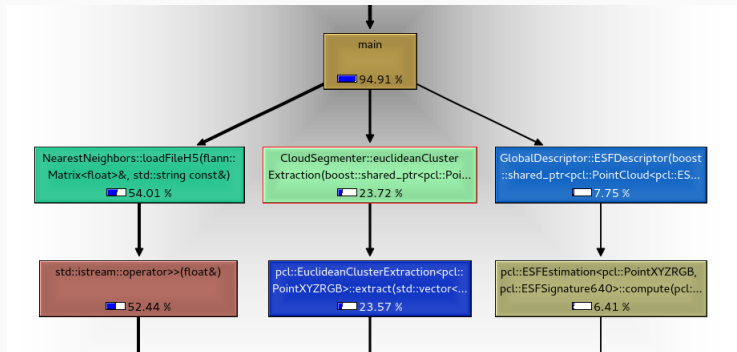


Figure 1: Visualized callgraph of 3D object recognition node.

Test Conditions

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- Intel® RealSense™ camera (F200),
- Camera with a static top-down perspective to the table with objects,
- Sensor distance to objects between 0.3 and 0.4 m,
- Registered point cloud data (XYZRGB data),
- System information: 3.8 GiB RAM, Intel® Core™ i5-4200U CPU @ 1.60GHz × 4

Technical specifications:

RGB video resolution

Full HD 1080p (1920 × 1280).

IR depth resolution

VGA (640 × 480).

Image frame rate

30 fps (RGB), 60 fps (IR depth).

Field of view

77°(RGB), 90°(IR depth).

Range

0.2 m - 1.2 m.

Minimum prerequisite

4 GB RAM (1.2 GB).

Input

5 V.

USB port

USB 3.0.

Setup

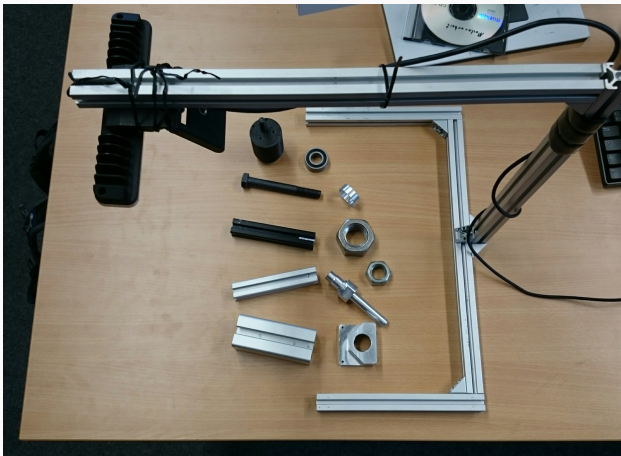


Figure 2: Setup with RealSense camera, aluminium profile skeleton and objects with a preferred base.

Efficiency

- Measuring time (sec) for each component of 3D object recognition pipeline,
- Taking worst time value for each component out of 100 measurements,
- Putting exactly one S40_40_G in the center of the image,
- Sensor distance = 0.35 m

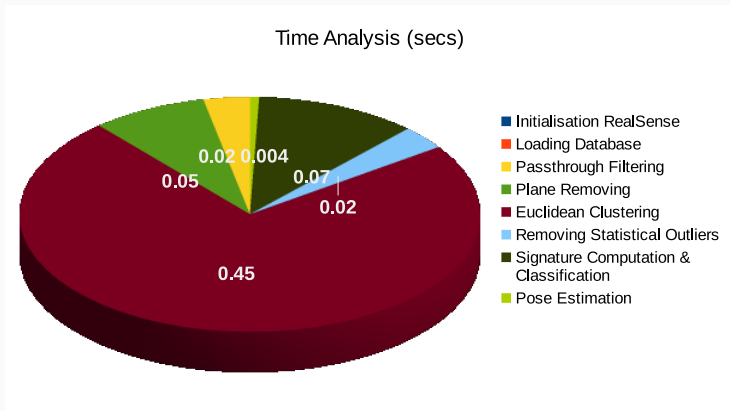


Figure 3: Time analysis without RealSense initialisation and database loading. In the worst case, one iteration of 3D object recognition takes 0.614 secs.

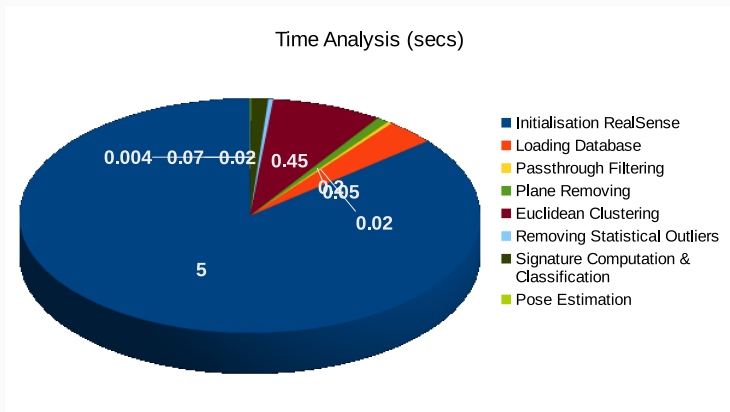


Figure 4: Time analysis with RealSense initialisation and database loading. In the worst case, one iteration of 3D object recognition takes 0.614 secs plus 5.2 secs for RealSense and database initialisation.

Effectivity

Effectivity

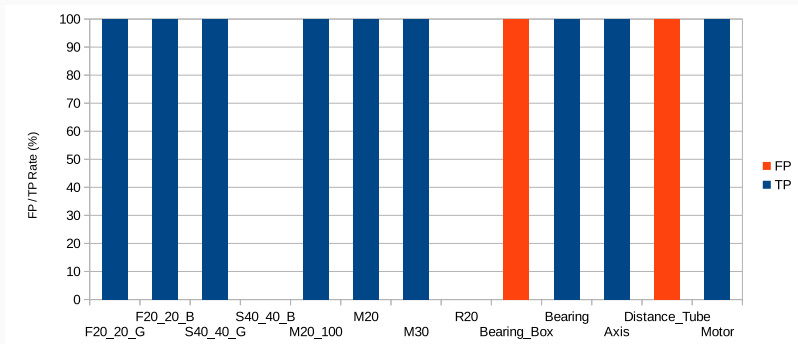


Figure 5: Effectivity of 3D object recognition. FP means False Positives and TP means True Positives. S40_40_B and R20 are not available.

Questions?