Object Recognition in ROS

Using Feature Extractors
and Feature Matchers

By Dolev Shapira
Introduction and Goals

• Provide a reliable, modular system for object recognition.
• Provide guidance for the user how to optimize the use of the system.
• Creation of a “standalone” node that provides an of abstraction between object recognition and other processes.
“What is ROS? The Robot Operating System (ROS) is a set of software libraries and tools that help you build robot applications. From drivers to state-of-the-art algorithms, and with powerful developer tools, ROS has what you need for your next robotics project. And it's all open source.”

ROS.org
Introduction to ROS

ROS provides an interface that allows the user to create a modular independent pieces of code called “Nodes”, communicating with each other using “Topics”.
Introduction to ROS

• Nodes – “processes”.
• Topics – “message boards”.
• Subscribers – Nodes “watching” the topics and reading incoming messages.
• Publishers – Nodes publishing (“posting”) messages into topics.
OpenCV

OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products.
Feature Detection

We have seen in this course a biological mechanism used for feature detection.

- Simple cells – Orientation.
- Complex cells – Orientation and Direction.
- Hypercomplex cells – “end-stop” property.

The only question in hand is, what feature should we trace?
SIFT Feature Detector

• Scale invariant.
• Rotation invariant.
• Functions well even when there is a change in illumination.
• Function relatively well even when there’s noise.

David G. Lowe 2004
How Does it Work?

• We load a set of “Templates” prepared beforehand.
• We sample images from the camera (scenes).
• We detect features both in the scene, and the templates.
• We match between the two using a Matcher.
Templates

• Should not be noisy.
• Should not contain a transparent part of an object.
• Should not contain a reflective part of an object.
• Should contain “static” features.
• Should be of a part proportional to the object itself (with relation to the resolution).
Results
Results