SynGrasp: a MATLAB toolbox for the simulation of robotic hands

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What is SynGrasp?

- SynGrasp is a MATLAB toolbox for grasp analysis of fully or underactuated robotic hands with compliance.
SynGrasp is a MATLAB toolbox for the analysis of grasping with fully or underactuated hands with compliance.
Why MATLAB?

• Specific toolboxes have been developed in the past years as support for research and teaching in almost every branch of engineering.

• MATLAB programming language is intuitive and well known in the research community

• MATLAB scripts and functions can be easily integrated with specific tools and built-in math functions
  • statistical elaboration of experimental data,
  • optimization,
  • dynamic models
  • simulations
SynGrasp: Features

**HAND MODELING**
- Build the hand
- Synergies/underactuation
- Place the hand/object

**USER INTERFACE**
- GUI
- Scripting

**GRASP DEFINITION**
- Contact points
- Grasp planner
- G, J, H matrices
- Compliance

**GRASP ANALYSIS**
- Grasp analysis
- Quasi-static maps
- Manipulability Ellipsoids
Human Hand Modeling

Anthropomorphic hand model:
20 degrees of freedom
How to define the mapping?

Several solutions for anthropomorphic hands (joint to joint, fingertip mapping, etc.)

Non-anthropomorphic hands? Goal: to develop a mapping independent from the kinematic structure of the hand

Focus on the effects on the manipulated obj
Mapping synergies from human to robotic hands
The Numbers of SynGrasp

• Developed since 2012 mainly by the Siena Robotics and Systems Lab (SIRSLab).

• More than 300 functions and scripts for grasp analysis
• Main subject of 2 published papers (2013, 2015)
• 4044 downloads of the toolbox
• 2774 downloads of the user guide
• Used in 4 European Projects
Download SynGrasp

SynGrasp Toolbox and User Guide can be downloaded from the website:

http://sirslab.dii.unisi.it/syngrasp/