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Vision Techniques for Robots in Industrial and Home Environments

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Study with Industrial Experts

“What Do Industrial
Developers and End-Users
Expect from a Cognitive Robot?”

- Questionnaire of AICoR Topic Group
- Three ERF Workshop on AI & Robotics
- Interviews with selected key persons in industry

Vernon, Vincze: Industrial Priorities for Cognitive Robotics. Proc. of EUCognition, 2016. ceur-ws.org/Vol-1855/EUCognition_2016_Part2.pdf

11 Functional Abilities – The Essence

Industry wants to

Teach a robot like an intern.

Key abilities:

- Safe and transparent operation

- Use high-level commands to teach a new task

- Perception provides understanding of objects and scene**

- Autonomy within fixed limits

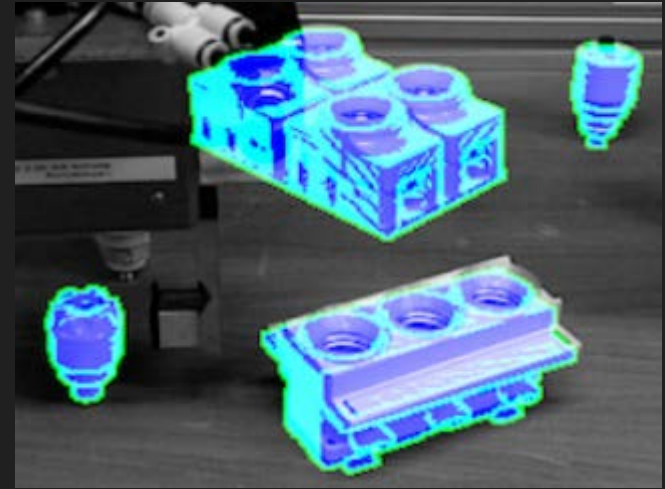
- Robot reasons about task completion

 - If it cannot progress, e.g., blocked, ask user

- Robot keeps learning, it extends its skills and abilities

Perception in Industry

- 6D Pose Estimation challenge
- Motivated by industrial application
- Yet a database clearly for research



Robot Helper at Home



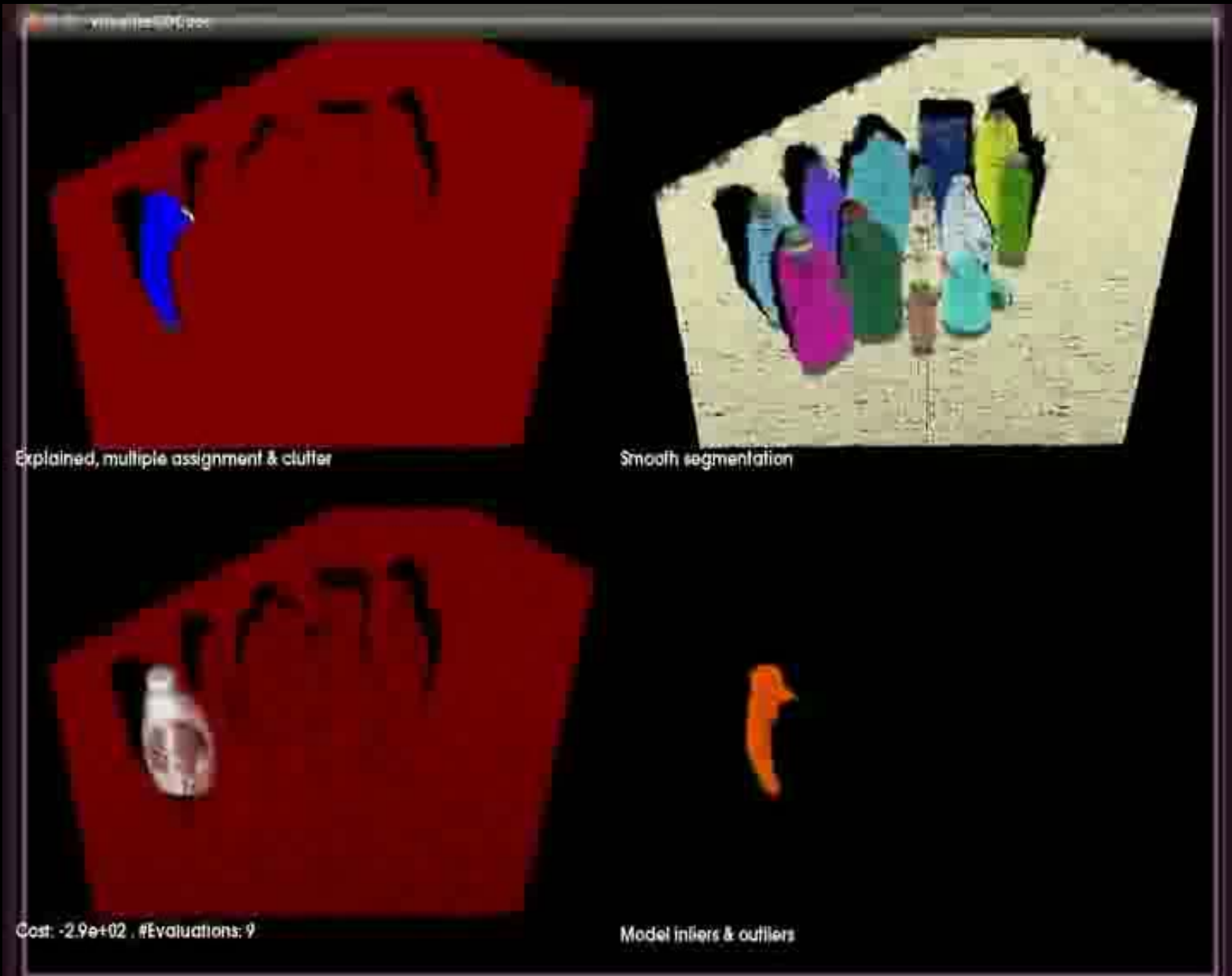
HOBbit tested in 18 homes

In Clutter: Hypothesis Verification

- Local & global classifier → object & pose hypotheses
 - Acceptance thresholds tricky, occlusion, FPs
- → Consider *all hypothesis simultaneously*: *Global Hypothesis Verification* of scene in terms of objects



GHV in Clutter



Open Challenges for Perception

- World is richer than DB
- Few learning examples is a necessity
 - Learning only from CAD models
- Context is largely missing test in target domain
- Feedback loop

[LineMod DB, e.g. Thalhammer 2019]

