LearnBiP (2011-2012)

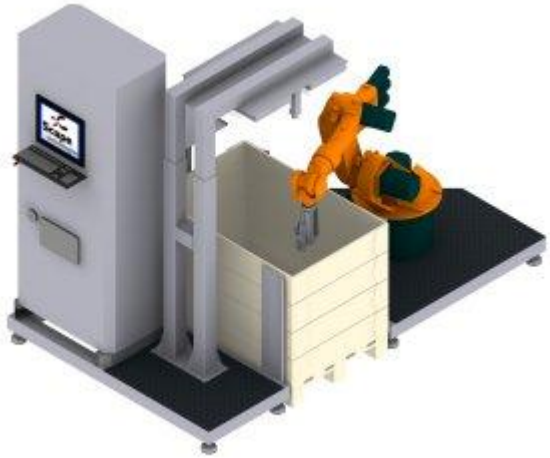
European Clearing House for Open Robotics Development

Grasp Learning in Industrial Bin-Picking

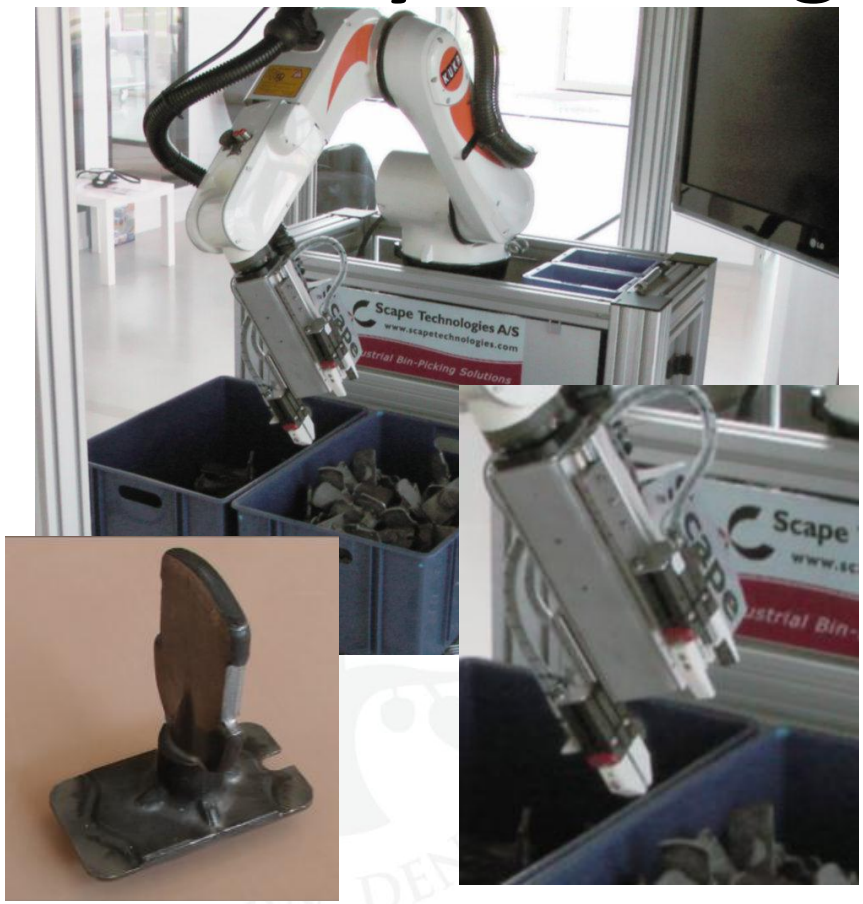
- **Main Goals:**
  - Learning in industrial bin-picking
  - Evaluation of the use of the dexterous hands SDH-2 in an industrial production context
- **Additional Achievement**
  - Use of simulation for replacing human modelling of grasps

Learning in industrial bin-picking

- During bin-picking a large amount of experience is generated
  - Cycle time of 25 seconds gives around 100000 experiences a month
- Currently the success rate varies between 50% and 90% depending on the objects and gripper
- Grasp definition requires a lot of manual design
- The large amount of experience is yet completely unused!
  - **Aim: Improvement through learning**

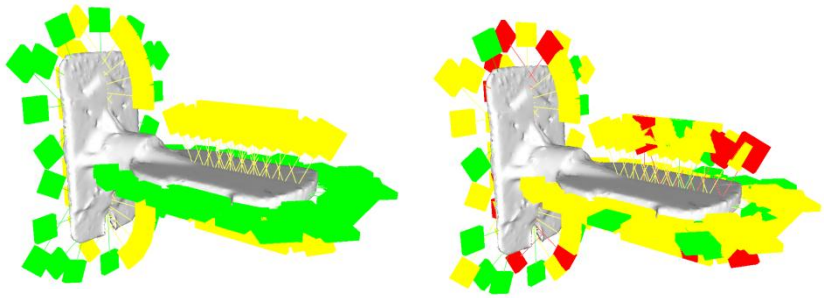


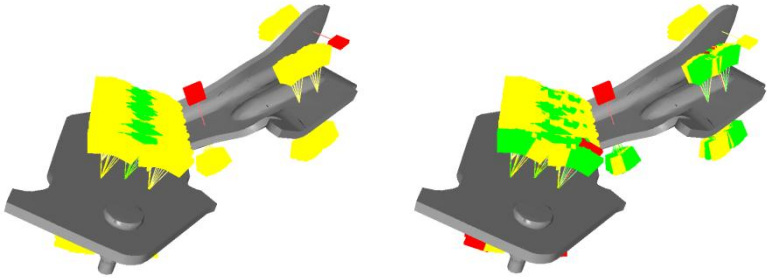
Achievement 1: Improving of manually chosen grasp preferences

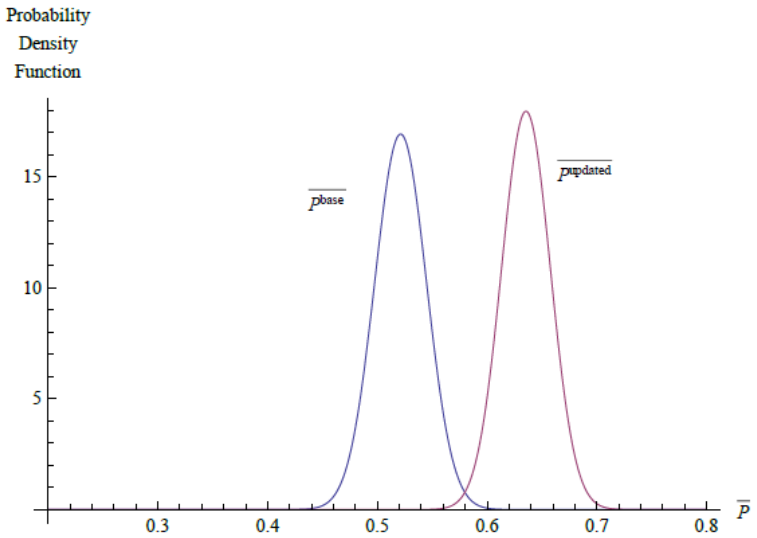


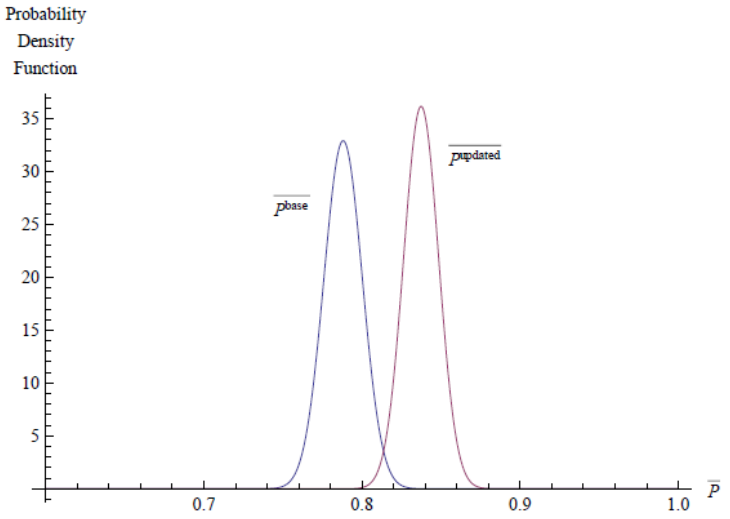
L.-P. Ellekilde, J. A. Jørgensen, D. Kraft, N. Krüger, J. Piater and H. G. Petersen.
Applying a Learning Framework for Improving Success Rates in Industrial Bin Picking. IROS 2012.

Achievement 1: Results on improving of manually chosen grasp preferences









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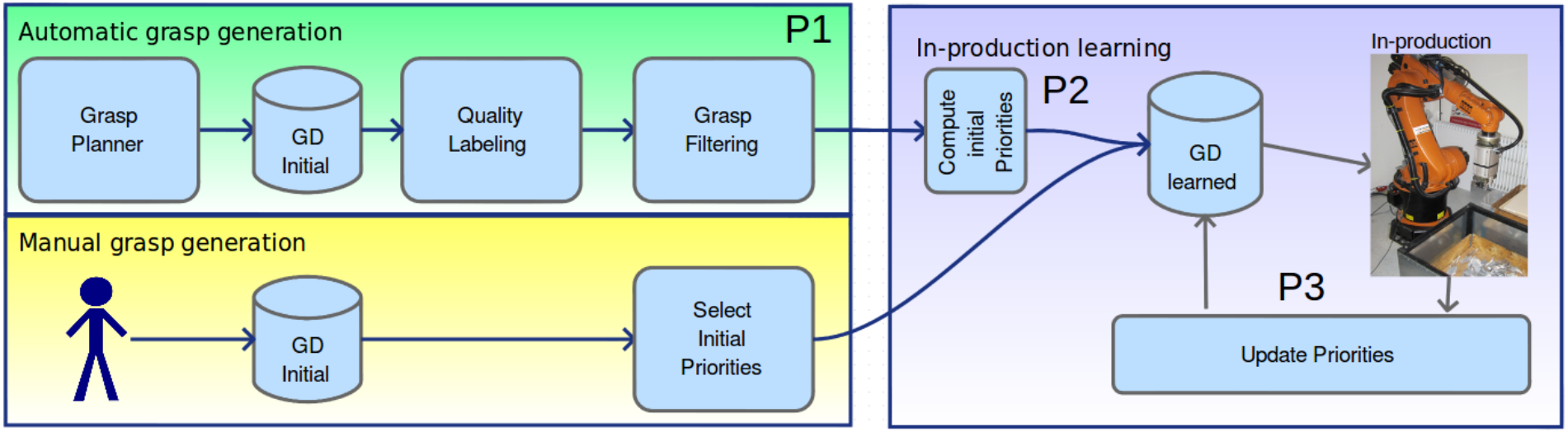
Conclusions

- **Learning can improve bin-picking in an industrial context**
  - Utilizing vast amount of available experience
  - Reduction of error rate by more than 20% in two set-ups

Achievement 2: Replacing Manual design through simulation

- Problem: Potential grasps are designed manually
- Replace by process by simulation



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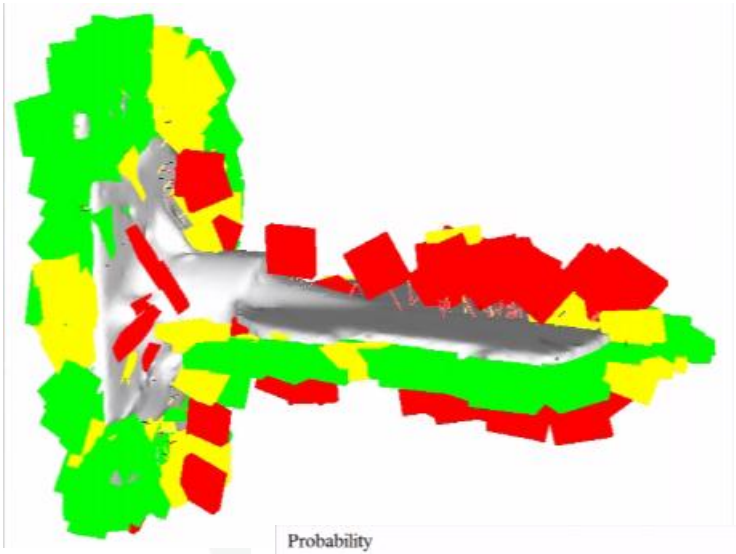

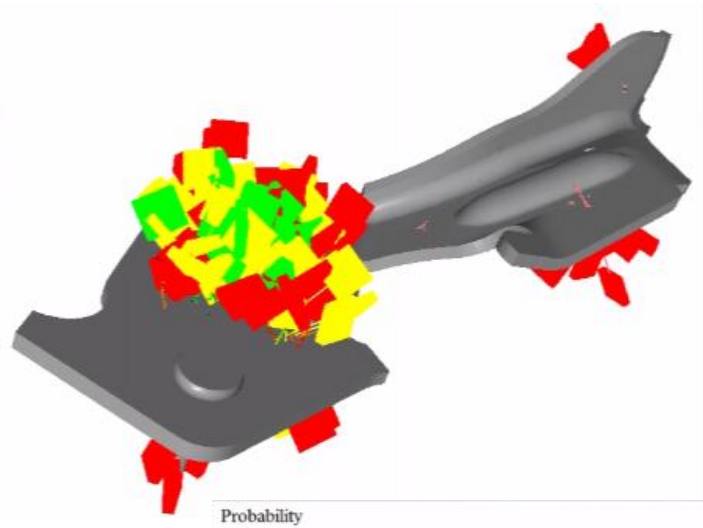

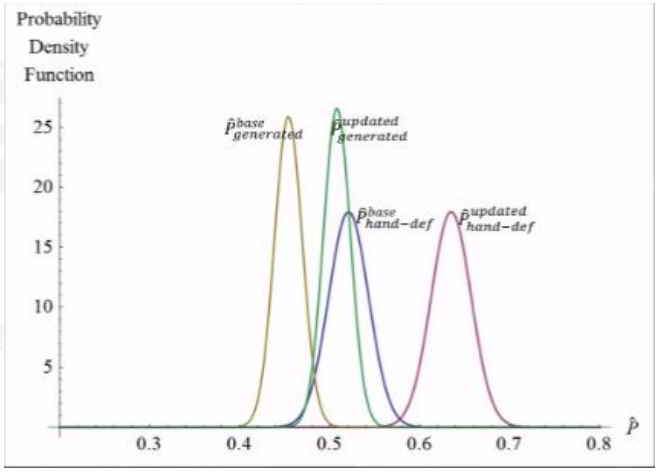

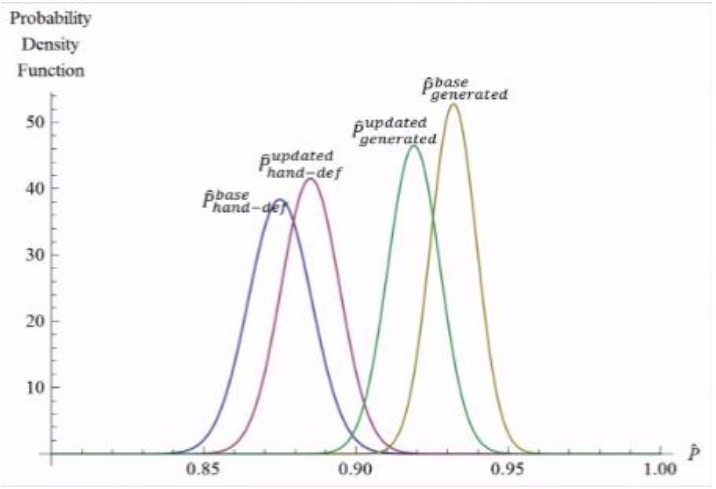

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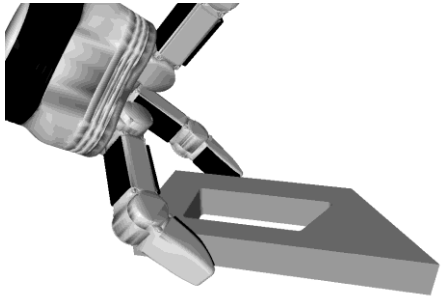
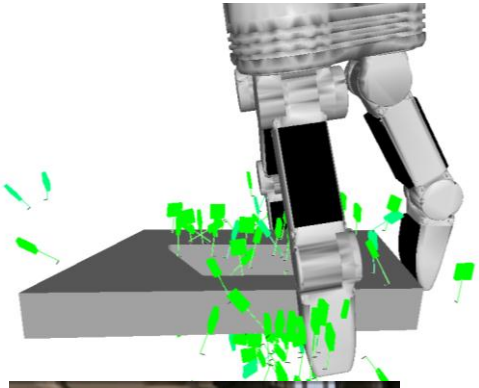
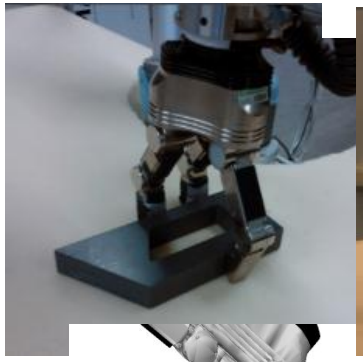
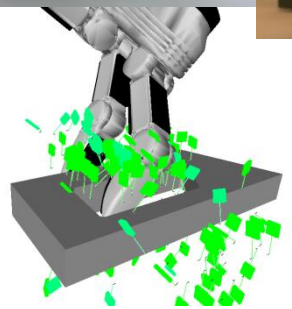
Achievement 3: Show potential of use of dexterous hands in bin-picking

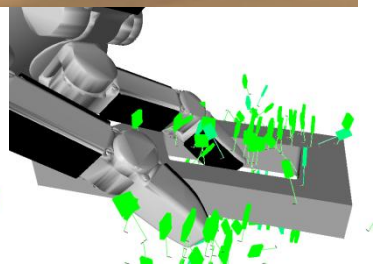
- Sharp edges
- Rather heavy











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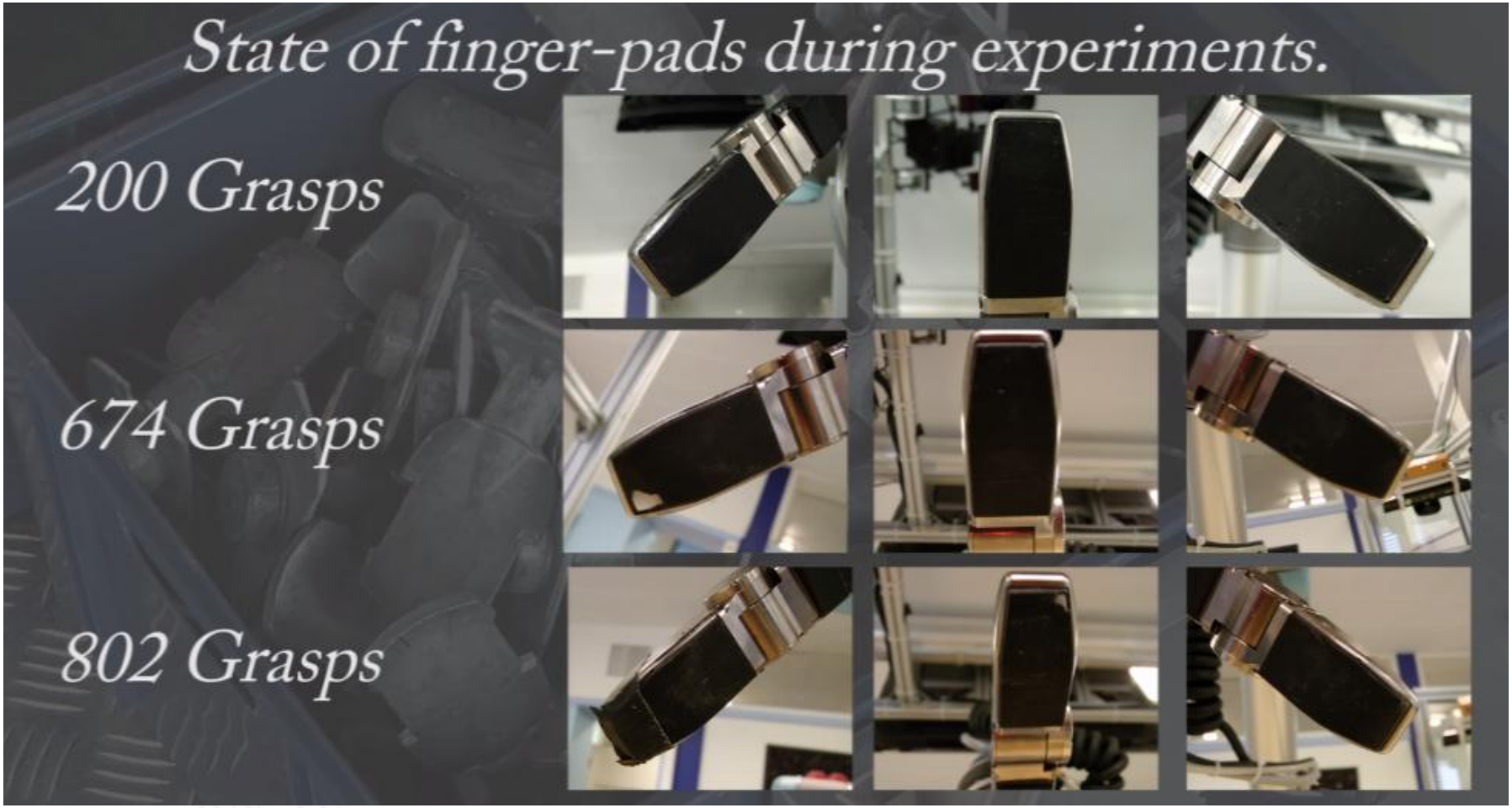
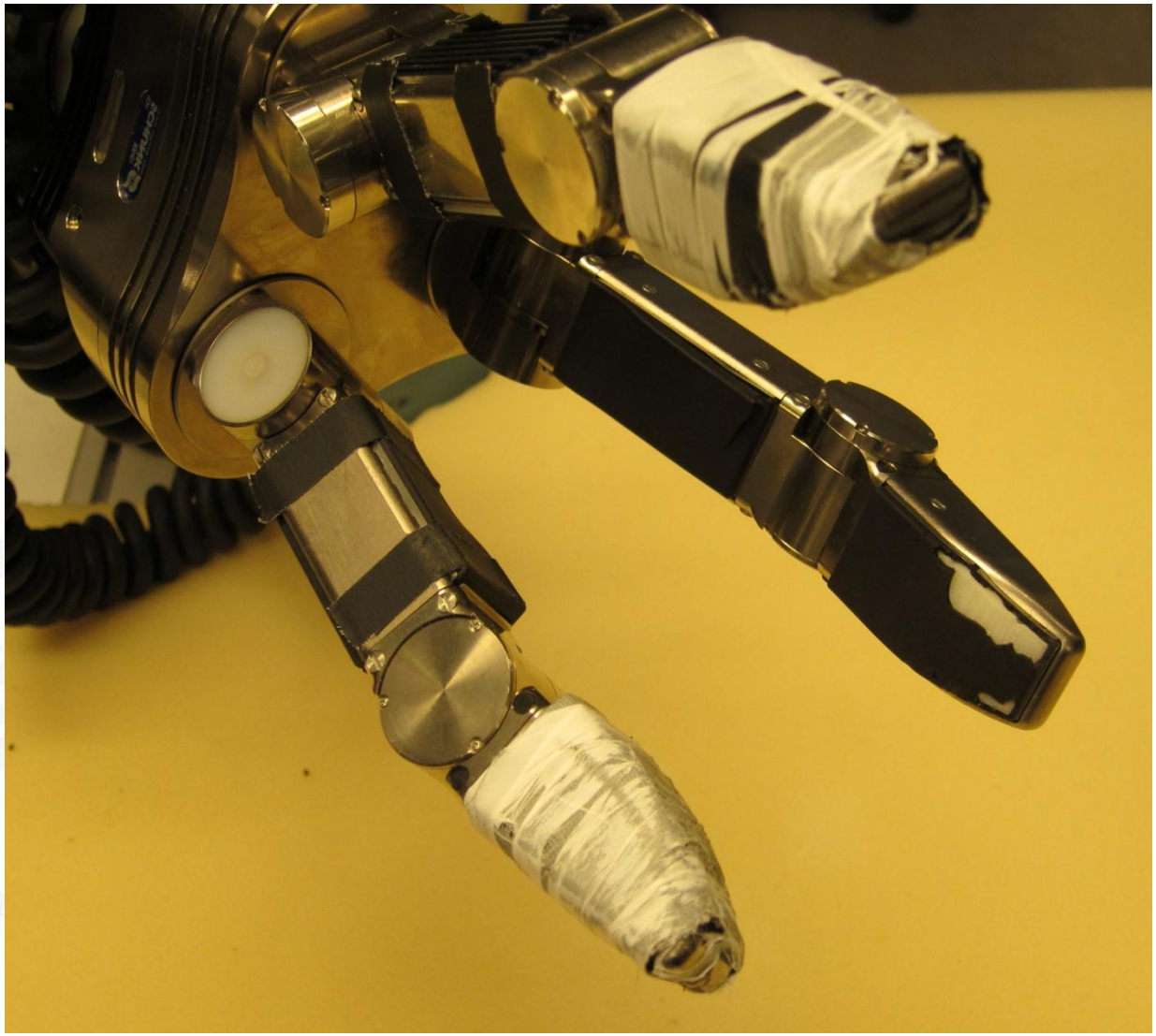
- **Dexterous grippers have a large potential for industrial bin-picking**

But!


State of finger-pads during experiments.
200 Grasps
674 Grasps
802 Grasps

And after more than 5000 grasps



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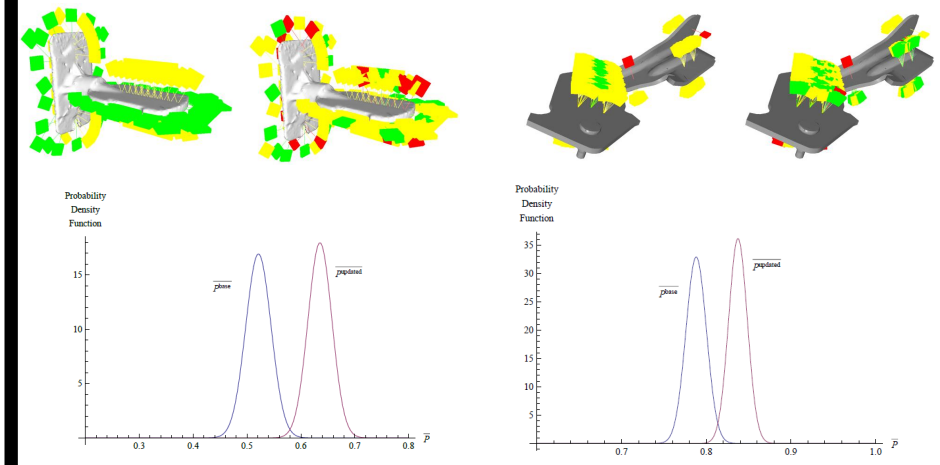
- **But the SDH-2 Schunk hand is not yet ready for use in an industrial context**

Learning can improve bin-picking in an industrial context



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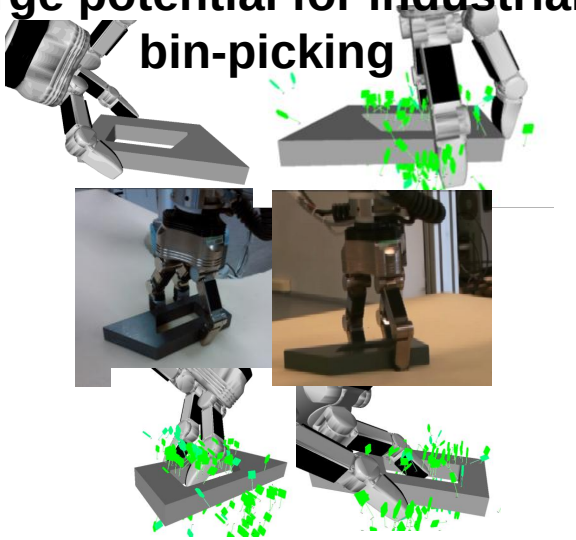

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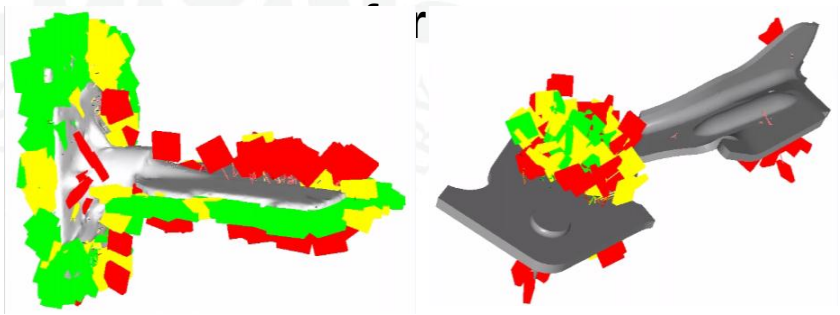

But the SDH-2 Schunk hand is not yet ready for use in an industrial context