KIT-Department of Informatics
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# Exam Answer Sheet

## Robotics II: Humanoid Robotics

on September 24, 2020, 09:00 – 10:00

| Family name: | Given name: | Matriculation number: |
|---|---|---|
| | | |

| | |
|---|---|
| Exercise 1 | out of 7 points |
| Exercise 2 | out of 8 points |
| Exercise 3 | out of 10 points |
| Exercise 4 | out of 8 points |
| Exercise 5 | out of 12 points |

| | |
|---|---|
| **Total:** | |

| | |
|---|---|
| | **Grade:** |

# Exercise 1 *Humanoid Robots*

1. Humanoid robots:
   - 
   - 
   - 
   - 
2. Two advantages:
   - 
   - 

   Two disadvantages:
   - 
   - 
3. Models of human body in the MMM:

## **Exercise 2** *Grasping Synergies and Eigengrasps*

1. Mechanism for the first eigengrasp:

2. Explanation of the mechanism:

   Mathematical description of the mechanism:

3. Amplitude vector **a**:

4. Soft Synergy Concept:

Solved actuation problem:

# Exercise 3 *Grasping*

1. (a) Two other object classes:

   - 
   - 

   (b) Object knowledge of each of the two other classes:

   - 
   - 

   (c) Your approach to grasp an object (for each of the two other classes):

   - 
   - 

2. Steps required:

3. (a) Two ways for generating data:

   - 

   - 

   (b) Block diagram and description:

# **Exercise 4** *Active Perception*

1. Discussion of the difference:

2. Heuristics:
   - 
   - 
   - 

3. Purpose of the costs functions:
   - $\psi_1$:
   - $\psi_2$:
   - $\psi_{3,pos}$ and $\psi_{3,rot}$:
   - Only $\psi_1$:

# Exercise 5 *Imitation Learning*

1. Mirror neurons:

2. Challenges:
   - 
   - 

3. Information to be extracted from demonstration:

4. Task constraints:
   - 
   - 

5. Criteria and segmentation methods:
   - First Level:
   - Second Level:

6. - Canonical system:
   - Transformation system:

7. Can it be learned by multiple demonstrations?