Practice Problems - 07

Practice problems are supposed to help you digest the content of the lecture. It is important that you manage to solve them on your own. Before you write your solutions, you may of course ask questions, and discuss things. In order to prepare for the exam, already now, try to explicitly write down your solutions – clearly and easy to read. Apply definitions properly, and give explanations for what you are doing. That will help you to understand them later when you prepare for the final exam.

I. Sensors

Describe the difference between accuracy and repeatability.

II. Robit Units

1) Describe the functional units of a robot, with the concrete example of an autonomous car (i.e. don't write just the general description, but apply that to the specific case).

2) Do a little research and describe the functional units of a robot, with the concrete example of an industrial arm in a pick-and-place scenario (i.e. don't write just the general description, but apply that to the specific case).

III. True or False?

Mark the following statements as True (T) or False (F)

- The multiplication of two quaternions with zero scalar parts produces a quaternion with the cross product as its scalar part, and the negative dot product as its vector part T F
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- The multiplication of two quaternions with zero scalar parts produces a quaternion with the cross product as its vector part, and the dot product as its scalar part T F

- Cylindrical coordinates are defined adding an additional coordinate (z) to the standard 2D polar coordinates (ρ, θ) T F
- Spherical coordinates are defined adding an additional coordinate (z) to the standard 2D polar coordinates (ρ, θ) T F
- Cartesian coordinates in 3D are defined adding an additional coordinate (z) to the standard 2D polar coordinates (ρ, θ) T F

- Centripetal acceleration and tangent acceleration are orthogonal T F
- Centripetal acceleration and tangent acceleration are parallel T F
- Centripetal acceleration and tangent acceleration are two scalar values that can be summed up T F
- Centripetal acceleration and tangent acceleration are the same concept expressed with two different names T F

- The moment M of force F about point O can be expressed by the cross product of the vector r and the vector F T F
- The moment M of force F about point O can be expressed by the cross product of the vector F and the vector r T F
- The moment M of force F about point O can be expressed by the dot product of the vector F and the vector r T F
- The moment M of force F about point O can be expressed by the dot product of the vector r and the vector F T F

- If three couples act on a body, the overall result is that the net moment equals 0 but the net force is not necessarily equal to 0 T F
- If three couples act on a body, the overall result is that the net force and net moment are equal to 0 T F

- In statics, a couple is defined as two forces of equal magnitude acting in opposite directions, separated by a perpendicular distance T F
- In statics, a couple is defined as two forces of equal magnitude acting in the same direction, separated by a perpendicular distance T F