Robotics 1 - Sheet for Exercise 2

September 9, 2022

With reference to the inverse kinematics problem of robot manipulators, check if each of the following statements is **True** or **False**, and provide mandatorily a *very short* motivation/explanation sentence.

1. When the robot is in a singularity, there is always an infinite number of inverse solutions.

   True ☐   **False** ☐

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2. A 6-dof Cartesian robot with a spherical wrist has two inverse solutions, out of singularities.

   True ☐   **False** ☐

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3. If a closed-form inverse solution is not known in advance, a numerical method cannot provide one.

   True ☐   **False** ☐

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4. A 6R industrial robot may have sixteen inverse solutions in its workspace, out of singularities.

   True ☐   **False** ☐

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5. A planar manipulator with $n \geq 3$ revolute joints has up to n inverse solutions for a positioning task.

   True ☐   **False** ☐

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6. At workspace boundaries, there is never an analytic solution to the inverse kinematics.

   True ☐   **False** ☐

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7. A 3R robot with twist angles α_i different from 0, $\pm\pi/2$, or $\pm\pi$ has no closed-form inverse solution.

   True ☐   **False** ☐

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8. The number of inverse solutions under joint limits is always strictly less than that without limits.

   True ☐   **False** ☐

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9. A 6R spatial robot without spherical wrist or spherical shoulder has no closed-form inverse solution.

   True ☐   **False** ☐

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10. A 3-dof gantry-type robot has only one inverse kinematic solution in its workspace.

    True ☐   **False** ☐