Arbeidsfordeling

Navn I fet tekst vil stå ved siden av arbeidsoppgave utført av person(er).

Develop the forward kinematics of your robotic solution, in Matlab (not Toolbox) or by hand:

i. For the robot arm(s): => **Daniel Klepsvik**

1. Develop the table of DH parameters
2. Develop the transformation mapping end-effector to base (for the first 4 joints only)

ii. For the mobile robot platform(s): => **Alle**

1. Draw a model of the mobile robot with the necessary variables defined (see Fig. 4.1 in Corke for inspiration)
2. Develop the kinematic equations of motion for the mobile robot
3. Discuss whether the mobile robot is holonomic or non-holonomic

iii. For the robotic system in general: => **Josef Hellesen-Heimset**

1. Develop the transformation from the chosen sensor system to the relevant coordinate system on the robot (world, end-effector, mobile robot, etc)

Model your robot kinematics with Peter Corke's Robotics Toolbox in Matlab:

iv. For the robot arm(s): => **Daniel Klepsvik**

1. Demonstrate equivalence of the forward kinematic solution obtained previously in Matlab (not Toolbox) or by hand
2. Develop the differential kinematics (i.e. relating joint and Cartesian velocities), and demonstrate how it could be used
3. Develop the inverse kinematics, and demonstrate how it could be used
4. Demonstrate example motion planning, on a task relevant to your robot design challenge (or similar)

v. For the mobile robot platform(s): => **Johannes Eidsvik**

1. Determine suitable controller(s) to control the mobile robot for your chosen challenge
2. Implement the kinematic model and the controller(s) in Matlab (/Simulink)

iii. For the robotic system in general: => **Stine Hopland**

1. Demonstrate using the sensory system to command the robot, according to the task chosen. That is, show the calculations necessary to make the sensory data (e.g. an apple detected at an arbitrary location from a static 3D camera) useful to the robot (e.g. calculate the joint angles to put the tool point of the end-effector at the apple's location).

Simulate the kinematics of your robot in Matlab:

i. For the robot arm(s), depending on robot design challenge <u>either</u>: => **Daniel Klepsvik og Stine Hopland**

1. Use motion planning to move the robot end-effector through the required positions/orientations for the task chosen, <u>or</u>
2. Use differential kinematics to move the end-effector using velocity commands according to the task chosen

ii. For the mobile robot platform(s): => **Johannes Eidsvik og Josef Hellesen-Heimset**

1. Simulate your chosen challenge, and discuss the simulation results in terms of chosen control strategy and performance
2. Discuss and implement a navigation strategy for the mobile robot for your challenge
3. Discuss how you would implement a localization strategy for the mobile robot for your challenge

Connect the Matlab code to ROS and simulate the physical robot in Gazebo

iii. For the complete system: Model your complete robot system using URDF and visualize the robot in Gazebo, including: => **Helene Andersen og Johannes Eidsvik**

1. Your robot arm(s) mounted on your mobile platform
2. Your mobile platform, with wheels, sensors etc ii. For the robot arm(s): Demonstrate controlling your robot arm(s) in Gazebo over ROS from Matlab, by following along a trajectory calculated in Matlab, or controlled using your differential kinematics implemented in Matlab.

iii. For the mobile robot(s): Demonstrate controlling your mobile robot platform in Gazebo over ROS from Matlab. => **Helene Andersen og Johannes Eidsvik**