**Robotics**

*Prof. Lozano-Pérez discussed two approaches in robotics: reinforcement learning and advanced planning (integrated symbolic and motion planning), which can be used separately or in conjunction. The approaches differ based on characteristics of the knowledge required for a robot to carry out a task and on the variation in tasks for which the approach is well suited.*

*Discuss the differences between these two approaches, including such information as the kind of knowledge needed, how the knowledge is acquired, how the knowledge is represented and used, and how the approach affects the kinds of tasks for which it is best suited.*

Reinforcement Learning: Mapping from state to reward, trial and error, improves with experience in real-time. Random process, relies on randomness, computationally expensive, produces very various results (reproducibility crisis). We have no guarantee that these methods work. Is okay when humans do not know about the task (ie cannot write down the rules in order to achieve a result). Problem: does not support a wide variety of related tasks.

Robot task and motion planning: don’t have to solve ahead of time. Using rules of behaviour of the world and explore them in the particular context we are in. Planning for situations in which there is a lot of variability. Continuous variables : sample-based planners, factorize states and dynamics: STRIP-like planners. Need to describe actions in term of preconditions and effects. Need a lot of handwritten code in order to prevent random exploration. Somebody needs to write the pieces of code for the reward. Very detailed and task specific reward.

Description of the robot, need universal (same as RL, need URDF). Main difference: nature of the physics (RL: simulator, planner: operators, high level description + set of primitive actions). Not clear which one has an advantage.