TEL AVIV UNIVERSITY אוניברסיטת תל אביב

Full Syllabus

Course Title

Algorithmic Robotics and Motion Planning

Lecturer

Prof. Dan Halperin (lecture) and Dr. Michal Kleinbort (recitation)

Semester

A: Fall 2020-2021

Course requirements

The course is geared toward graduate students in CS. There are no formal prerequisites but knowledge of algorithms, data structures, and software 1 is assumed.

Final grade components

50% homework+50% final project;
or if you give a mini-talk then 40% homework+10% mini-talk+50% final project

Course schedule

Class no. / Date	Subject and Requirements (assignments, reading materials, tasks, etc.)
1	Introduction Part I; the configuration space (C-space) of a disc moving among discs-combinatorial analysis
2	Introduction Part II; C-space of robot systems with 2 degrees of freedom (dofs), translational motion planning and Minkowski sums
3	Motion planning and geometric arrangements, general results
4	Piano Movers I, translating and rotating a segment in the plane
5	Basics of exact motion planning: Wrapping up
6	Sampling based motion planning I: PRM; Collision detection
7	Sampling based motion planning II: Single query and the RRT family
8	Path quality: distance, clearance, multi objective optimization, HGraphs
9	Exact motion planning for large fleets of robots I: the unlabeled case
10	Exact motion planning for large fleets of robots II: the labeled case and revolving areas
11	Sampling based planners for multi-robot motion planning (MRMP) and the tensor product: dRRT, dRRT*
12	Near-Optimal MRMP with Finite Sampling
13	Multi agent path finding (MAPF)

Required course reading

TEL AVIV UNIVERSITY אוניברסיטת תל אביב

Full Syllabus

Optional course reading

See the course's website for a bibliography

Comments

In addition to the lectures above there will be several guest lectures as well as mini talks by students on diverse topics in robotics