

91.450 Midterm, Fall 2001

Name:

There are 7 pages in this exam. You have 50 minutes to complete it. Please read the exam before beginning.

Problem	Points	Score
1	10	
2	20	
3	15	
4	15	
5	20 + 5	
6	20	
Total	100 + 5	

Problem 1 (10 points): Robot Paradigms

a) Draw the relationship between the SENSE, PLAN and ACT primitives for the hierarchical paradigm.

b) Draw the relationship between the SENSE, PLAN and ACT primitives for the reactive paradigm.

Problem 2 (20 points): Brief Definitions

Give brief (no more than 2 sentences) definitions of the following terms:

a) teleoperation

b) semi-autonomous control

c) closed world assumption

d) frame problem

e) releaser

Problem 3 (15 points): Reactive paradigm vs. Hierarchical paradigm

a) Briefly discuss one advantage that the reactive paradigm has over the hierarchical paradigm.

b) Briefly discuss one advantage that the hierarchical paradigm has over the reactive paradigm.

Problem 4 (15 points): STRIPS planning

Operator	Preconditions	Add-list	Delete-list
OP1:GOTODOOR(IT, dx)	INROOM(IT, rk) CONNECT(dx, rk, rm)	NEXTTO(IT, dx)	
OP2:GOTHRUDOOR(IT, dx)	CONNECT(dx, rk, rm) NEXTTO(IT, dx) STATUS(dx, OPEN) INROOM(IT, rk)	INROOM(IT, rm)	INROOM(IT, rk)
OP3:OPENDOOR(IT, dx)	STATUS(dx, CLOSED) NEXTTO(IT, dx)	STATUS(dx, OPEN)	STATUS(dx, CLOSED)

Initial state: INROOM(IT, R1)
 CONNECT(D1, R1, R2)
 CONNECT(D1, R2, R1)
 STATUS(D1, CLOSED)

a) Draw a picture of the world given by the initial state.

b) We want the robot to move to R2. Write out the goal state that represents this.

c) Given the difference table, initial state and goal state above, show the steps taken to build a plan to achieve the goal.

Problem 5 (20 points): Designing for the reactive paradigm

Design a reactive robot that will vacuum a room. Fill in the information for the design steps below.

a) Describe the task:

b) Describe the robot:

c) Describe the environment:

d) Describe how the robot should act in response to its environment (list the behaviors):

e) Extra Credit (5 points): List the remaining 3 steps for designing a reactive system:

f) Problem 6 (20 points): Robot programming

Write code for a Handy Bug that will back up and turn in place when both bumpers are hit at the same time. The left motor is in motor port 0, the right motor is in motor port 2, the left bumper is in digital port 9, and the right bumper is in digital port 10.