Robotics: Integrated System Design
Computer Science

Name Key November 18, 2009

CS Quizam (50 pts)

1. (20 pts) Robot Control Architectures
   a. Briefly define the 2 robot control architectures: 1) reactive and 2) deliberative
   b. Which one would have difficulty with the task of delivering mail in an office building – you must explain why to get credit.
   c. Which one works best with the Closed World Assumption – you must explain why to get credit.
   d. What type of robot control architecture is your robot using for the final project? To get full credit you must describe the design of your robot's control architecture.

A. 1) Reactive Stimulus → Behavior → Response

Tightly couples perception to actions
No intervening abstract representation

2) Deliberative Sense → plan → Act

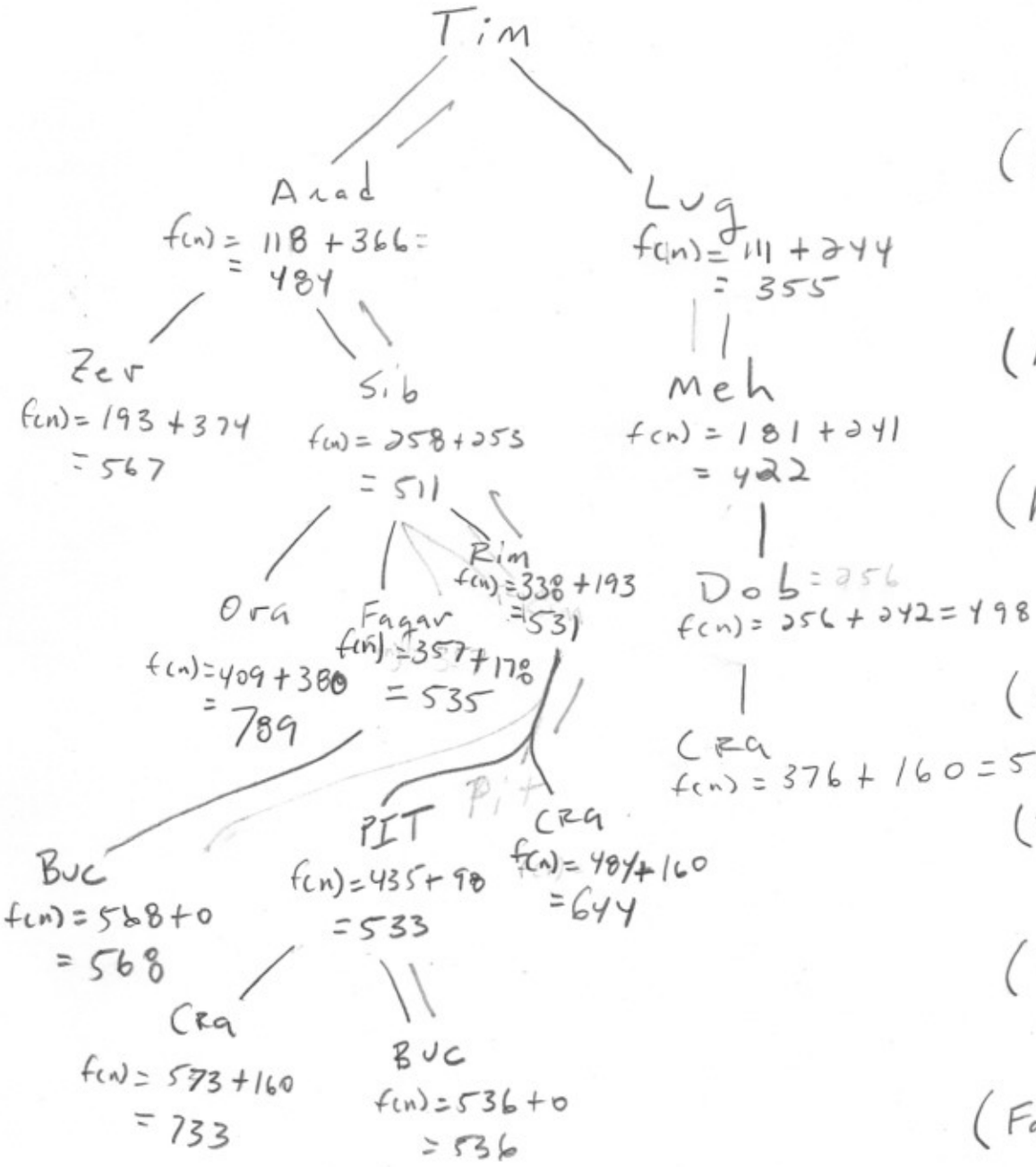
Senses the world, constructs a world model, creates a plan, makes an action, then senses the results of the action

B. Reactive – it does not have a world model to construct a plan for effectively finding a path to deliver the mail to the correct office.

C. Deliberative – since it plans an optimal solution it could execute it accurately assuming NO changes or surprises (closed world assumption)

D. Hybrid – must indicate how reactive and deliberative work together.

2. (10 pts) Repeat the A* search presented in class, but this time start in **Timisoara** (the goal is to get to Bucharest). Show the search tree. Assume you have written the program to avoid revisiting cities along the same path.
   - For each node in the tree show the calculation of the evaluation function, f(n).
   - For each level of the search tree show the open list of nodes.
   - Diagram is on the last page (you may detach the page).



(Lug 355, Arad 484)

(Meh 422, Arad 434)

(Arad 434, Dob 498)

(Dob 498, Sib 511, Zer 567)

(Sib 511, CRa 536, Zer 567)

(Rim 531, Fagar 535, CRa 536, Zer 567, Ora 789)

(PIT 533, Fagar 535, CRa 536, Zer 567, CRa 644, Ora 789)

(Fagar 535, Buc 536, CRa 536, Zer 567, CRa 644, Ora 789)

(Buc 536, CRa 536, Zer 567, Buc 568, CRa 644, Ora 789)

3. (10 pts) Assume an interleaved image representation in RGB color planes. Write the pseudo code for image segmentation. The input to your function will be a specific area within the RBG color cube.

```
for (i= = 0; i< numberRows; i++)
  for (j= = 0; j<numberColumns; j++) {
    if (((ImageIn[i][j][RED] >= redValueLow)
 && (ImageIn[i][j][RED] <= redValueHigh))
      &&((ImageIn[i][j][GREEN]>=greenValueLow)
         &&(ImageIn[i][j][GREEN] <= greenValueHigh))
      &&((ImageIn[i][j][BLUDE]>=blueValueLow)
 &&(ImageIn[i][j][BLUE] <= blueValueHigh))) {
             ImageOut[i][j] = 255;
    }
    else {
      ImageOut[i][j] = 0;
    }
}
```