

# CS 3630 Spring 2007

## Practice Test 2

**Instructions** Put your name and GTID on every page (starts with 901). If you make a mess, clearly mark your final answer. Answer the short questions concisely but do show your derivation.

### Pinhole Cameras

Suppose you have a digital camera with a 200 mm. zoom-lens, and a  $5\text{cm} \times 5\text{cm}$  CCD sensor with  $1000 \times 1000$  pixels. Where in the CCD will a 3D point  $(X, Y, Z)$  be projected? Give the answer as a function from  $X, Y, Z$  to pixel coordinate  $u, v$ .

### Stereo

Derive the basic stereo equation, i.e., given the image projections  $(u_L, v_L)$  and  $(u_R, v_R)$  of a 3D point  $(X, Y, Z)$  in respectively the left and right image, give equations for  $X, Y, Z$ . Assume the baseline is  $B$  and the focal length  $f$ .

### Behavior-Based Control

Describe briefly what the subsumption entails and give one advantages and one disadvantage with respect to potential fields.

## **Reinforcement Learning**

The reinforcement learning applet on Frank's homepage shows an agent acting in a deterministic world. Look at the optimal Q-values after learning (described as colors, press r to add a reward, press l to learn) and explain why the agent does what it does. Now, look at the value function. How would you expect the value function to change if actions were unreliable, e.g. with probability 10% a different action than the one chosen would be executed.