Exam 2
Assigned: 05/04/2004
Due: 05/07/2004 (Midnight)

Problem 1 *RANSAC*

Given a set of measurements and a hypothesized model, the RANSAC algorithm estimates the parameters of the model from subsets of the measurements, each subset chosen uniformly at random. It then tests each fit against the remaining measurements outside of the corresponding subset and retains the best fit as its solution. How many points should be included in each subset of the RANSAC algorithm? Explain.

Problem 2 *Particle Filtering*

What is sample impoverishment and how is it avoided?

Problem 3 *Image-Based Rendering*

In image-based rendering the plenoptic function models the complete flow of light through space. It is parameterized by 3D viewing location (x, y, z) and direction (θ, ϕ), and may also vary with wavelength, λ, and time, t. How is this 7-dimensional parametrization of the plenoptic function, $P(x, y, z, \theta, \phi, \lambda, t)$, represented in only 4 dimensions using light fields? Does the light field representation make any assumptions about the scene?

Problem 4 *Feature Selection*

Solve exercise 22.4 in Forsyth and Ponce.

Problem 5 *Example-Based Vision*

What typical effect do you expect from increasing the number of hash tables in LSH, while keeping the number of bits per hash key fixed? Briefly explain.

Problem 6 *Linear Dynamic Models*

Multiple dynamic models can be used when tracking with linear dynamic models; describe an example scenario when this might be useful and how the different models may be integrated. Is this solving the data association problem as described in the text?

Problem 7 *k-Means Data Clustering*

Solve problem 14.1 of Forsyth and Ponce.

Problem 8 *Model Selection with EM*

Does EM address the model selection problem? If so, how?

Problem 9 *Tracking Periodic Motion*

If a trajectory has a known periodic motion structure, would it be advisable to track it with a particle filter, or some other method? Explain your rationale.

Problem 10 *Course feedback for Trevor (optional)*

(a) **Topic coverage.** Did the course cover what you expected/needed? Does it fit well with other vision courses in the department or MIT?

(b) **Breadth/Depth.** Should more or less technical detail be covered in lectures? In problem sets?

(c) **Pace/Pressure.** Should next year's students suffer more or less than this year?

(d) **Lecture Style.** How can I improve lectures? Should I spend more time working specific problems on board, or conveying the big picture?

(e) How well did the guest lecturers do? Was it distracting or useful to hear different perspectives/styles?

Responses to this question in any format are welcome, including verbal or anonymous.