CSci 6967 and ECSE 6969
Image Registration
Spring 2004
Class 20 — Mutual Information
March 30, 2004

Discussion Questions

This document presents some questions to help frame the discussion. A more detailed summary of mutual information will be distributed at the end of class.

1. What is the challenge of multimodal registration?
2. Why aren't SSD and normalized SSD appropriate measures for multimodal registration?
3. How can you convert an image to a probability density function?
4. What is entropy, why is it a good measure of image similarity, and when can it be bad?
5. What is mutual information, what do the individual terms mean in the mutual information equation, and why might it be a good measure of image alignment?
6. How can we formulate an objective function for registration using mutual information? Why can this be optimized effectively?
7. What algorithms have been proposed for optimizing mutual information? How effective are they?
8. What are the weaknesses and limitations of mutual information and the associated algorithms?
9. Do you believe all of this?

Looking Ahead

- There will be no Class 21 on Friday, April 2nd.

- Class 22 on Tuesday, April 6th, will begin the discussion of video sequence / motion estimation algorithms and mosaicing. Two papers will be distributed in class 20: Bergen et al. [1] and Sawhney et al. [3]. In reading the Bergen paper, skip Sections 3.2 and 3.3. We will begin our discussion with that paper.

- In Class 23, Friday, April 9, we will compare the approach in the Sawhney paper with the approach in the Brown and Lowe [2] paper distributed for Class 19. For Class 23, please turn in a summary of one of these two papers, using the same guidelines that you used in preparing your summary of a mutual information paper.

References

[1] J. Bergen, P. Anandan, K. Hanna, and R. Hingorani. Hierarchical model-based motion estimation. In *Proceedings of the Second European Conference on Computer Vision*, pages 237–252, 1992.

[2] M. Brown and D. Lowe. Recognising panoramas. In *Proceedings of the IEEE International Conference on Computer Vision*, 2003.

[3] H. Sawhney, S. Hsu, and R. Kumar. Robust video mosaicing through topology inference and local to global alignment. In *Proceedings of the Fifth European Conference on Computer Vision*, volume II, pages 103–119, 1998.