Liz Marai

Reading and Research Spring 2000
The Wrist Project

05/15/2001

1 Goals (proposed and achieved)

This was my fourth semester at Brown, therefore the priority number 1 was finishing my research comp, presenting it, and turning in the associated research paper (see the annex for specifics). I am done with all of the above. I'm working on the publishable version.
The distal radioulnar ligament project is complete (6 patients out of 9) - rotation angles and insertion point study included. We found consistent alterations in the length of the dorsal ligament between healthy and injured wrists (see research report). If Trey Crisco will provide corrected bone and motion data for the remaining 3 patients, all i need to do is run the programs (align, chop, deform, shortest paths) on the new data sets. The code i have written might need some cleaning, but i will take care of that (summer).
I have completed an additional contact area study (iso-contours included) for the 6 patients with malunited distal radius fractures. There is an evident shift of the ulna contact area between healthy and injured wrists; we concluded that the injured radius became shorter either during the fracture or during the healing process.
The scapholunate ligament experiment was a partial success. I got the test case running, then i got stuck for a while trying to get the medical papers with insertion point data, and after all the trouble it turned out that the structure of the scapholunate ligament is different from the structure distal ligaments (multiple insertion points, perpendicular fibers). Although I am sure the shortest paths would provide better ligament information than the generic distance maps, the choice and placement of insertion points is a serious issue. We will probably discuss it with Trey when time comes?

While dealing with the scapholunate ligament issue I had to adjust the align/chop/deform code for the carpal bones. We have reasonable manifolds for all 4 data sets. There is a lot of anatomical variation between patients. A better canonical model (average of the patients we have?) seems to be needed. I obtained better results by going back and working directly with the mesh generator instead of the manifold mesh; the fitting code needs however further work. It would be nice to be able to use the raw CT data, instead of the NUAGES output.
We have started looking into automated segmentation and bone surface reconstruction via manifolds. Right now it seems we will be working mostly directly on the distance field representation, and not on the manifolds. We may use the Bayesian tissue classification algorithm.

2 Evaluation of success

It looks like I covered pretty much all I wanted to do this semester. It's either that I'm writing more reasonable proposals ;-), or that I had more time to work on my research. Grade proposed: A.

3 Annex

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Reading & Research Spring 2001
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Liz Marai, 31 Jan. '01


Goals
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 - Research Comp.;
 - research paper;
 - start exploring segmentation/surface reconstruction of wrist bones using
manifolds.
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Intermediates and deadlines
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 ---> Feb. 3rd ( done with distal ligaments)
    - finish getting ("anatomical") rotation angles from data;
    - finish insertion point study;
    - salvage whatever I can from damaged data sets (3 out of 9).


 ---> Feb. 24th ( deal with scapho-lunate ligaments)
    - generate manifolds for scaphoid and lunate bones (4x2 data sets);
    - find insertion points for SL ligament;
    - adjust ligament algorithm to work for scapholunate ligament;
    (test case running Feb 15th)
    - get Trey to look at what we have

 ---> Feb. 28th (done with SL ligaments)
    - generate SL ligament lengths for all data sets


 ---> Mar. 15th
    - prepare presentation


 ---> Apr. 15th
    - have research paper


 ---> May 15th
    - look into segmentation/surf.reconstruction using manifolds:
         automatic/manual alignment?
         mapping of points to bones?
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