Motion Tracking for Medical Imaging

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Acquisition of medical images (e.g. PET, MRI, etc.) often requires the patient to remain motionless for long periods of time. Even the most compliant patients can't meet this requirement. Motion compensation methods are used to solve or at least alleviate the problem. To compensate for motion, we need to track the motion and incorporate the information into an image reconstruction algorithm. This project will focus on the motion tracking part. Our group aims to recreate variations of different techniques using a controlled test setup and perform a comparison of the results.

The project goals are organized by tier of difficulty.

1. **Track the motion of an object using two cameras and a geometric target.**
   This setup would entail the use of a geometric target (such as a grid pattern or other shape) that can be precisely manipulated in six degrees of freedom. An algorithm would be developed that accepts as its input four still images of the target (two images of the starting state, and two images of the ending state), and produces the six component motion as its output.

2. **Track the motion of an object using one camera and a geometric target.**
   This goal expands on the results of the first by attempting to decipher the components of motion with a single camera. The same target would be used from the first goal. The inputs to this algorithm would be two still images from the same camera (starting and ending image), and the output would be the six components of motion.

3. **Track the motion of an object using two cameras and feature detection.**
   This goal would attempt to decipher the components of motion of a moving object without the aid of a geometric target. Two cameras would be used to detect key features of the moving object, track these features, and return the net motion.

References

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