Towards an Image/Vision-guided System for Virtual Models

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Background

Nowadays many image guided surgeries involve the use of position trackers and computer vision in order to visualize the motion of medical equipment to improve application accuracy.

Implementation of a computer vision system using readily available resources will aid research in image guided therapy (IGT), as well as development of a commercial product for usage in New Zealand hospitals.

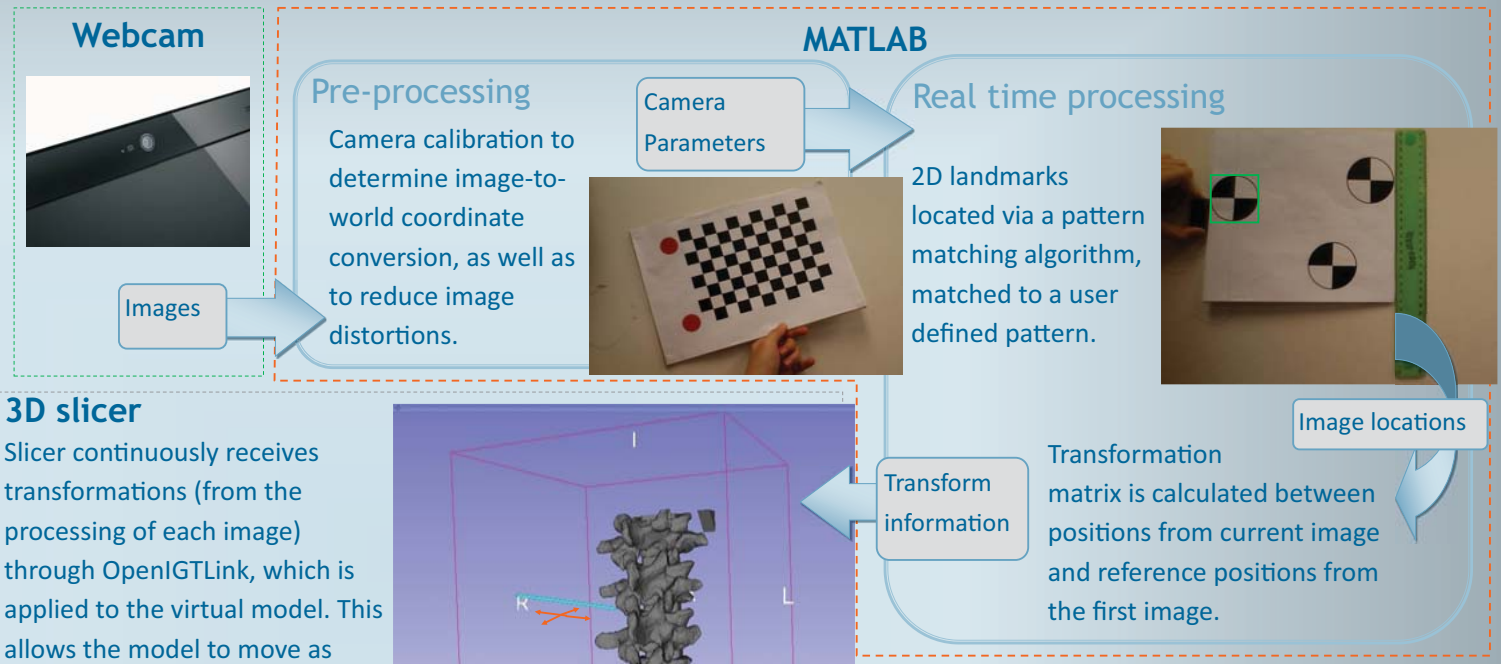
In this project, a computer vision system was created using MATLAB and 3D slicer. The two were interfaced using the OpenIGTLink module embedded in slicer, which enables easy importing of 3D tracking data of various devices in the operating room.

Aim

To construct a computer vision system that can:

- Track user specified landmarks
- Translate true motion in a 2D plane into motion in a 3D virtual scene.

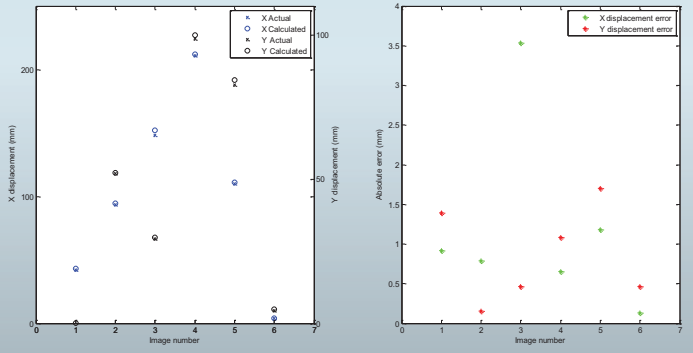
Method



Results

Left: Comparison of x and y displacements between those calculated using the MATLAB algorithm, and the actual displacements between images.

Right: Absolute errors between calculated and actual displacements.



The maximum error between calculated and actual displacements is 4mm. This illustrates that the algorithm can calculate displacements, hence transformations, accurately with minimal error.

Conclusions and Future work

A computer vision system was created that could track user defined planar objects to two degrees of freedom (x and y translational motion). The tracked points were then translated into corresponding motion of a virtual object in 3D slicer.

By implementing stereovision, this system could be further developed to track object motion with six degrees of freedom.

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