MICRON RANGE-OF-MOTION VISUALIZATION

Check Point Presentation

Preetham Chalasani

Department of Computer Science
The Johns Hopkins University
pchalas1@jhu.edu

Mentors - Dr. Russell Taylor, Marcin Balicki, Balazs Vagvolgyi
SUMMARY

- Need: Surgeons don’t always know the position of the micron in its range of motion.

- Goal: Develop a visual alert assistance system for the surgeons dealing with very small anatomy.
MICRON

- Tremor Cancellation
- Move actively to compensate

Developed in CMU
### Timeline

<table>
<thead>
<tr>
<th>PHASE - I</th>
<th>PHASE - II</th>
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<tbody>
<tr>
<td><strong>Week Starting with</strong></td>
<td><strong>Spring Break</strong></td>
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<td>Feb. 4</td>
<td>Apr. 8</td>
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<td>Feb. 11</td>
<td>Apr. 22</td>
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<td>Feb. 18</td>
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<td>Feb. 25</td>
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<td>Mar. 4</td>
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<tr>
<td>Apr. 29</td>
<td>May 6</td>
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</tbody>
</table>

- Understanding CISST and SteroVision libraries
- Setting up development Environment
- Understanding the Existing Framework
- Create a test Application
- Include some overlays
- Communicate with the micron and get the information
- Develop Application using simulated data
- Feedback
- Alert system
- Feedback
- Debugging
- Improve the tracker

- Spring Break
- Understanding CISST and SteroVision libraries
- Setting up development Environment
- Understanding the Existing Framework
Maximum

Improve the robustness.

Expected

Integrate the tool tracker

Visual alert assistance system

Get feedback from the surgeons.

Minimum

Test application running and have some overlays displayed.

Get Information form Micron

Summary
Background
Progress
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CURRENT PROGRESS

Internal Component Connections
Dummy Source
Random Data
Transformation between Frames
Add Overlays
Get motion Information from Micron
INTERNAL COMPONENT CONNECTION

Client Component

- **Function objects**
  - FunctionVoid
  - FunctionWrite
  - FunctionRead
  - FunctionQRead

- **Event handlers**
  - CommandVoid
  - CommandWrite

Server Component

- **Required Interface**
  - FunctionVoid
  - FunctionWrite
  - FunctionRead
  - FunctionQRead

- **Provided Interface**
  - CommandVoid
  - CommandWrite
  - CommandRead
  - CommandQRead
  - MultiFuncVoid
  - MultiFuncWrite

Source: https://trac.lcsr.jhu.edu/cisst/wiki/cisstMultiTaskTutorial
FRAMES
ASAP ANGLES

YAW

\[
R_z(\alpha) = \begin{pmatrix}
\cos \alpha & -\sin \alpha & 0 \\
\sin \alpha & \cos \alpha & 0 \\
0 & 0 & 1
\end{pmatrix}.
\]

PITCH

\[
R_y(\beta) = \begin{pmatrix}
\cos \beta & 0 & \sin \beta \\
0 & 1 & 0 \\
-\sin \beta & 0 & \cos \beta
\end{pmatrix}.
\]

ROLL

\[
R_x(\gamma) = \begin{pmatrix}
1 & 0 & 0 \\
0 & \cos \gamma & -\sin \gamma \\
0 & \sin \gamma & \cos \gamma
\end{pmatrix}.
\]
PROBLEMS FACED

- Few complications with cisstVector
- Access to Micron
- 3D transformation not supported by CISST
- Build/Compile Delay
Maximum

Improve the robustness.

Show the workspace of the micron tip.

Audio Feedback

Expected

Integrate the tool tracker

Visual alert assistance system

Get feedback from the surgeons.

Minimum

Test application running and have some overlays displayed.

Get Information from Micron

Summary | Background | Progress | Deliverables | Dependencies | Timeline | Reading List
## DEPENDENCIES

<table>
<thead>
<tr>
<th>Dependency</th>
<th>Source</th>
<th>Status/Comments</th>
<th>What If ??</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC or Laptop</td>
<td>Self</td>
<td>Acquired</td>
<td>Project Delayed</td>
</tr>
<tr>
<td>CISST and Stereo Vision Libraries</td>
<td>Open Source-Online</td>
<td>Installed</td>
<td>Custom Libraries</td>
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<tr>
<td>QT Creator - IDE</td>
<td>Open Source-Online</td>
<td>Installed</td>
<td>Use other free IDEs available</td>
</tr>
<tr>
<td>Material to understand Micron better</td>
<td>Dr. Russel Taylor</td>
<td>Acquired</td>
<td>Learn Myself</td>
</tr>
<tr>
<td>Documentation of previous work</td>
<td>Marcin Balicki/Balazs Vagvolgyi</td>
<td>Acquired</td>
<td>Learn myself</td>
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<tr>
<td>Access to micron</td>
<td>Marcin Balicki/Balazs Vagvolgyi</td>
<td>In progress</td>
<td>Work on simulated data/Project Delayed</td>
</tr>
<tr>
<td>Access to Stereo video Microscope</td>
<td>Marcin Balicki/Balazs Vagvolgyi</td>
<td>In progress</td>
<td>Work on simulated data/Project Delayed</td>
</tr>
</tbody>
</table>

**Summary**

**Background**

**Progress**

**Deliverables**

**Dependencies**

**Timeline**

**Reading List**
### UPDATED TIMELINE

<table>
<thead>
<tr>
<th>Week Starting with</th>
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QUESTIONS?