Micron Range-Of-Visualization Behavior

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Problem

- Micron is a fully handheld microsurgical tool, which provides the surgeon a method to more precisely control μ-level hand movements. However, when the micron tip goes out of its workspace, it stars moving erratically.

- Surgeon while operating cannot keep track of his hand movements to check if the tip is in its workspace.

- Workspace is not always of the same dimensions.
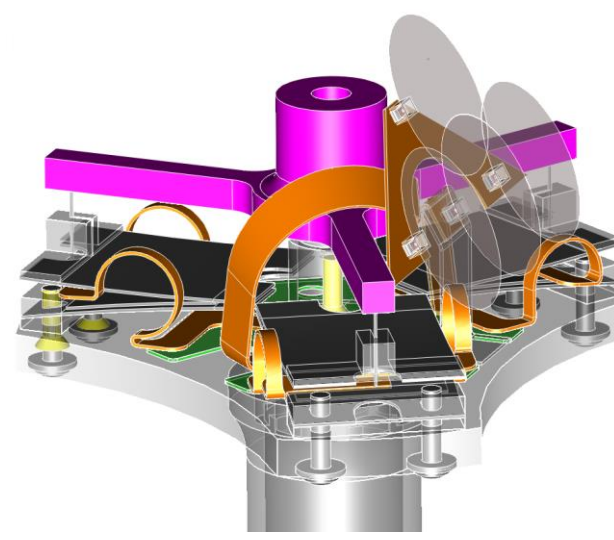
Significance

- Micron has a very limited range of motion, so during critical retinal microsurgeries, the application helps the surgeons to stay within the workspace.

- Since, micron is still in research phase, this application will help the user to track the location of the tip w.r.t home location.

Solution

- Display micron workspace – Cube or Sphere

- Track the displacement of the micron tip from the home position, including depth.

- Interface to set the orientation of the ASAP (Yaw, Pitch and roll)
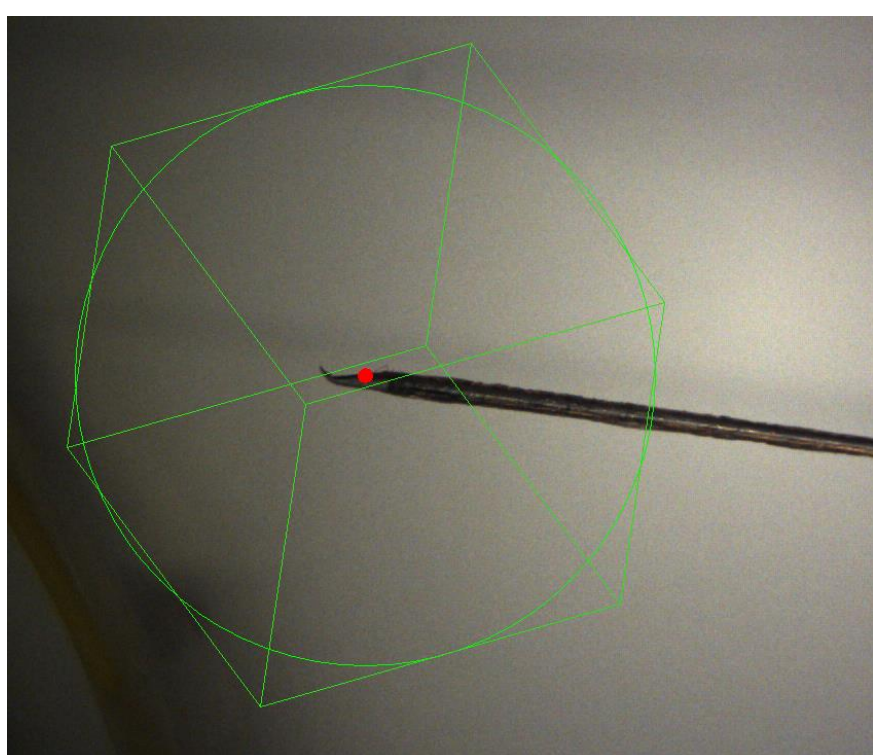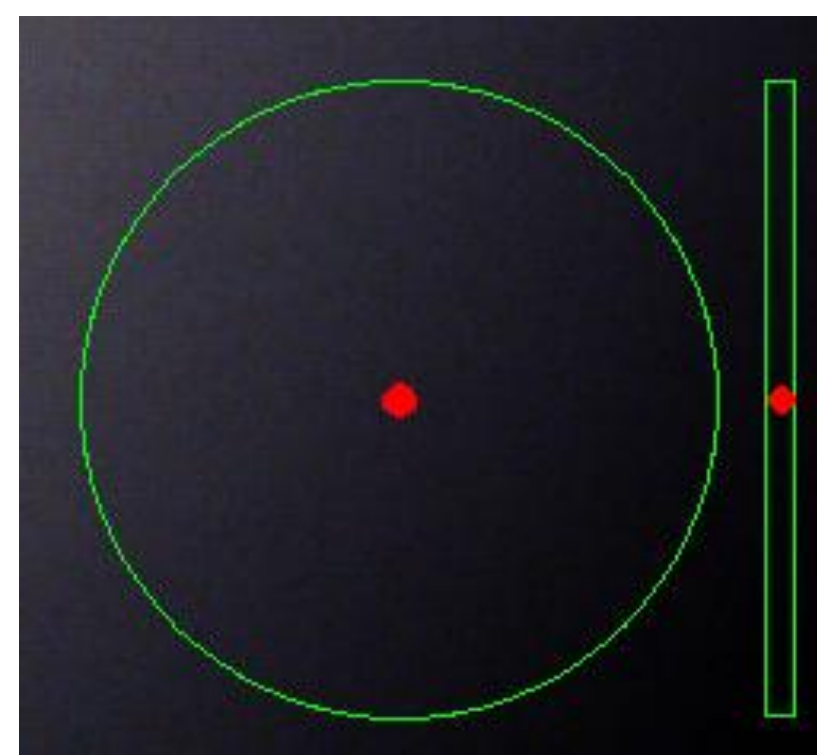
Fig. 1. Sphere and Cube workspace

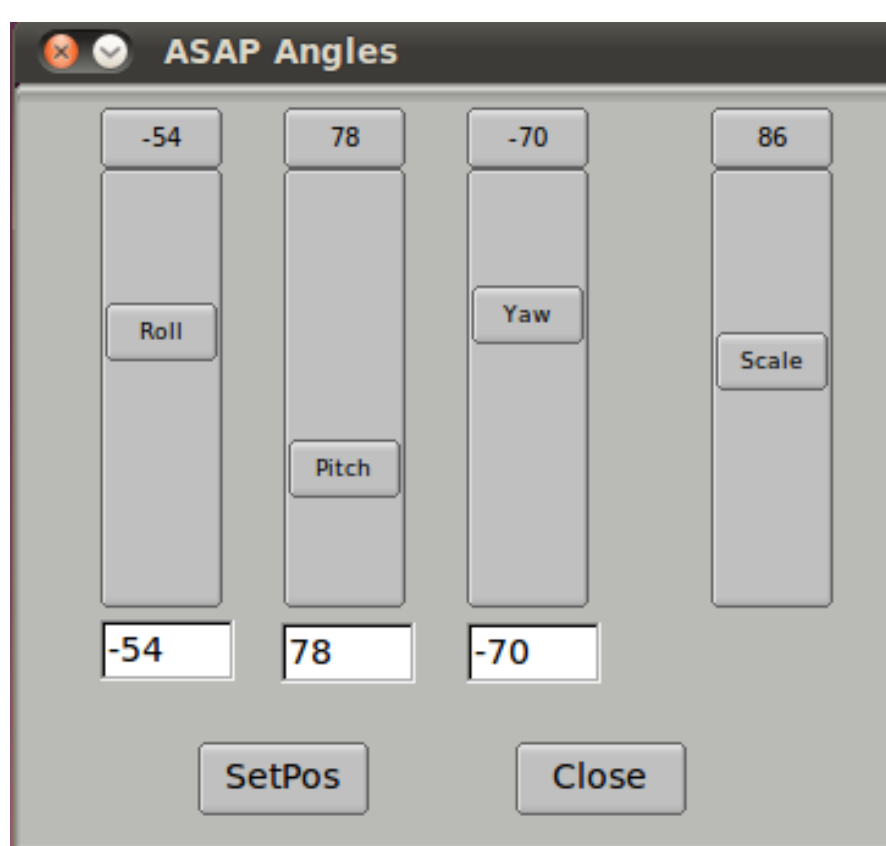Fig. 2. Circle and depth overlay representing virtual micron tip position w.r.t to the home position

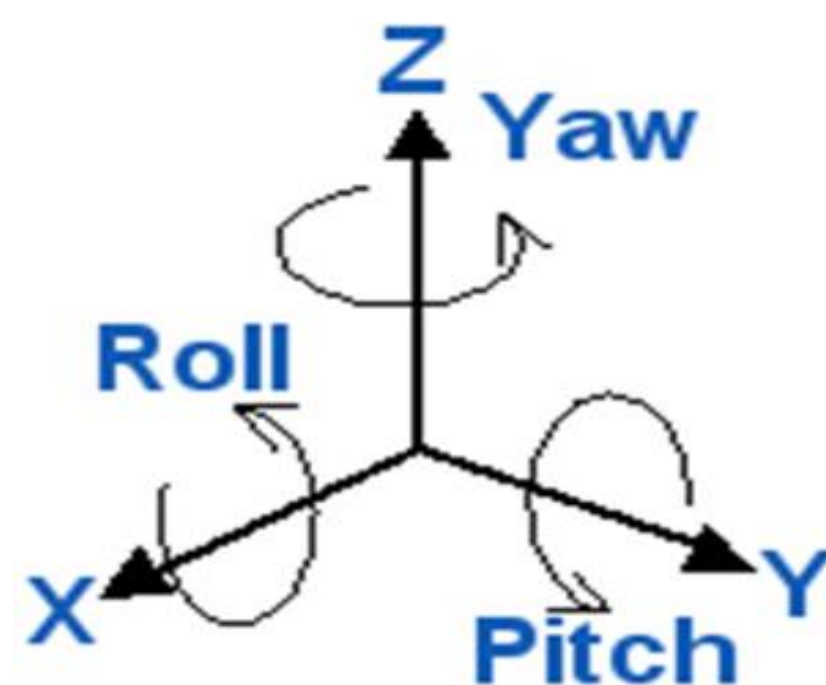Fig. 3. ASAP orientation Interface

Fig. 4. Three angles of rotation

Acknowledgements

- I would like to thank my mentors for their support throughout the project. Their input and guidance was immeasurable.

- I would specially like to thank Balazs for his valuable help and suggestions along the way.

Method

- Circle overlay drawn with the center of the circle as the home location and a red dot moves inside this circle, representing the tip position.

- The micron tip can be in one of the three regions, inside the circle Safe. Warning. Alert. Also, OpenAL libraries are used to play sounds according to the tip position.

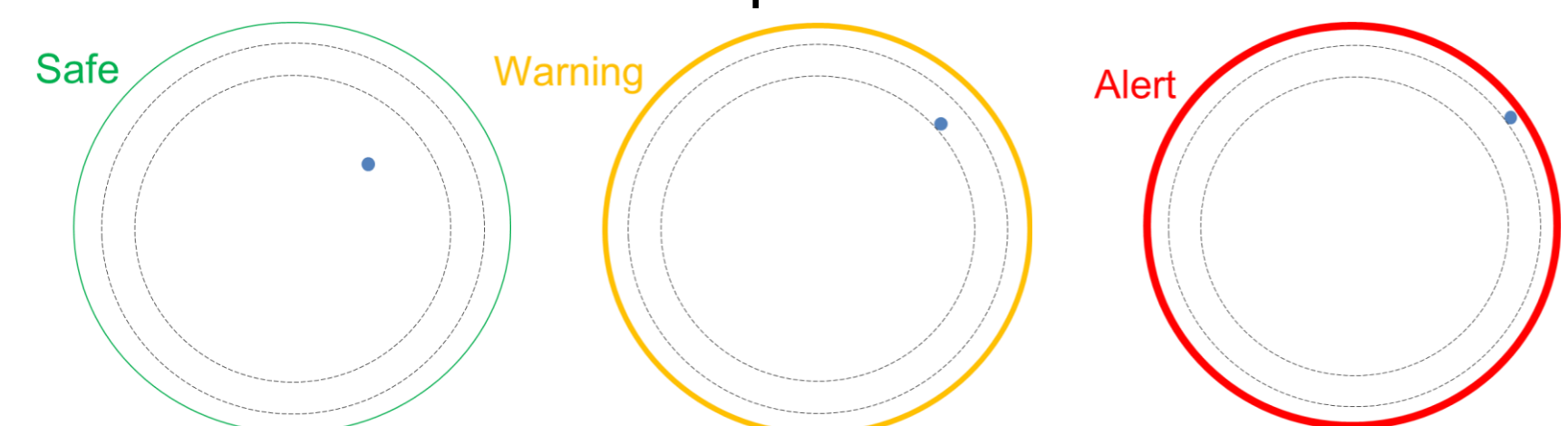- Cube display is a isometric projection of a 3D cube drawn around the micron home tip.

Fig. 5. Three regions inside the circle overlay, Safe, Warning, Alert

Results

- The application was tested during a bunny experiment on 29th march, 2013. The data on which the application was tested is :-
  - Workspace – Cylinder
    - Height : 4mm   Radius : 2mm
  - Scale : 1mm = 100px
  - ASAP Orientation
    - Yaw : 22.5   Pitch : 50   Roll : -10

Future Work

- ASAP orientation can be retrieved, initially, from the gyro sensors. Later, the same ASAP interface can be used to control the ASAP.
- Workspace of the micron is a 2D isometric projection, which can be rendered as a 3D figure.

Lessons Learned

- Back up code to your personal repository

- Document your code at every moment

- Always keep upgrades and future work in mind