Robot Automation in Dentistry

Autonomously drill a tooth using a robotic arm.

Ariel Anders

Advisor: Jacob Rosen
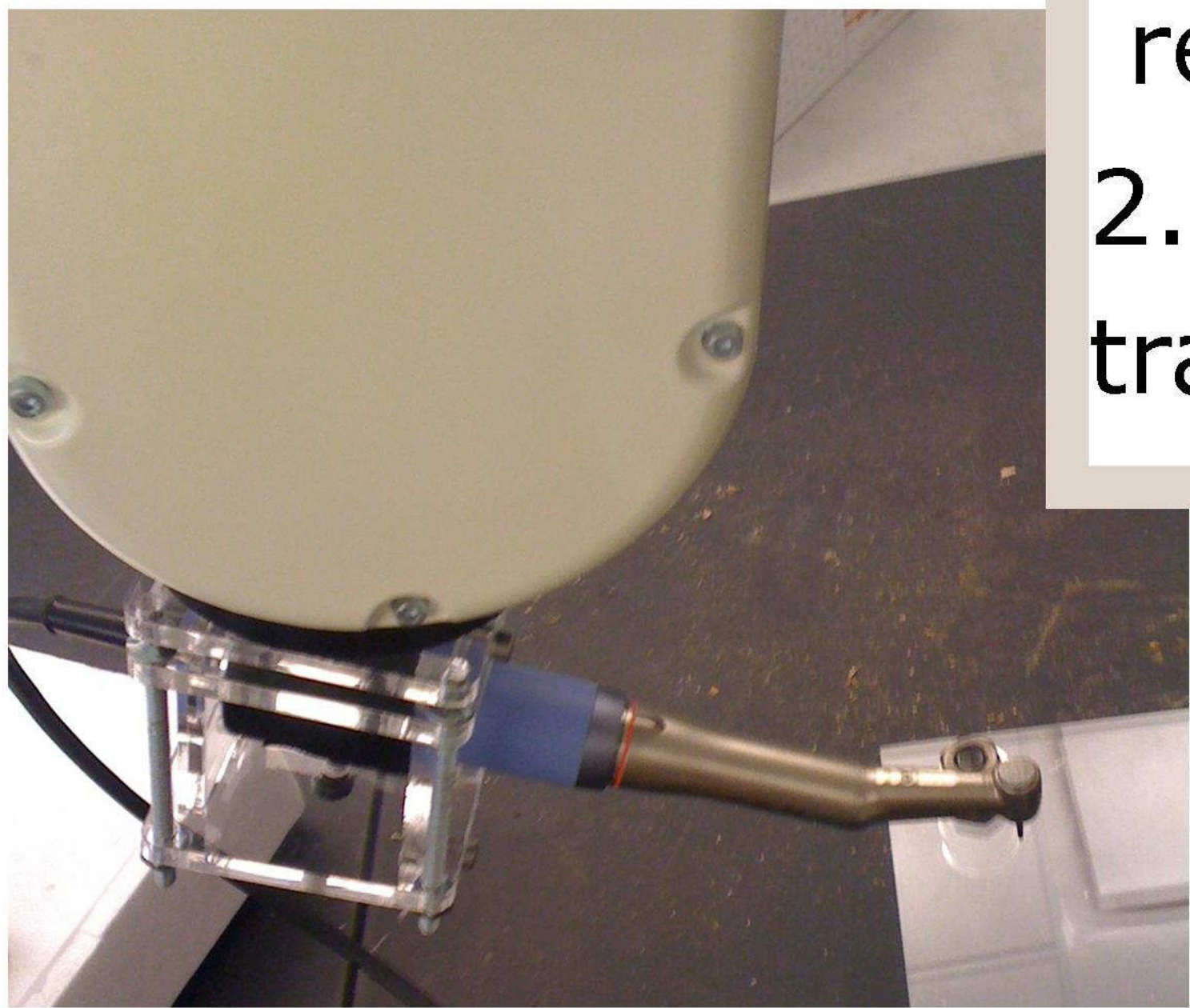
3D Digital Rendering of tooth

MicroScribe MX: precision contact-based 3D digitizing device produces XYZ coordinates or "Point Clouds"

Denso VM60B1G

1. A scanner creates a 3D replica of a tooth
2. 3D CAD software creates trajectories

Robotic Arm with 6 Degrees of Freedom Dental Drill attached

Implementation

3. A script converts trajectories to XYZ coordinates .

4. Using PERL, these points are transformed to robot executable files.

5. The arm, with a dental drill attached, moves through these paths to drill on the tooth.

Reverse Engineering with **SolidWorks**

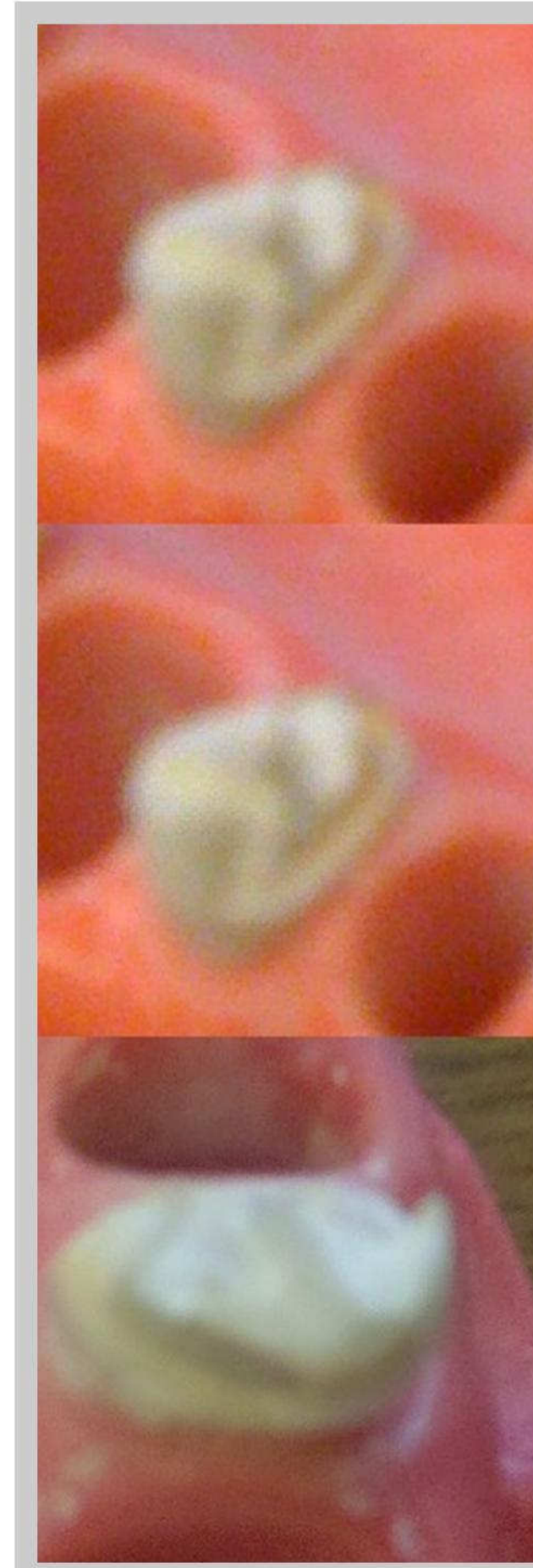**Point Cloud**   **Mesh**   **Trajectories**

Results

Overall, the **first test run** performed to expectations with minimal flaws:

1. The orientation of the tooth was slightly off making one corner not completely drilled.
2. Robot's Spline function for jumping to lower paths caused noise in the center.

An industrial robotic arm, 3D scanner, and software produced promising results in under 10 weeks.

In Conclusion:

Automated tooth drilling is achievable.

Acknowledgements