

**Autonomous University of the
State of Mexico**

Engineering Faculty

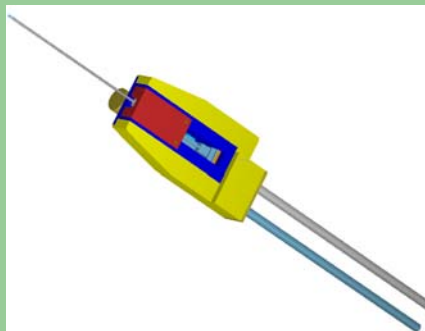


Hepatic Biopsy Robot.

ADVISORS:

Juan Carlos Avila V.

Adriana H. Vilchis G.



Raquel G. Estrada Flores

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Hepatic Biopsy Robot

- Hepatic biopsy
- Justification
- Objective
- Hepatic biopsy performed on dogs
- 3D Model
- Work envelope
- Video
- Reference coordinates and kinematics schema
- Calculation of mass and inertia moments
- Fabrication of Prototype Parts
- Future work



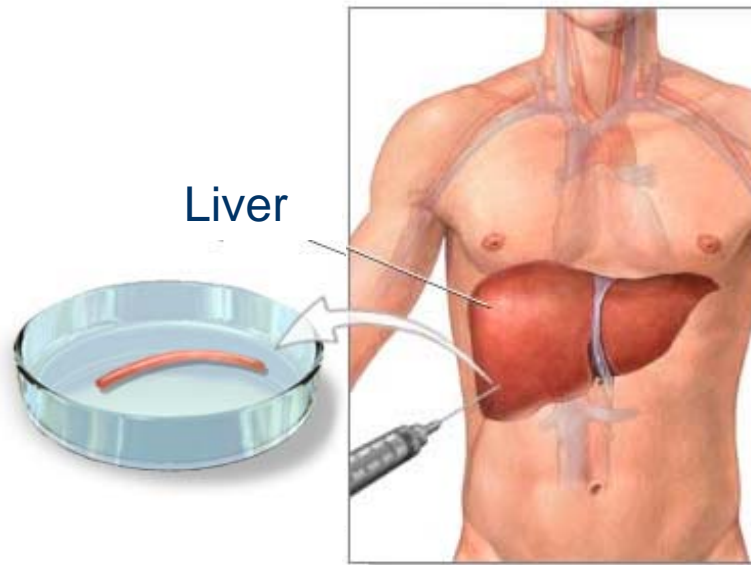
Menu



Exit



Hepatic Biopsy



Menu



Exit

Justification

- Automated minimally invasive procedure.
- Ensure physician safety by avoiding direct contact with the needle and sample.
- System to be used on training of future doctors.



Menu



Exit

Objective

- Compare the quality of the sample taken by the robot with the one obtained by doctors using the percutaneous method.



Menu



Exit

Hepatic Biopsy performed on dogs



Menu



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Hepatic Biopsy performed on dogs



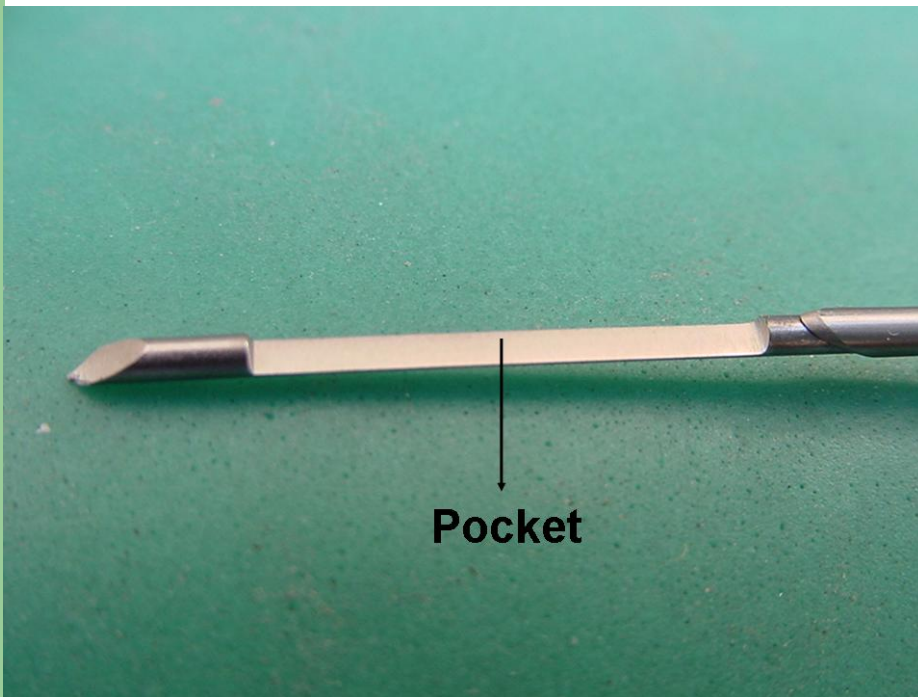
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Needle used



Disposable biopsy
needle, trucut type,
14G, length = 15.2cm

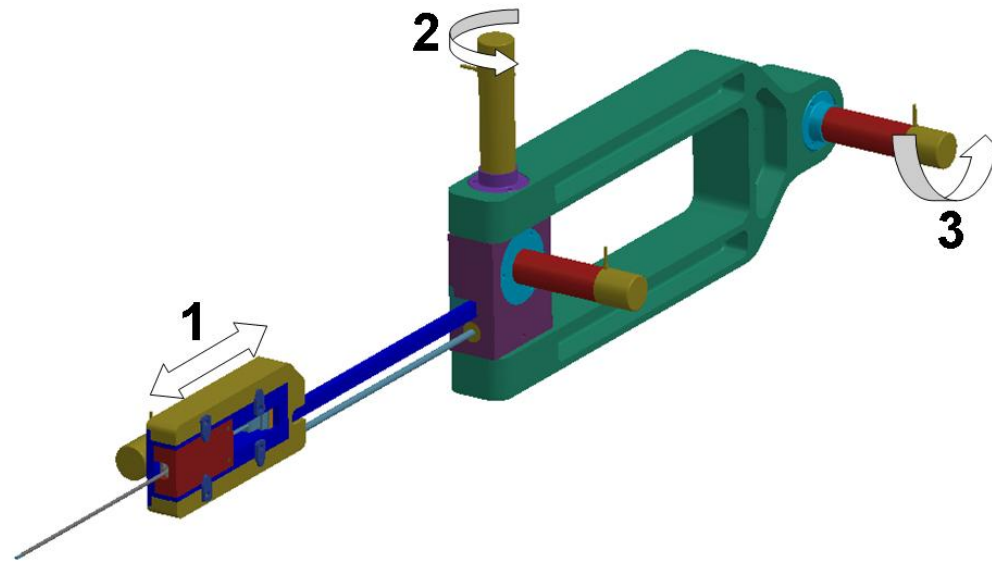


Menu



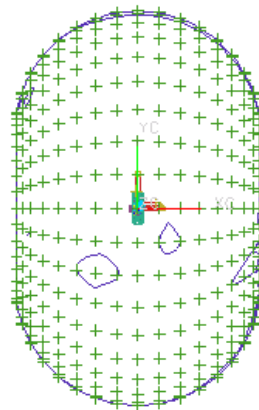
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3 DOF

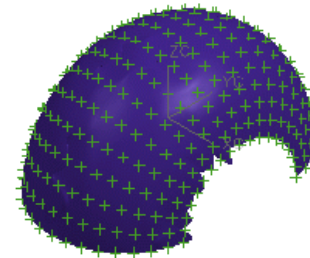


Work envelope of the robot

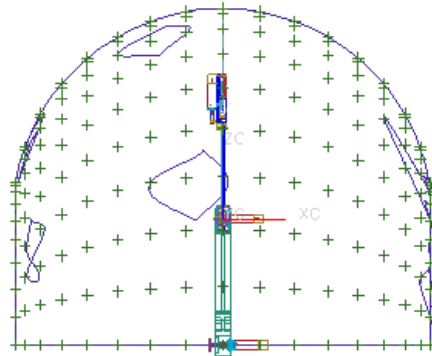
The surface shows the maximum displacement of the tip of the needle for the three degrees of freedom of the robotic system.



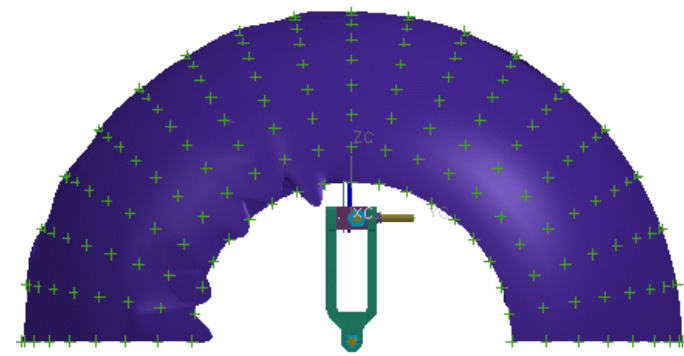
TOP WORK



TFR-ISO



FRONT



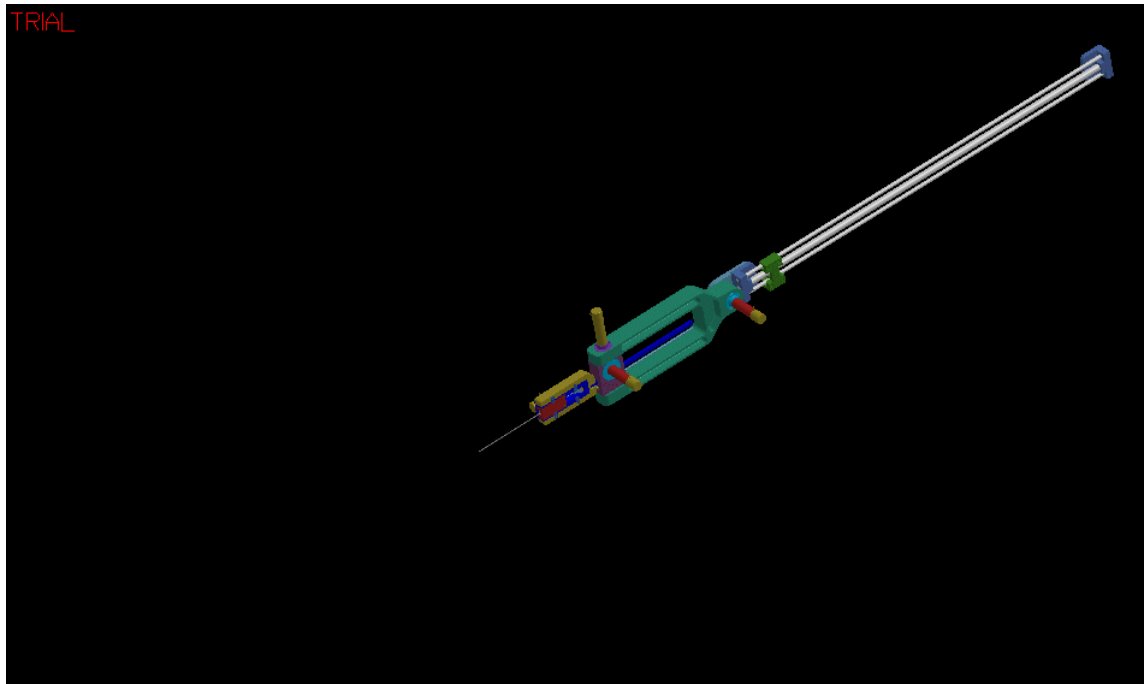
RIGHT



Menu



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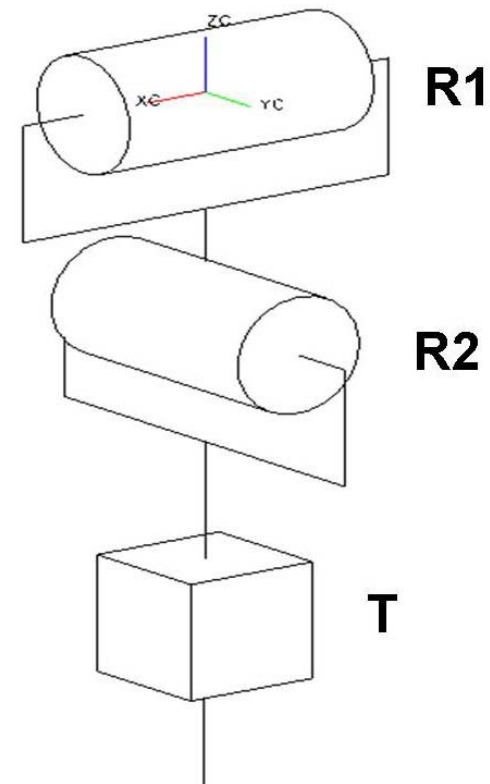
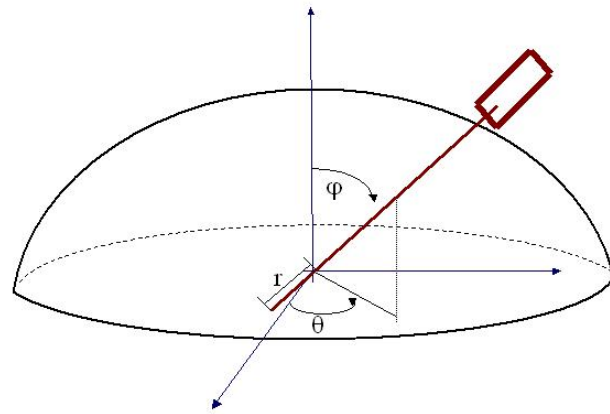


Menu



Exit

Reference coordinates and kinematics schema

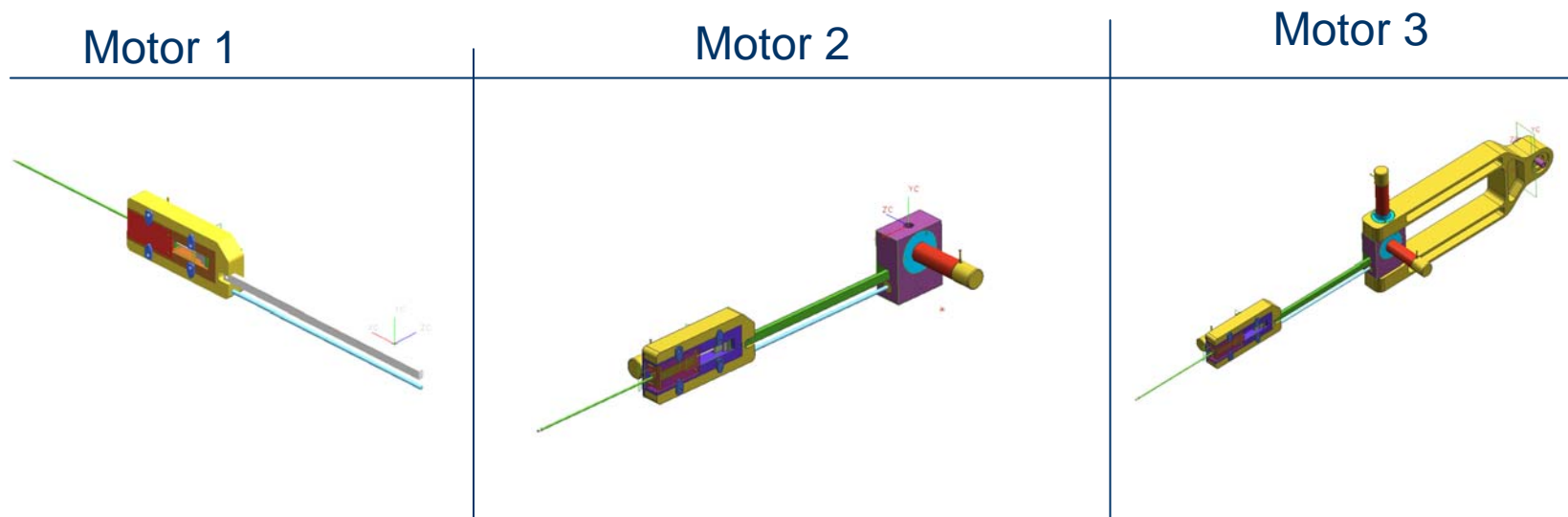


Calculation of mass and inertia moments.

Mass of components driven by motor #3: 1495.4229 g

By component mass: 

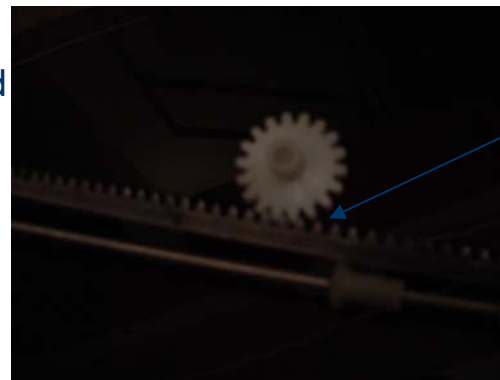
Inertia moments and products (click en la imagen)



Fabrication of prototype parts

- First design iteration

Most of the prototype parts had quality issues. Manufacturer did not have the appropriate machinery and had lack of experience on manufacturing of precision parts. Some dimensions were out of specification.



adjustment



interference



Menu



Exit

Future work

- Construction of redesigned parts.
- Obtaining Kinematic and Dynamic models.
- Making the robot's control.
- Validation of first prototype robot.
- Training of future surgeons through a tele-operated controlled device.



Menu



Exit