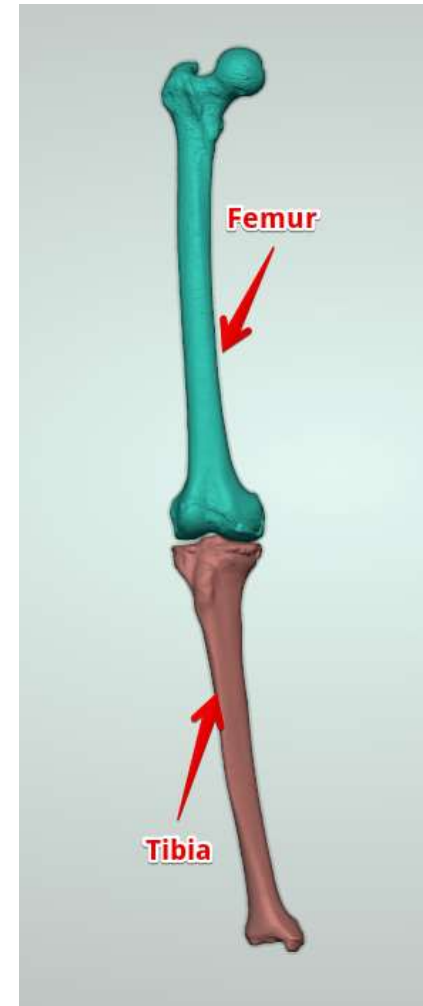# Assignment

Knee Preop Planning

Step-1

- Load STL in the web application scene
  - Femur.stl
  - Tibia.stl

  Note: The position of object with respect to world coordinate should not change while importing in the web application.

Step-2

- Create Landmarks(Points)

  - Femur Center ⊙

  - Hip Center ⊙

  - Femur Proximal Canal ⊙

  - Femur Distal Canal ⊙

  - Medial Epicondyle ⊙

  - Lateral Epicondyle ⊙

  - Distal Medial Pt ⊙

  - Distal Lateral Pt ⊙

  - Posterior Medial Pt ⊙

  - Posterior Lateral Pt ⊙

o Default all buttons are in inactive mode,
o First user clicks on Femur Center Landmark Active Button(so it will change color from light gray to black) then Landmark(Point) creation functionality will activate
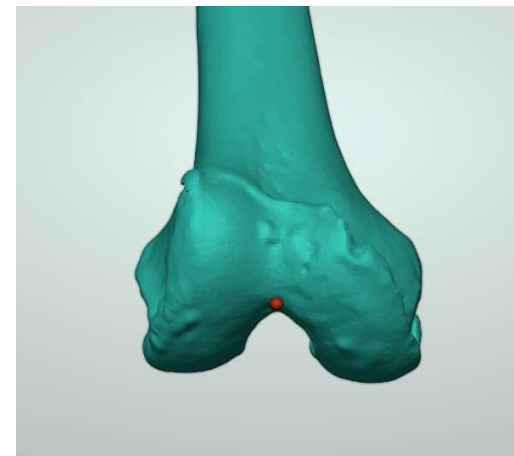o Then the user click on femur bone surface then landmark will be created, also translation (in X-Y-Z) Control will be activated
o If the user want, then he can move the landmark
o Then user either click on Another landmark or Femur Center Landmark Active Button
o So Translation control will not appear in scene, also button will change color to gray
o Then user click on Hip Center Landmark Active button and again Landmark creation functionality will activate and user click on surface and landmark will created, and translation control will be applied
o Similar way user will create all the 10 landmarks on Femur Bone
o Landmarks position is shown in next page

Active Mode

Inactive Mode

Step-2 (As Result)

Femur Center

Lateral Epicondyle

Posterior Lateral point

Posterior Medial Point

Hip Center

Medial Epicondyle

Lateral distal point

Medial distal point

SUPERIOR

SAGITTAL
PLANE

CORONAL
PLANE

TRANSVERSE
PLANE

LATERAL   MEDIAL

midline

POSTERIOR

INFERIOR

ANTERIOR

OSMOSIS.org
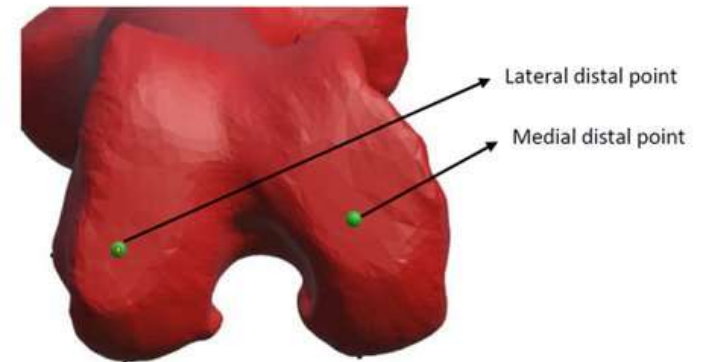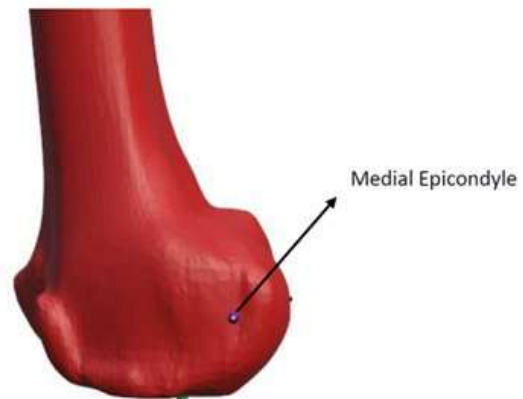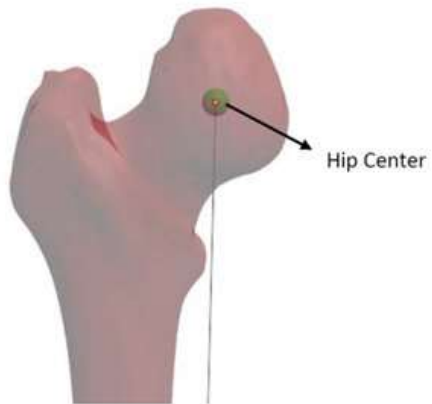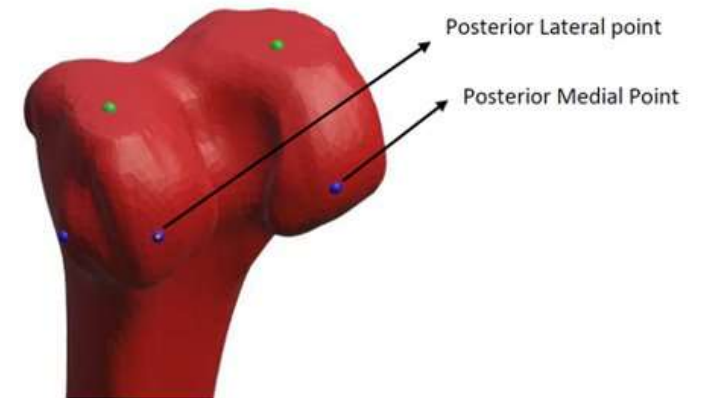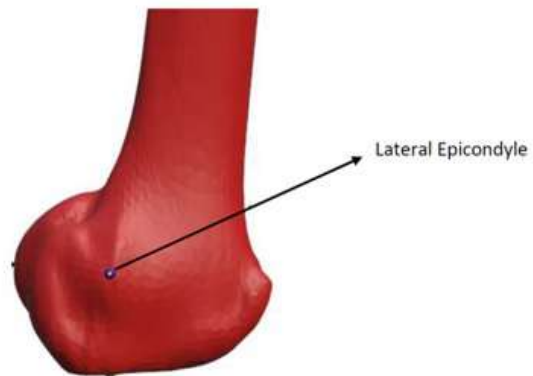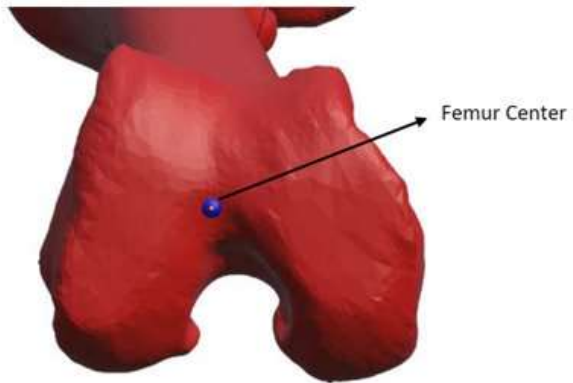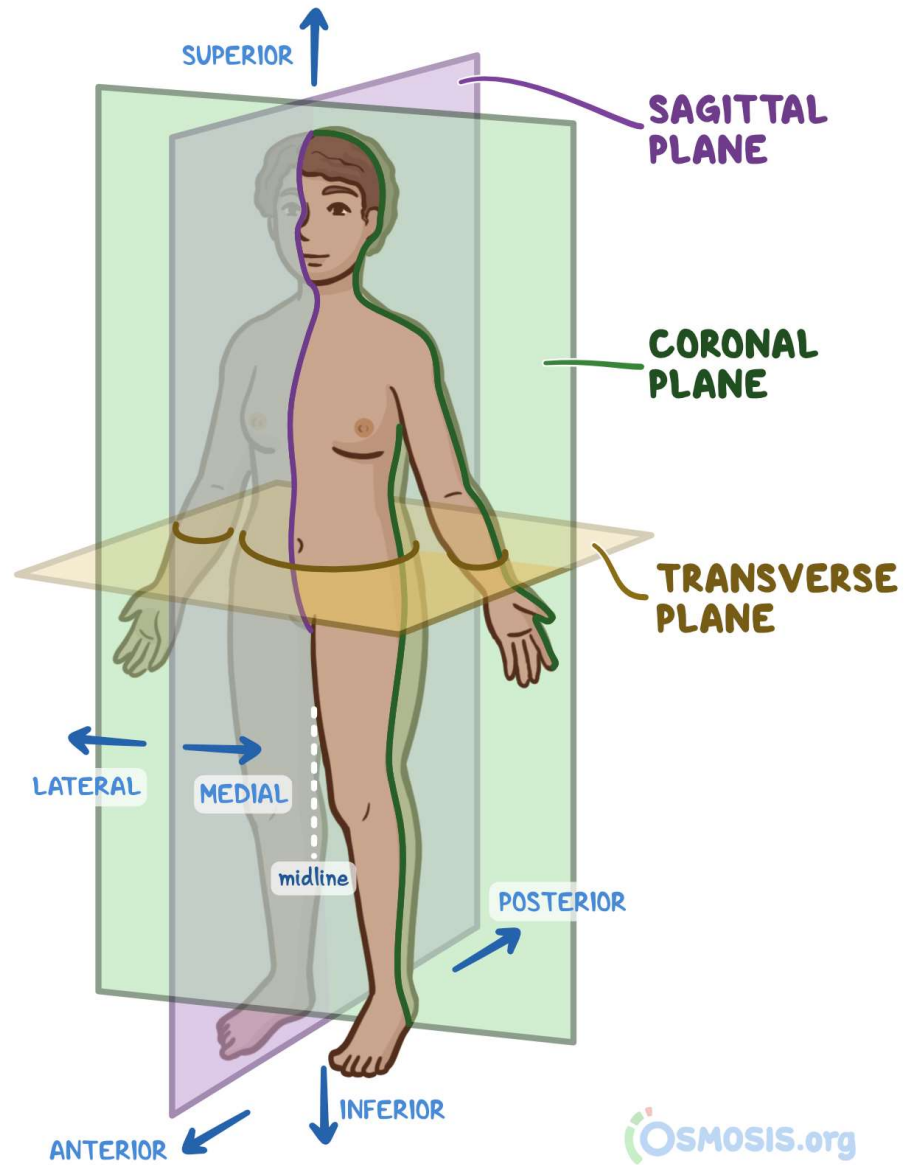
Step-3

- Update Button:
  - After all landmarks creation user will click on "Update Button"
  - So the first Axis (lines) will create.

---

o   Line Create – Between Femur Center & Hip Center Landmark (Mechanical Axis)
o   Line Create – Between Femur Proximal Canal & Femur Distal Canal (Anatomical Axis)
o   Line Create – Between Medial Epicondyle & Lateral Epicondyle (TEA-Trans epicondyle Axis)
o   Line Create – Between Posterior Medical Pt & Posterior Lateral Pt (PCA- Posterior Condyle Axis)
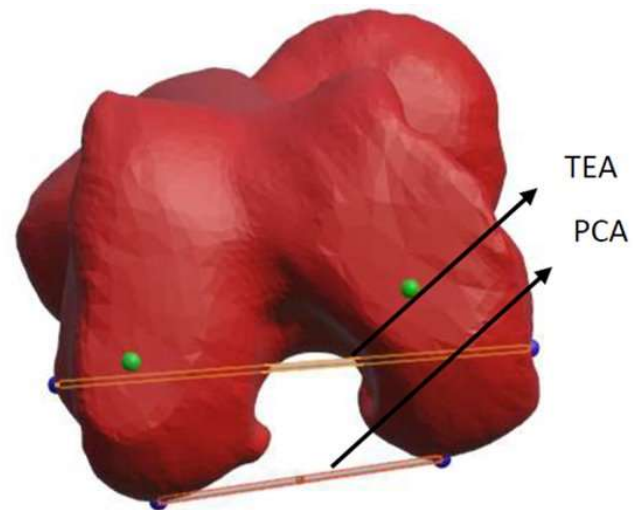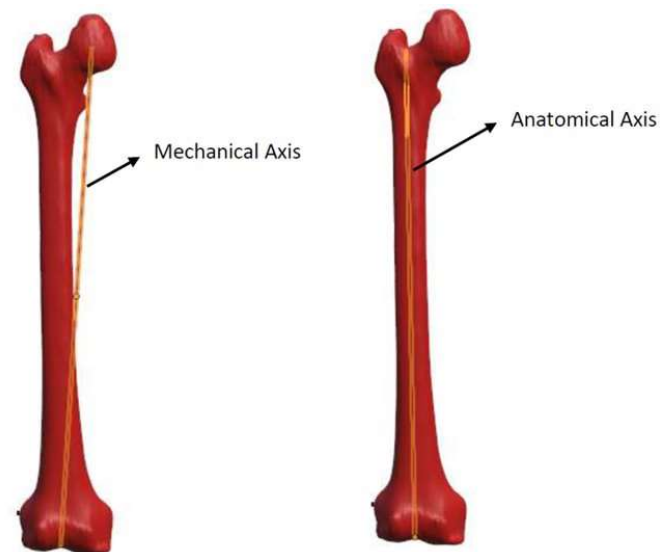
Step-4 (Continue)

- o Plane Create – Perpendicular to Mechanical Axis

TEA
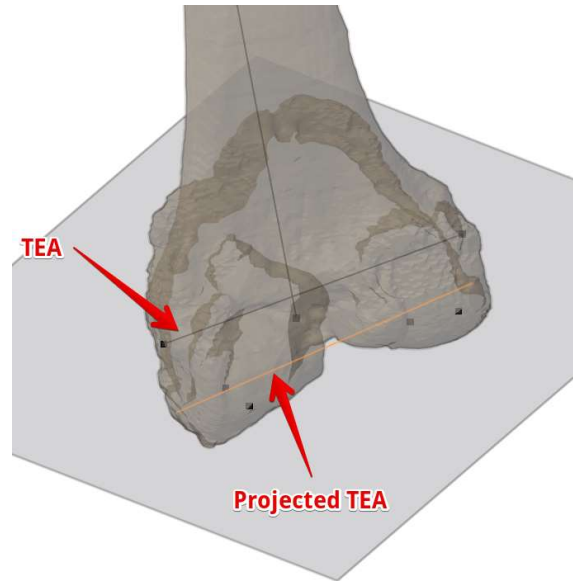
Projected TEA

- o Project "TEA" Axis on Perpendicular Plane

Step-4 (Continue)
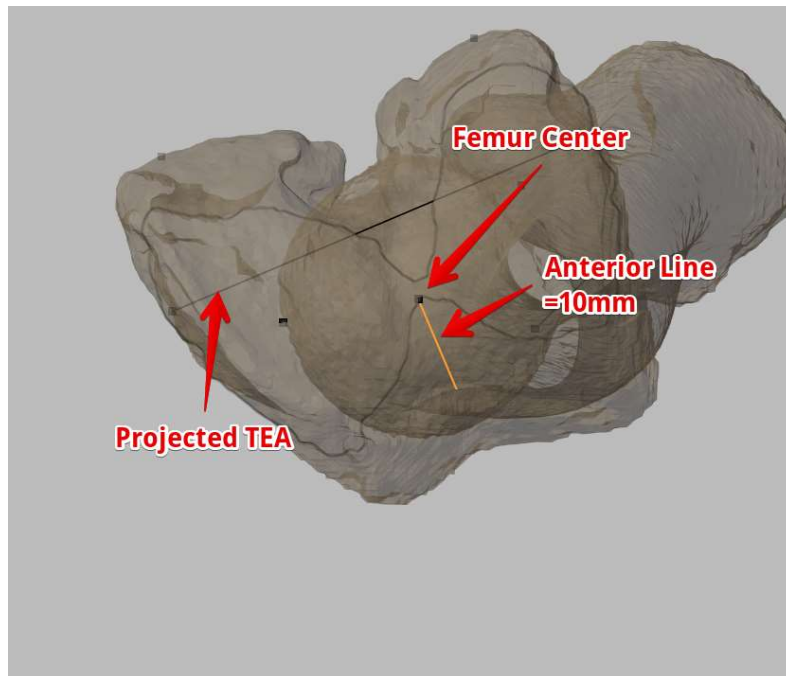
- Create a line on a perpendicular plane, that line should start from Femur Center Landmark & have 10mm distance Anterior Side , Also this line should be perpendicular to the Projected TEA Axis
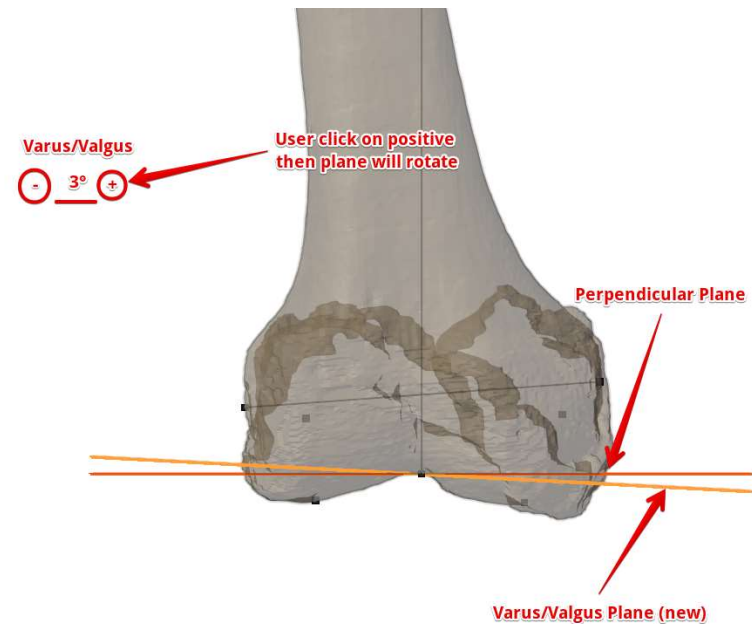
- Duplicate Perpendicular plane and make functionality like
- If user click on Positive or Negative button, Then New Plane should be Rotate along to Anterior Line (Anterior Line is a rotation axis for new plane) we can call new plane as varus/valgus plane

Step-4 (Continue)

Anterior Line (Projected on varus/valgus plane)

Lateral Line(Created on varus/valgus line & it is perpendicualr to projected Anterior line)

Flexion/Extension

- 3° +

User click on positive then plane will rotate

Flexion/Extension Plane

Varus/Valgus Plane
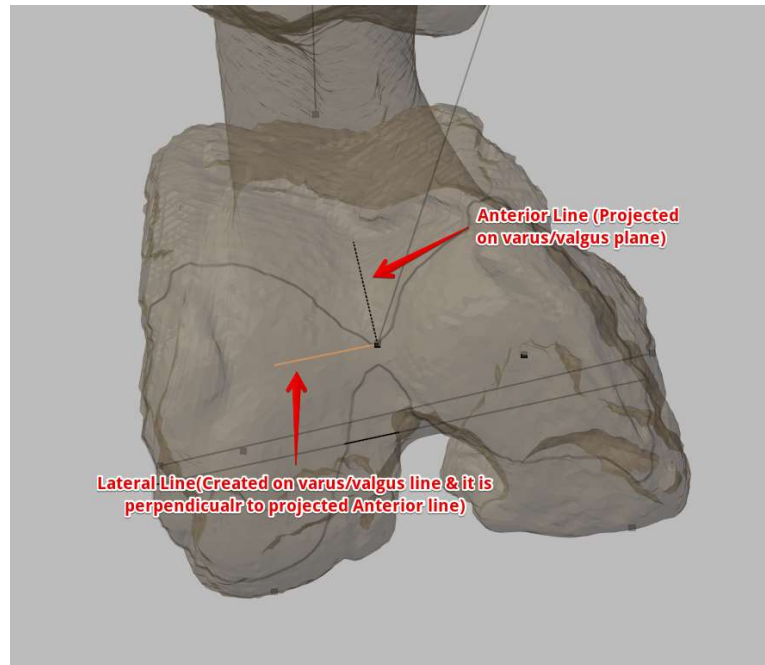
o Project Anterior Line on Varus/Valgus Plane
o Then create a on Varus/Valgus Plane, it should be perpendicular to the Projected Anterior line and start from femur center & end at 10mm Lateral side
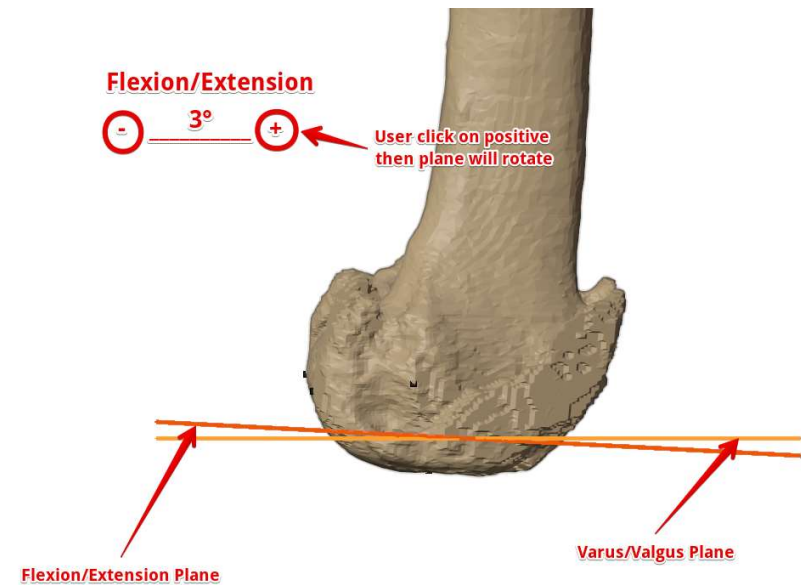
o Duplicate Varus/Valgus plane and make functionality like
o If user click on Positive or Negative button Then New Plane(Flexion/Extension Plane) should be Rotate along to Lateral Line (Lateral Line is a rotation axis for a new plane) we can call new plane as Flexion/Extension plane

Step-4 (Continue)

Flexion/Extension Plane

Distal Medial Plane

Distal Medial Pt

Distal Lateral Pt
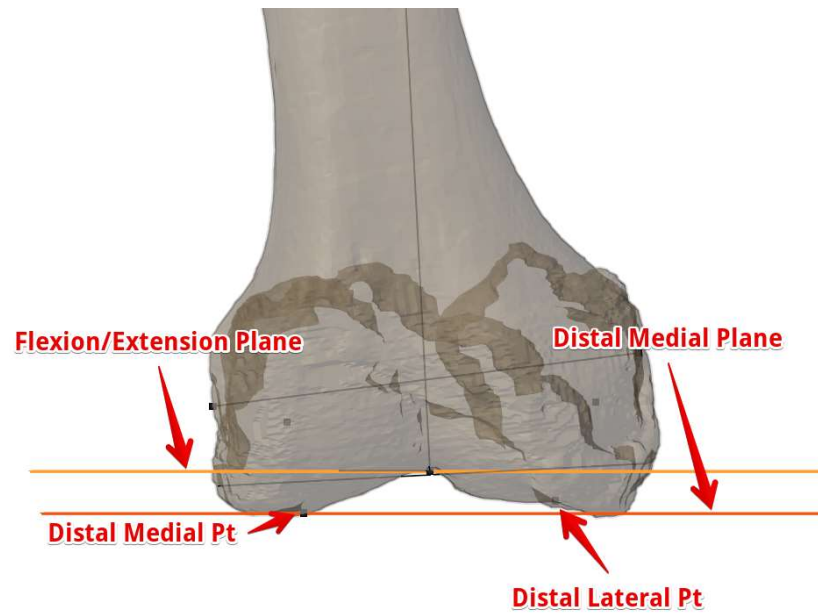
- o   Again create new plane
- o   It is parallel plane to flexion/extension plane
- o   Also it is passing through Distal Medial Pt
- o   New plane called as distal medial plane

Proximal Direction

Distal Resection Plane

10mm

Distal Medial Plane
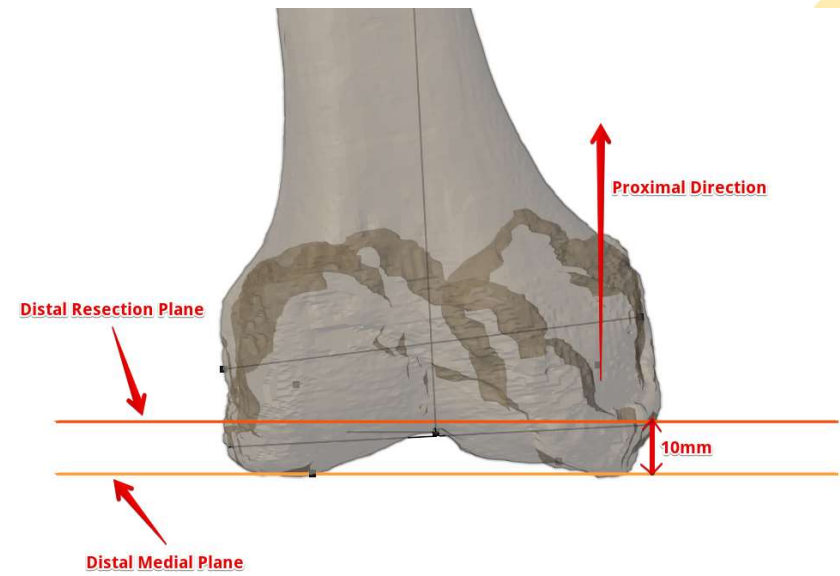
- o   Again new plane create
- o   It is parallel to distal medial plane & have 10mm distance
- o   10mm distance should be on proximal direction.
- o   New plane called as distal resection plane

Step-4 (Continue)

Distal Resection Plane

Distal Resection Plane
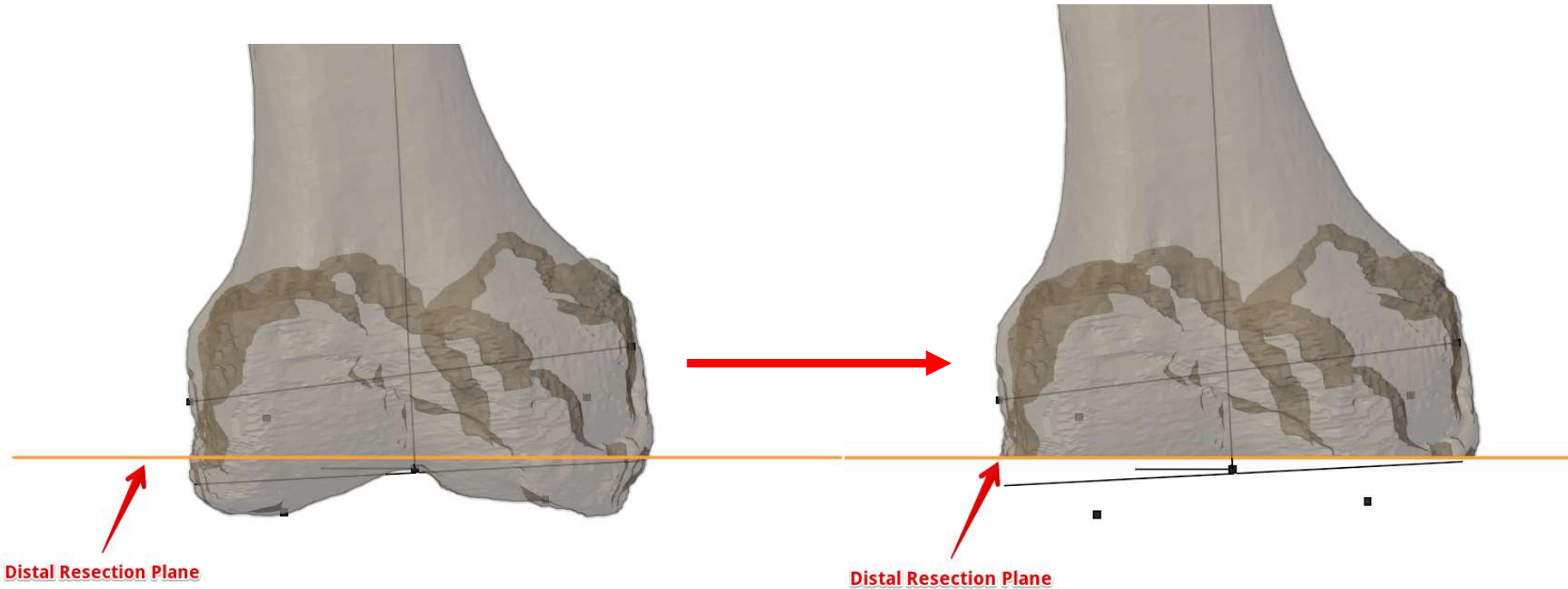
- o Resect distal part of femur with help of Distal Resection Plane
- o Also, resection can be controlled by a toggle button
    - o If toggle is on = Resection will be shown in a scene
    - o If toggle is off = Resection will not show in a scene

Step-4 (Continue)

o Show measurement in a scene
- o Distal Medial = Distance between Distal resection plane and Distal Medial Pt
- o Distal Lateral = Distance between Distal resection plane and Distal Lateral Pt
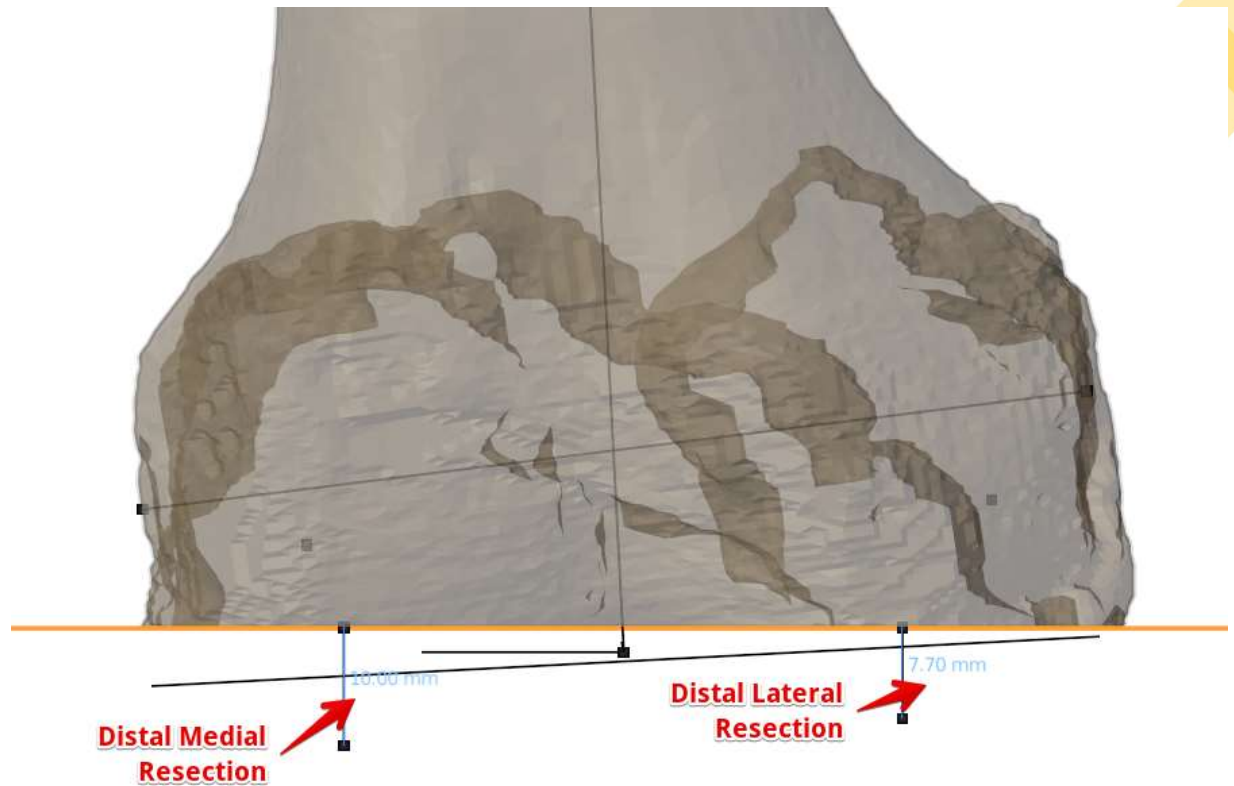
Application Feature

- o   1 Scene
- o   Femur and Tibia Bone visible
- o   4 Axis & 10 landmarks will be visible
- o   Plane should be hide
- o   Landmark creation and modification buttons (10 buttons)
- o   Update button
- o   Varus/Valgus Button = Increment and Decrement (°)
- o   Flexion/Extension Button = Increment and decrement (°)
- o   Distal Medial Resection= Increment and decrement (mm)
- o   Toggle button = to control resection visibilty

Note: If user modify anything then all child axis and plane will be update
as example ,
If Varus/valgus of 3° is changed to 1° then, Flexion/extension plane will change, then distal medial & distal resection also change so resection of femur also change , measurement also change.

Femur Preop Planning Platform

Femur Center
Hip Center
Femur Proximal Canal
Femur Distal Canal
Medial Epicondyle
Lateral Epicondyle
Distal Medial Pt
Distal Lateral Pt
Posterior Medial Pt
Posterior Lateral Pt

Update

Varus/Valgus
-   3°   +

Flexion/Extension
-   3°   +

Distal Resection
-   10 mm   +

Resection

Thank You