

USER MANUAL - 3D SIMULATION

INOVO ROBOTICS MODULAR ARM

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Product version 4.0.1

Introduction

This manual describes the 3D simulation features in the Inovo interface.

Software versions

RCU	V4.0.2
Engineering UI	v0.9.4
Pendant UI	v0.5.1
PSU Controller	v0.0.5
Joint Controllers	v1.10.
Wrist Controllers	v0.1.14

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PRE-RELEASE

1. Creating custom 3D models

You can create your own custom 3D models using most popular CAD tools by exporting your model in the recommended format and importing it into the Inovo simulation workspace.

1.1. Recommended Export format

CAD Tool	Manufacture	Recommended export format	Notes
Sketchup	Google	.fbx	
Fusion 360	Autodesk	.3mf /.fbx	Units are in mm not SI so set scale to 0.001 when importing. .fbx does not include colour information so .3mf is preferred format.
Inventor	Autodesk	.3mf	
Solid Works		.3mf	
Solid Edge	Siemens	.3mf	
Catia		??	
Blender		.gltf	
3D Builder	Microsoft	.3mf	Useful to applying bitmap textures
OnShape	OnShape	.stl	.Collada to be added soon

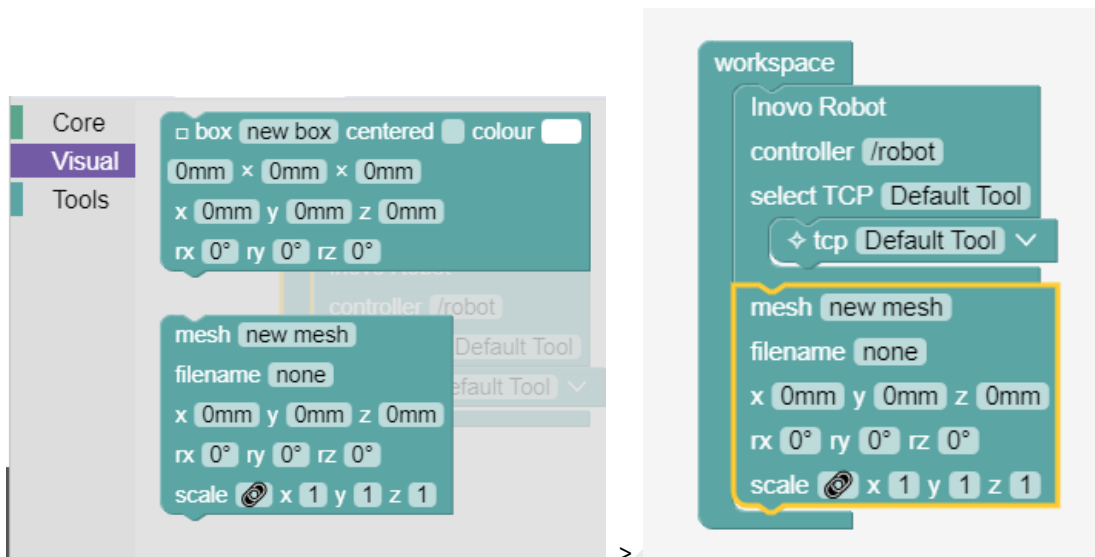
1.2. Supported format

The Inovo UI supports the following formats

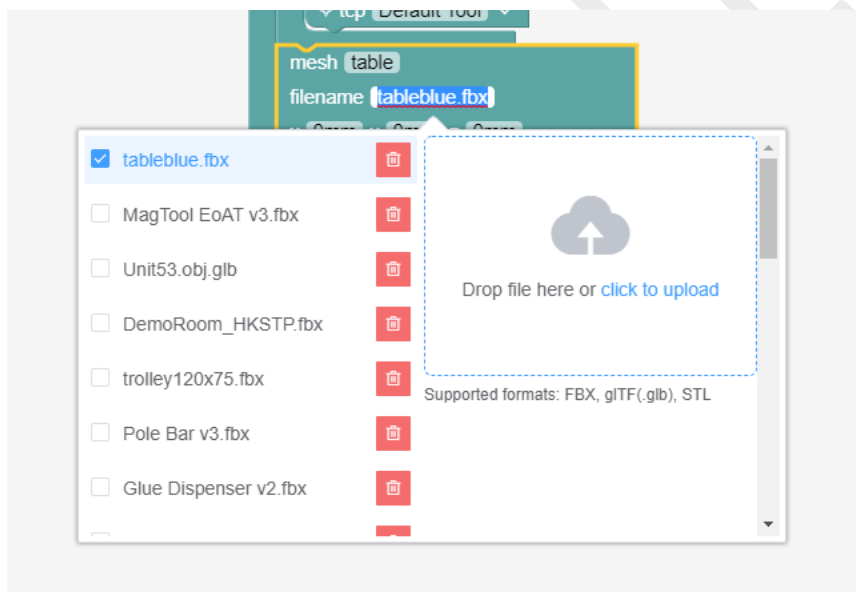
Format	Notes
.fbx	texture or colour data embedded
.3ml	texture or colour data embedded
.stl	No texture or colour data embedded
.glb	Good for 3D scans (ie polycam) and visual assets from the gaming sector

2. Importing 3D models

To import pre-existing 3D models into your robot simulation go to the workspace tab and select the 'mesh' block from the 'Visual' toolbox. Drag the block into your workspace group to add it to the scene.



Enter a name for your 3D model in the mesh field and click on the file name field to open the file upload view

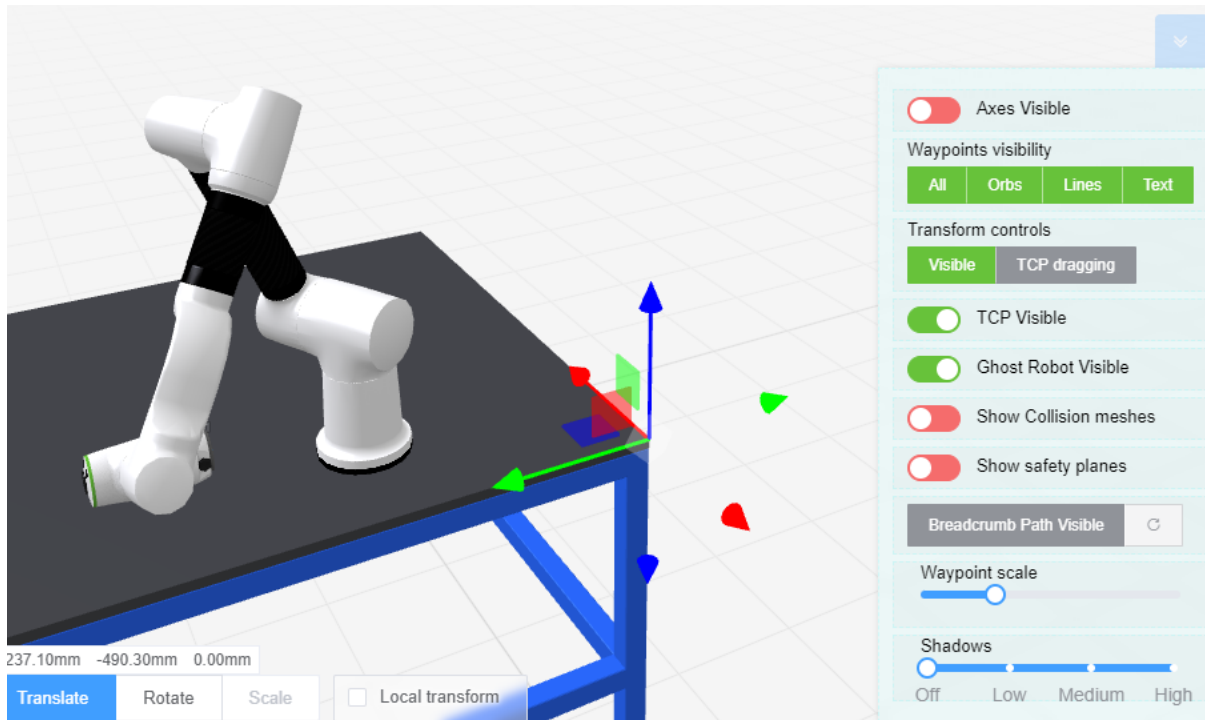


You can now drag your 3D mesh file to the upload area or click to open a file browser window and select the file on your PC. Once uploaded you can select the file from the list on the left. If you want to delete a 3D model that is no longer user click on the red trash can icon next to the file name.

3. Positioning 3D models in the Scene

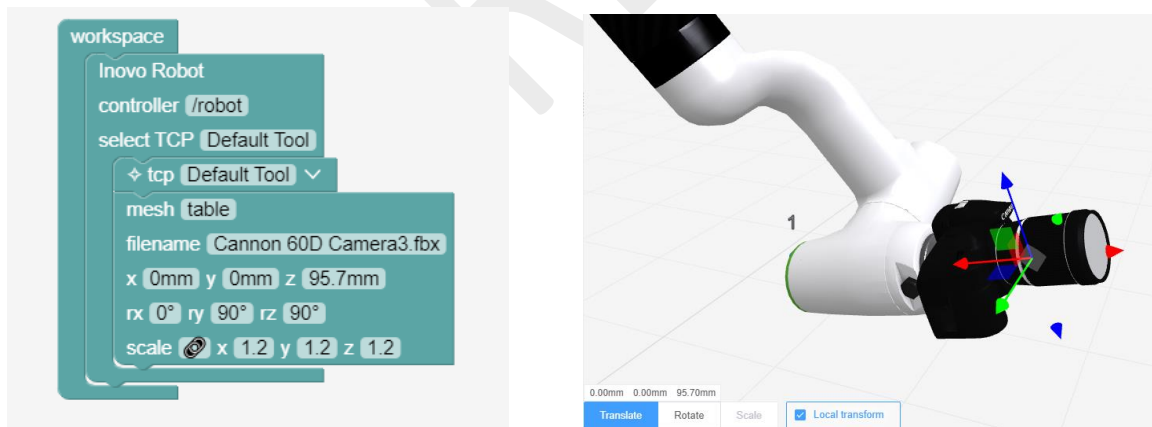
You can edit the position, rotation and scale numerically in the block or by dragging the model in the 3D view using the transform arrows. Some file formats will have very different scale so the model may not appear as its so large or small with the default scale of 1. If this happens try setting the scale to 0.01 or 100 to bring it into view. The transform control must be turned on in the view setting on the right, these are shown by pressing the light blue up arrow in the bottom right if not visible. The transform mode can be Translate or Rotate and

be in local or world frame depending on the buttons in the bottom left of the 3D view. Local will put the translation in the tool frame if the model is attached the robots wrist.



4. Attaching 3D models in the tool end effector

You can attached 3D models to the end of the robot so it moves with the arm. To do this put the mesh block inside the Inovo Robot block as shown below. You can then position it relevant to the tool plate output.



You can also position it by selecting the mesh block in the workspace and then dragging the arrows in the 3D view. Tick the 'Local Transform' check box to move it in the tool frame.

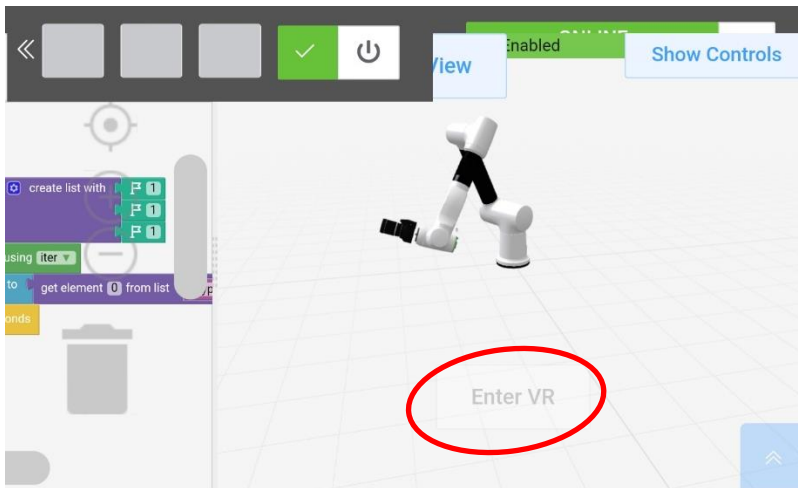
5. Virtual Reality (VR) Interface

You can experience your simulation in VR and even manipulate the robot, scene and sequence.

The following VR headsets are supported

Type	Notes
Oculus Quest 2	Full Support
Android Phone	Basic experience, using android and VR caddy but limited without head tracking or hand controllers
HTC Vive	TBC Full Support

With your headset connected to the LAN or Web for Cloud based simulation, open your simulation in the VR headset browser. Click on the 'Enter VR' button in the centre bottom of the 3D view. You will then be asked if you want to allow VR mode and you must answer 'Yes'



5.1. Moving around the environment

With a full tracking headset you can walk around the scene within the limits of your guardian space however it can be useful to 'jump' your position without physically moving. To do this deflect the joysticks and click them down at the same time, the following table lists the default that can be edited in the main page settings when outside of VR view.

Left Controller	Joystick Up	Move Up from the floor
Left Controller	Joystick Down	Move Down towards the flow
Left Controller	Joystick Left	Rotate Anticlockwise
Left Controller	Joystick Right	Rotate Clockwise

Right Controller	Joystick Up	Move Forward in the direction you are facing
Right Controller	Joystick Down	Move Backwards
Right Controller	Joystick Left	Move Left
Right Controller	Joystick Right	Move Left

5.2. Controlling the sequence playback

By default left hand controller enables the sequence to be played, paused, reset and stepped through.

Left Controller	Trigger	Step through next block
Left Controller	'Y' Button	Play / Pause
Left Controller	'X' Button	Stop and reset the sequence

5.3. Editing the sequence

You can move the arm, add, edit and delete waypoints using the hand controllers. By default the right hand controller has the following buttons assigned.

Right Controller	Trigger	Grip and drag the arm and
Right Controller	'A' Button	Insert a waypoint at the current arm position
Right Controller	'B' Button	Delete the highlighted waypoint

To move the arm point at the wrist, gripper or end joint of the arm, the arm section will illuminate green to indicate it is in view. You can then pull the trigger to grip the arm and move with the hand controller in simulation.

Pressing the 'A' button inserts a new waypoint at the current arm position. This will be at the end of the sequence unless you have another waypoint highlighted. If you want to insert between two existing waypoints position the arm in the desired pose and point at the waypoint you want to move to before this. The waypoint will be highlighted red, you can then press the 'A' button and a new waypoint will be inserted in the current pose between this and the next.

To delete a waypoint point at it with your right hand controller so the waypoint is highlighted red and press the 'B' button. The waypoint will be removed and the sequence will to link to the next waypoint if one exists.