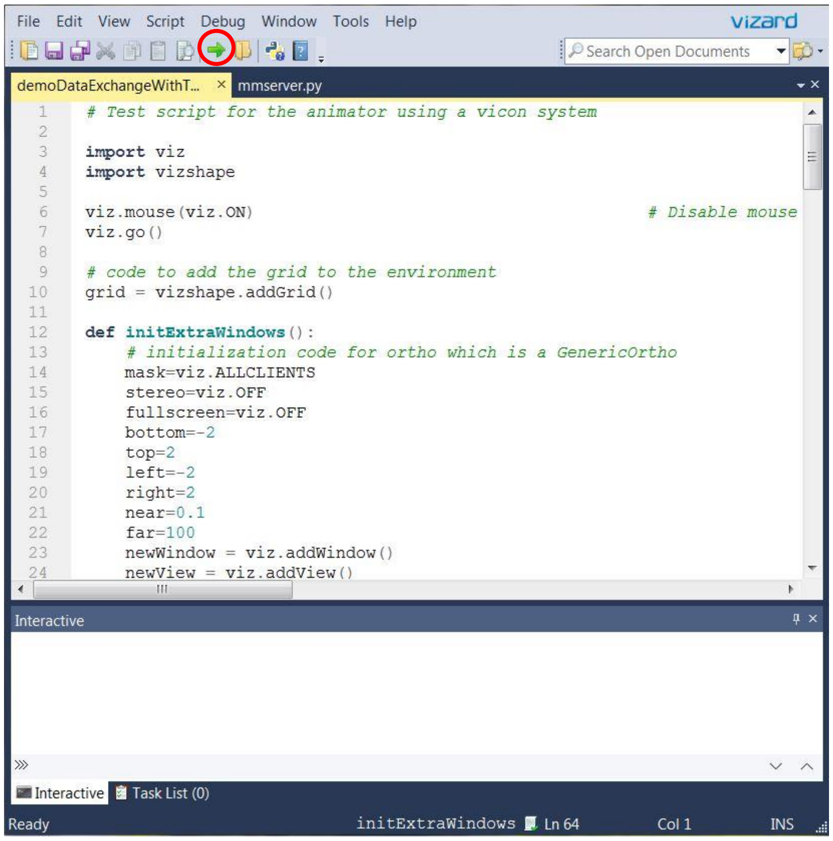
The MotionMonitor xGen Hardware Guide: Virtual Reality with Vizard

This document describes the files that will demonstrate how to exchange data between The MotionMonitor xGen and Vizard virtual worlds.

You should have the following files: VizardTMMxGenDataExchange.iws, and the VizardXGenDataExchangeVizardData.zip folder containing demoDataExchangeWithTMM.py, mmserver.py, and object files.

Please contact your Client Support Engineer or support@TheMotionMonitor.com for any of these files.

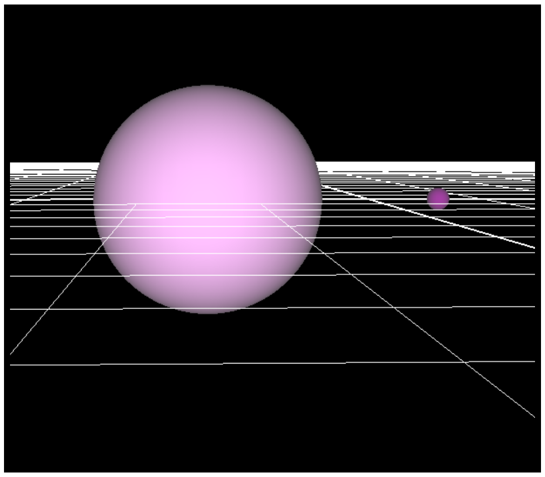


```
# Test script for the animator using a vicon system

import viz
import vizshape

viz.mouse(viz.ON)                                   # Disable mouse
viz.go()

# code to add the grid to the environment
grid = vizshape.addGrid()

def initExtraWindows():
    # initialization code for ortho which is a GenericOrtho
    mask=viz.ALLCLIENTS
    stereo=viz.OFF
    fullscreen=viz.OFF
    bottom=-2
    top=2
    left=-2
    right=2
    near=0.1
    far=100
    newWindow = viz.addWindow()
    newView = viz.addView()
```

First, to demonstrate the data exchange, run Vizard and open the demoDataExchangeWithTMM.py and mmserver.py files. If prompted by your Firewall, allow access to any networks. Run the scripts using the green arrow in the toolbar.

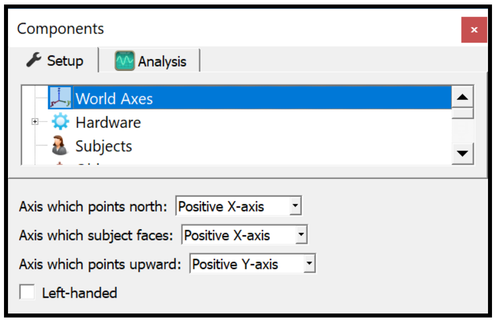
Launch The MotionMonitor xGen software, select an existing user or create a new one and Open the Workspace, VizardTMMxGenDataExchange.iws. This workspace can be used to demonstrate the communication between The MotionMonitor xGen and Vizard without any hardware. Click on the Activate/Deactivate Hardware icon to initiate the communication between The MotionMonitor xGen and Vizard. Click OK on the “Activation Successful!” message.

At this point you should see two objects, a large pink sphere and a smaller purple sphere, moving together horizontally within your Vizard animation window. Click the Activate/Deactivate Hardware icon again to terminate the connection with Vizard.



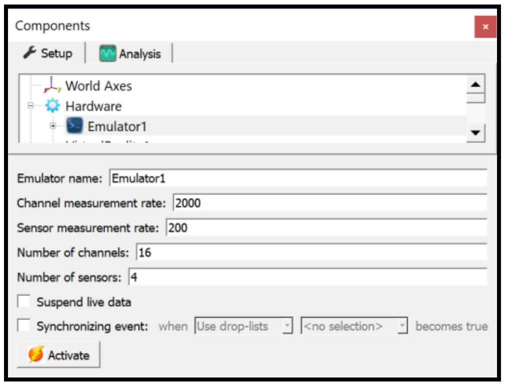
Within The MotionMonitor xGen Setup Components window the following settings have been configured:

World Axes - Configuration of the World Axes layout for The MotionMonitor xGen



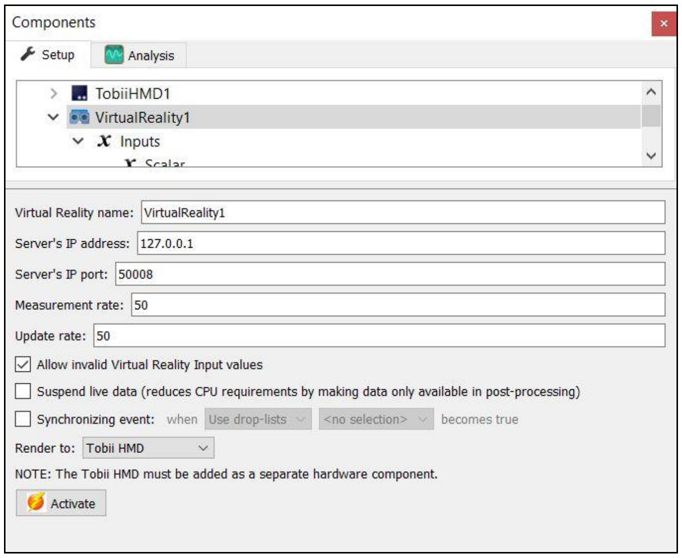
Axis which points north: Positive X-axis
Axis which subject faces: Positive X-axis
Axis which points upward: Positive Y-axis
Left-handed

Hardware Emulator - The emulator is a virtual hardware component that generates data without any physical hardware. This device can be removed in place of actual hardware connected to the system.



Emulator name: Emulator1
Channel measurement rate: 2000
Sensor measurement rate: 200
Number of channels: 16
Number of sensors: 4
Suspend live data
Synchronizing event: when Use drop-lists <no selection> becomes true

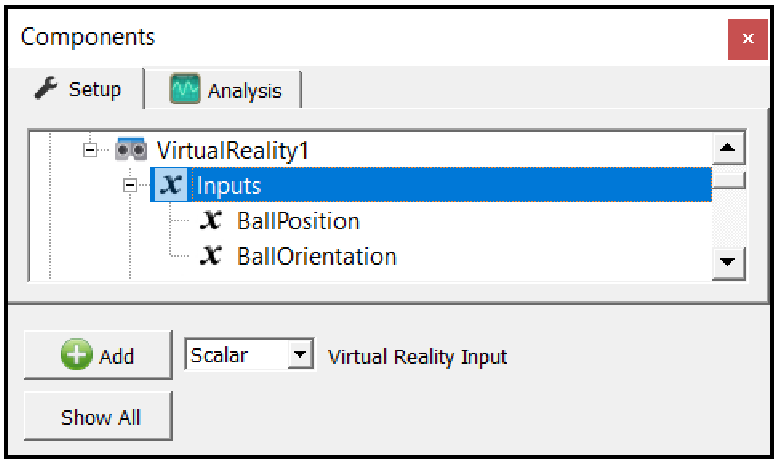
VirtualReality - Virtual Reality is the hardware component that controls the bi-directional communication between The MotionMonitor xGen and Unity or WorldViz virtual environments. The Server's IP address is either that of the local computer or of the server computer running the Unity application. The IP port should not change. The Measurement rate is the rate at which Unity Sends data to The MotionMonitor xGen and the Update rate is the rate at which The MotionMonitor xGen outputs data to Unity. Setting the measurement rate too high a rate can cause data to become unsynchronized. Discuss this with your Client Support Engineer for more details.



Virtual Reality name: VirtualReality1
Server's IP address: 127.0.0.1
Server's IP port: 50008
Measurement rate: 50
Update rate: 50
☑ Allow invalid Virtual Reality Input values
☐ Suspend live data (reduces CPU requirements by making data only available in post-processing)
☐ Synchronizing event: when Use drop-lists <no selection> becomes true
Render to: Tobii HMD
NOTE: The Tobii HMD must be added as a separate hardware component.

Enable the input of invalid values from virtual reality, suspend live data to reduce processing demands of the software and add a synchronizing event using the check boxes. Finally select the medium for which the VR will be rendered to, either immersive display, Tobii HMD or standard HMD.

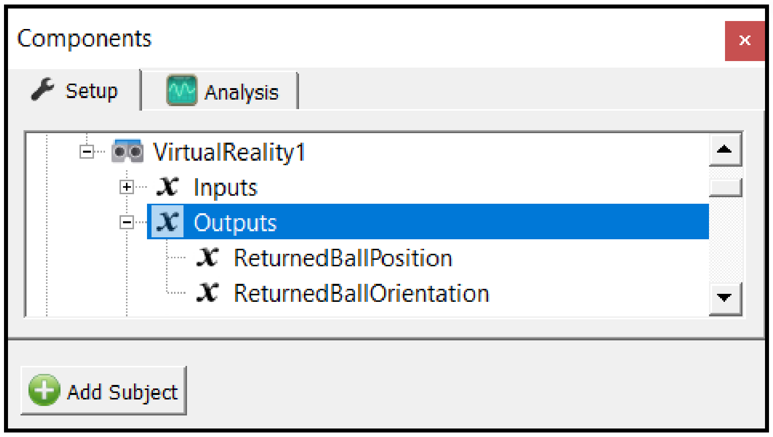
Inputs - Inputs are the variables that are sent to Vizard. Their names need to match that of the variables defined within the demoDataExchangeWithTMM.py.



BallPosition - Is a vector variable sent to Vizard whose value is used to control the position of a sphere.

BallOrientation- Is a rotation variable sent to Vizard whose value is used to control the orientation of a sphere.

Outputs - Outputs are variables that are received from Vizard. Their name needs to match that of the variable defined within the demoDataExchangeWithTMM.py.

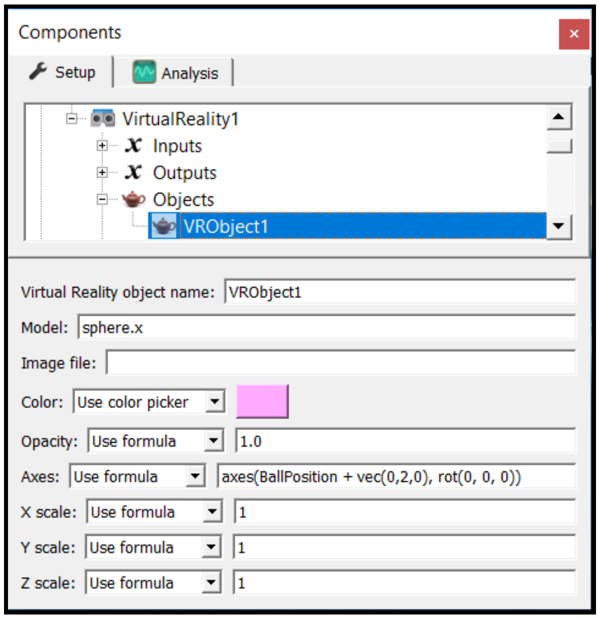


ReturnedBallPosition – Is a vector variable received from Vizard.

ReturnedBallOrientation – Is a rotation variable received from Vizard.

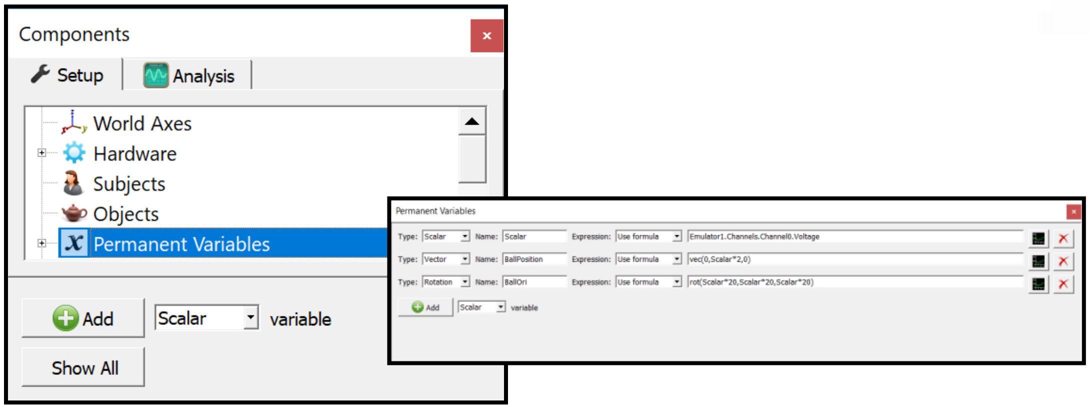
Objects - Any objects defined here will automatically be populated within the Vizard environment based on their defined parameters. This automatic population into the Vizard scene is handled by the MMServer script. The Model file specified here, typically an .obj file, needs to also be located within the Vizard directory. The same goes for if an image file is being used to display on the surface of an Object.

VRObject1 - Is an object whose axes (position and rotation) are used to control an object within Vizard. The model, in this case a Marker.obj file, also resides within the Vizard directory. Available settings that can be configured for the object include applying image files to the object's surface, specifying the color, opacity and scaling of the object. The scaling is applied to the files native dimensions.



Virtual Reality object name:	VRObject1	
Model:	sphere.x	
Image file:		
Color:	Use color picker	
Opacity:	Use formula	1.0
Axes:	Use formula	axes(BallPosition + vec(0,2,0), rot(0, 0, 0))
X scale:	Use formula	1
Y scale:	Use formula	1
Z scale:	Use formula	1

Permanent Variables - Permanent variables are variables that are typically used within Live experimental computations and cannot be modified after data are recorded. Each of these variables are currently receiving data from the Emulator hardware device but could be modified to use data from any hardware device. These variables could have also been defined directly through the scalar, vector or rotation Virtual Reality Input definitions.



Type: Scalar	Name: Scalar	Expression: Use formula	Emulator1.Channels.Channel0.Voltage
Type: Vector	Name: BallPosition	Expression: Use formula	vec(0,Scalar*2,0)
Type: Rotation	Name: BallOri	Expression: Use formula	rot(Scalar*20,Scalar*20,Scalar*20)

Scalar - This is the scalar variable that's being used for the "BallPosition" and "BallOrientation" permanent variable definitions.

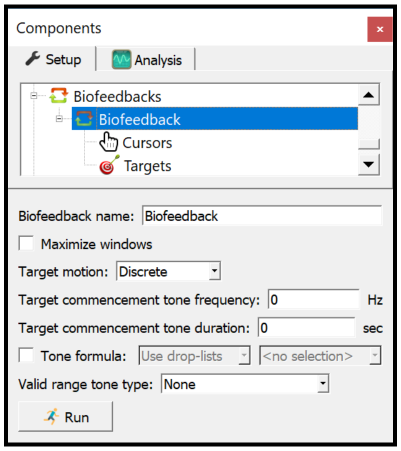
BallPosition - This is the vector variable that's being used for the "BallPosition" Virtual Reality Input.

BallOrientation - This is the rotation variable that's being used for the "BallOrienation" Virtual Reality Input.

Biofeedbacks - Provides the ability to perform cursor-target paradigms. They provide data similar to VR Objects in that they are automatically populated in the Vizard environment, if enabled under the Virtual Reality Hardware node. However, there are many ways in which they differ including that running the biofeedback initiates its own recording, they can be displayed in The MotionMonitor xGen animation window, have many more parameter settings, can provide auditory feedback, and their data can be accessed for analyses. Please refer to the Knowledge Base article for The MotionMonitor xGen Biofeedback to learn more about configuring and performing Biofeedback recordings.

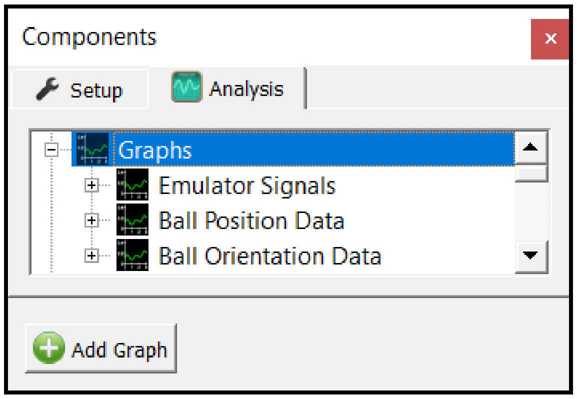
Cursors - Are the chasing object.

Targets - Can be configured as Discrete or Randomized.



Biofeedback name: Biofeedback
Maximize windows
Target motion: Discrete
Target commencement tone frequency: 0 Hz
Target commencement tone duration: 0 sec
Tone formula: Use drop-lists <no selection>
Valid range tone type: None

Graphs



Emulator Signals - Includes graphs for the raw data being generated from the Emulator hardware device.

Ball Position Data – Includes plots for data from the BallPosition and ReturnedBallPosition vector Virtual Reality Inputs and Outputs

Ball Orientation Data – Includes plots for data from the BallOrientation and ReturnedBallOrientation Virtual Reality Inputs and Outputs.

There are some things to keep in mind.

1. The demo python script must be run from the VR folder containing mmserver.py file using Vizard 5 or above.
2. The demo python script must be restarted, each time TMM reconnects. If doing repeated collections within biofeedback, it is not necessary to restart the script.
3. Setting the measurement rate in the VirtualReality dialog at too high a rate can cause data to become unsynchronized. Discuss with your Client Support Engineer for more details.

Future Developments:
- Ability to stream scalar variables into Vizard.
- Ability to optimize Vizard clock for extended recordings.