The FSP200 is a 6-axis IMU processor, integrating CEVA's Hillcrest Labs business unit high-performance sensor hub software stack, to provide heading and orientation outputs. When connected to one of several supported sensors, it performs all the accelerometer and gyroscope sensor fusion processing necessary to produce stable and accurate heading and orientation outputs. This document is intended to provide information about the FSP200 Serial/USB Adapter board with software provided by Hillcrest to facilitate customer evaluation.

1. Hardware

1.1. Introduction

The FSP200 Serial/USB Adapter board includes the FSP200 reference module with Bosch BMI055 6 axis sensor that is designed for quick and easy evaluation and prototyping.

Figure 1: FSP200 USB Serial adapter board

1.2. Connections

The FSP200 communicates with the host system over a UART interface, either in UART-RVC mode or in UART-SHTP mode.

In UART-SHTP mode, the FSP200 uses the Sensor Hub Transport Protocol (SHTP) to communicate with a system or application processor. The SHTP protocol is documented in the Sensor Hub Transport Protocol [3], allowing a customer to potentially develop their own host software if they choose to do so.

In UART-RVC mode, the FSP200 transmits heading and sensor information at 100Hz.

The mode selection is made with S1 switch on board. The default configuration is UART-SHTP mode.

2. Running a PC Demo Application

2.1.1. Requirement

Running Freespace™ MotionStudio 2 with FSP200 Serial/USB Adapter board requires the following items.

- Windows PC
- FTDI driver (Windows PC may not find the right driver) available in https://www.ftdichip.com/Drivers/VCP.htm
- USB Type A to Micro-B cable
- Freespace™ MotionStudio 2 application available in https://www.hillcrestlabs.com/downloads/freespace-motionstudio-2

Connect USB Type A to Micro-B cable to FSP200 Serial/USB Adapter board and your PC. The USB Serial COM port should appear in your Device Manager after the driver is installed properly.
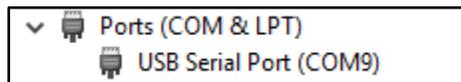
Figure 2: Device Manager for USB Serial Port

Please note the configurations of the FTDI COM Port driver should be updated to optimize latency and to improve overall performance.

Right click on the device entry and select *Properties* to bring up the properties windows.
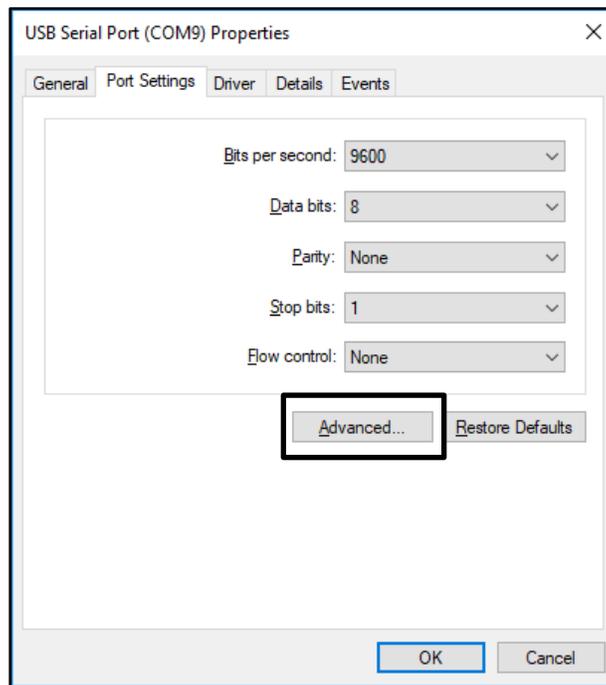
Figure 3: USB Serial Port Properties Window in the Device Manager

In the Properties windows, select the *Port Settings* tab and click the *Advanced* button to bring up the *Advanced Settings* window.

In the *Advanced Settings* window, change the default the *Latency Timer* from *16 msec* to *1 msec*.
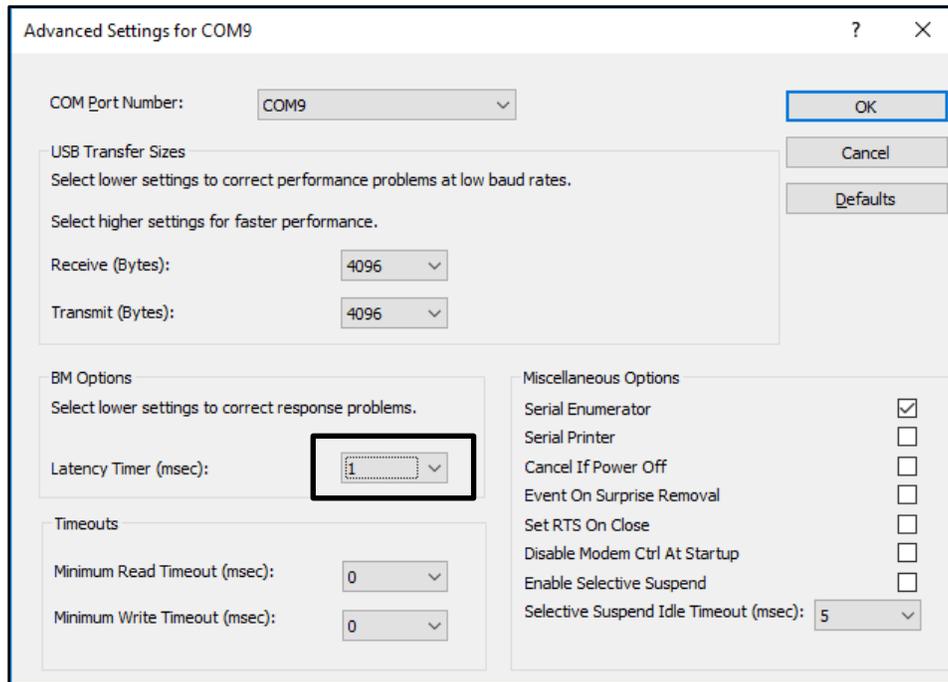
Figure 4: Advanced Setting for COM Port

2.1.2. Running Freespace™ MotionStudio 2

Start Freespace™ MotionStudio 2

After you unzip the PC Application package, launch MotionStudio2.exe under MotionStudio2 folder. This will open MotionStudio2 window.
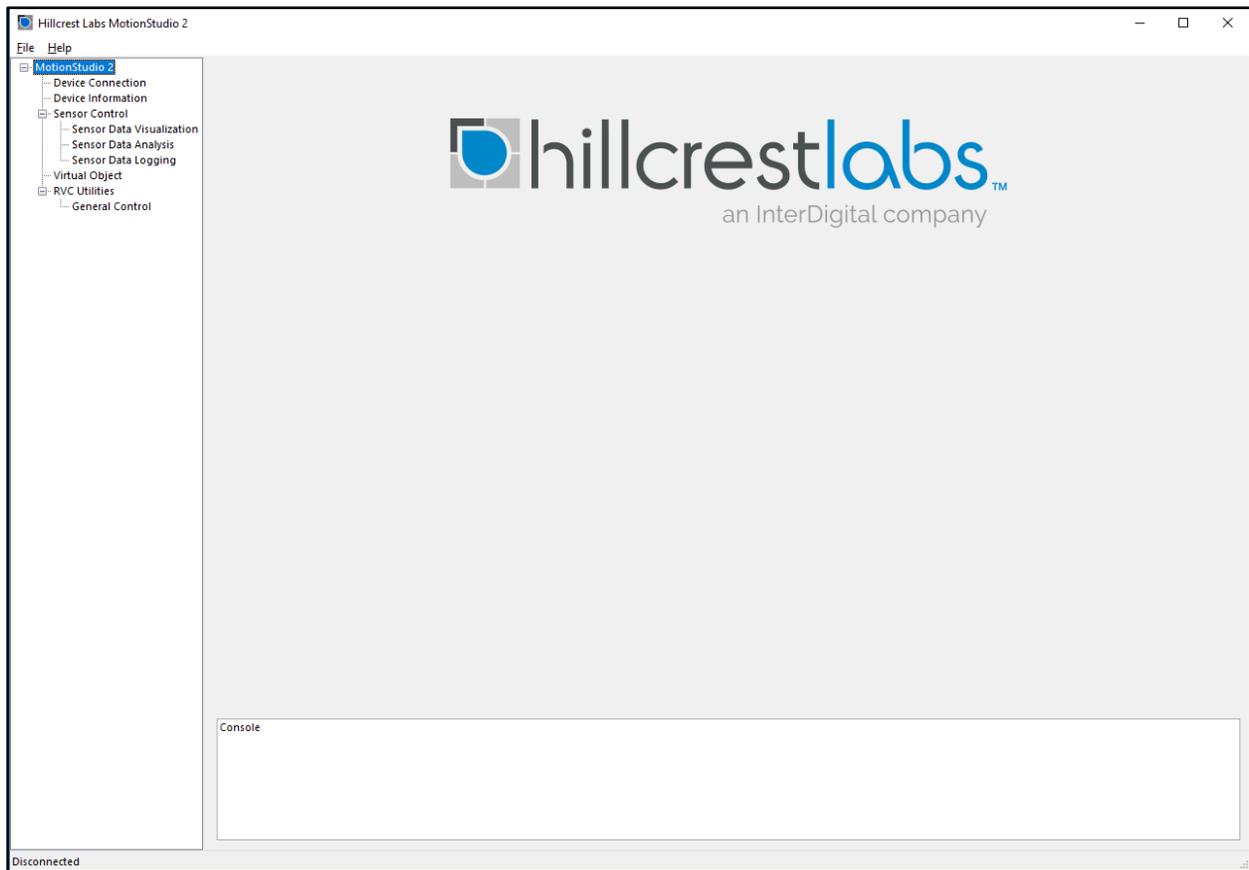
Figure 5: Startup Window of Freespace™ MotionStudio 2

Establish Connection to the FSP200 Serial/USB Adapter Board

From the menu panel on the left, select Device Connection. This panel allows users to select device type, transport protocol and more.

- "*Device Type*" of the bridge is set to *FTDI Adapter Board*.
- "Virtual COM Port" available in your PC appears in "*COM9 USB Serial Port*" box.
- "*Target Device*" set to *SHTP over UART* (default S1 setting)
- Use "*Connect*" button to start.
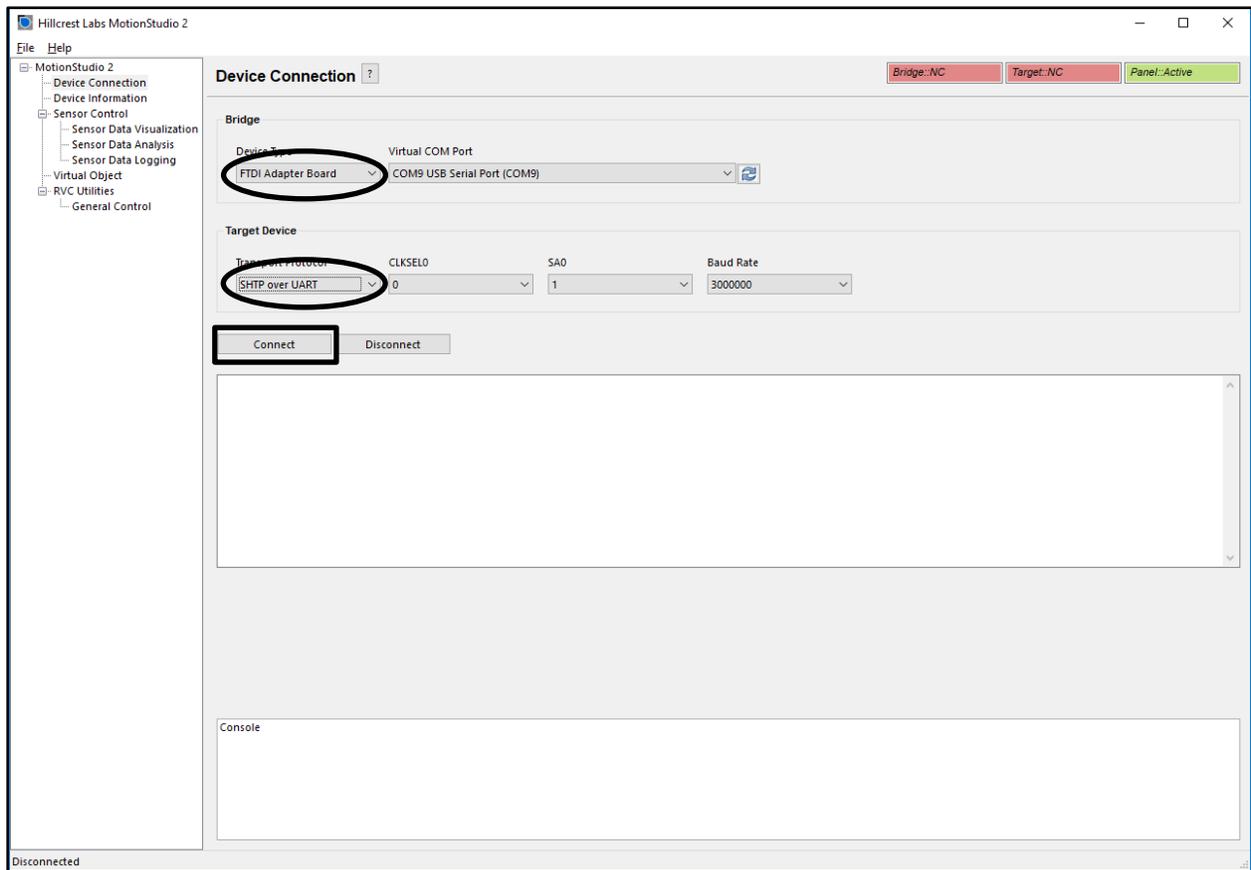
Figure 6 Device Connection Panel in Freespace™ MotionStudio 2
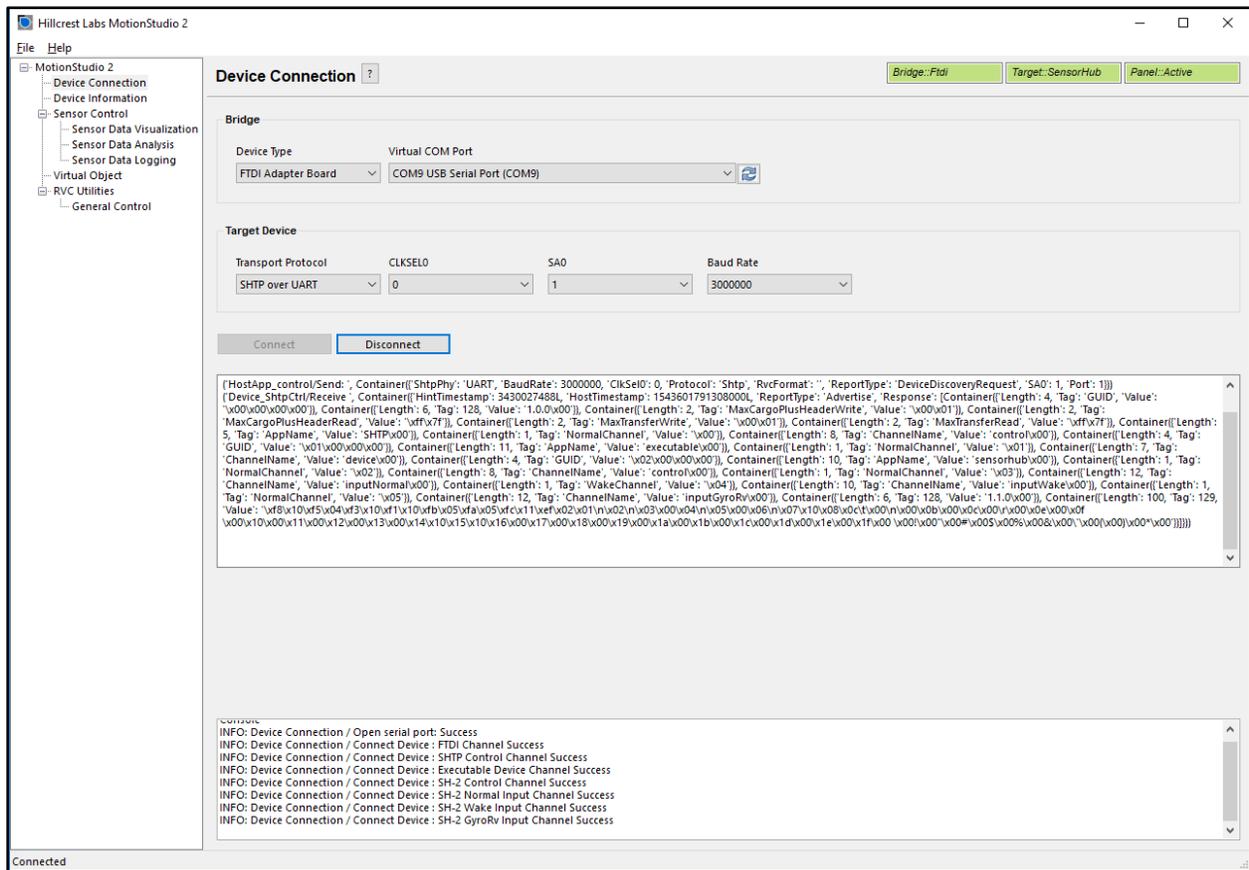
Figure 7: Device Connection Window after Successful Communication in Freespace™ MotionStudio 2

When connection process is completed, the three status indicator text boxes on the upper right corner of the panel and the console window on the bottom provide the result of connection process. The three status indicators show the status of the connected system and the status of the associated panel. If the specific panel supports the protocol used by the connected device, the panel becomes active and shows in green color.

Sensor Control

The Sensor Control panel allows the user to enable and disable the various sensors individually. There are two ways to control sensors:

- To enable an individual sensor at a default operation rate, use the check box on the right end of the row for each sensor.
- To enable sensors at specific rates, input the requested operating period, in microseconds, in the 'Requested Period (us)" fields. Then click the "Set Sensor Periods" button on the top of the panel. All sensors will be updated with the specified operating period. The "Requested Period (us)" fields which are left blank or have invalid values are assumed to be "zero".

In many cases, the sensors do not operate at the exact rate as requested. The actual operating period is shown in the "Reported Period (us)" field. Users can also use the "Get Sensor Periods" button on top of the panel to refresh the actual operating period for all sensors.
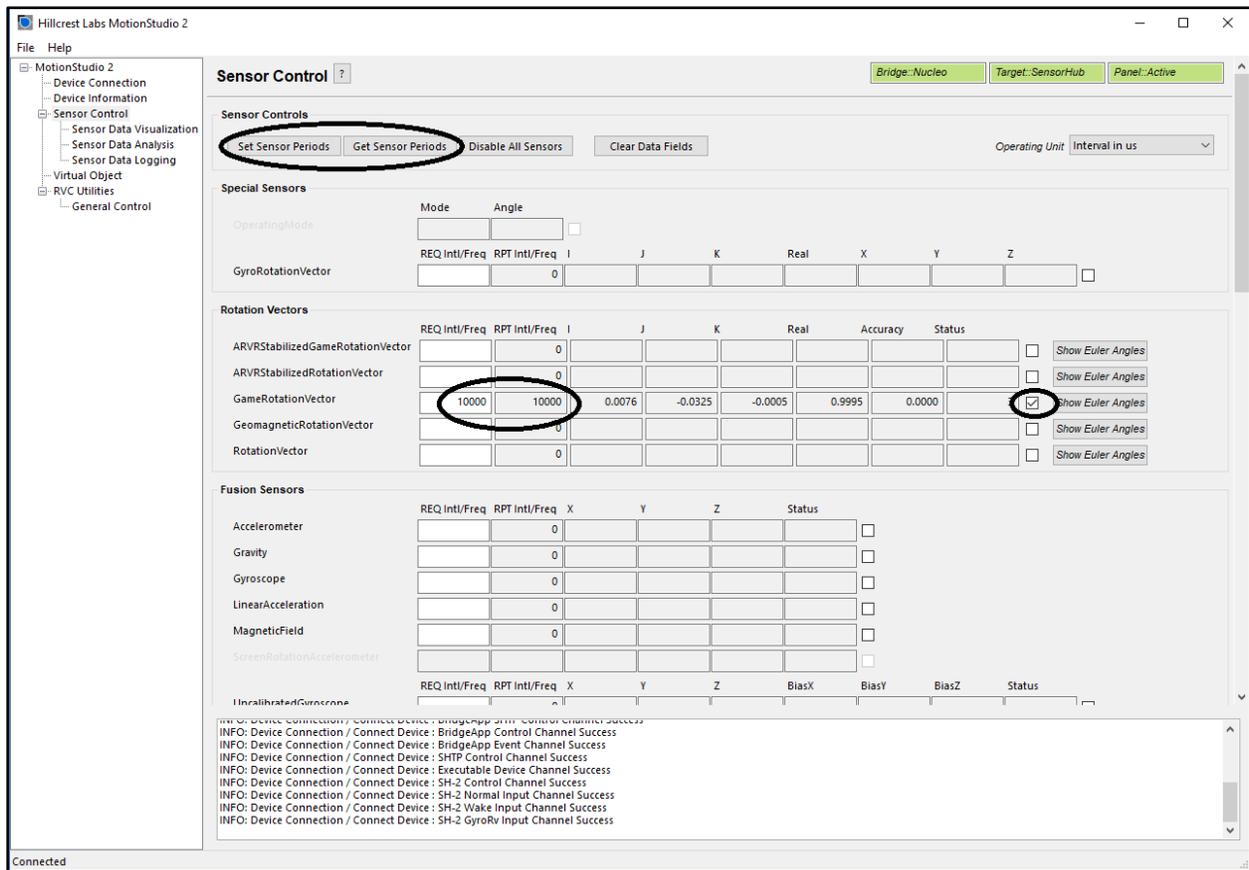
Figure 8: Sensor Control Panel in Freespace™ MotionStudio 2

Virtual Object

Virtual Object panel shows the orientation of the device. Please note that you need to enable sensors in *Sensor Control* panel, then select the sensor from the drop-down menu in *Virtual Object* panel. The sword in the Virtual Object will move according to the device orientation.

To adjust the camera position, move the cursor to the *Virtual Object* Panel, then press the LEFT mouse button. Hold the button down and move the mouse to change the view position. To reset the camera position, use the "*Reset Camera Position*" button.

To display the Game Rotation Vectors, select the *GameRotationVector* from the drop-down menu, the data fields should start updating with the received sensor data. The virtual object will move according to the orientation of the hardware. The Virtual Control panel does not control the sensor but displays the output data.
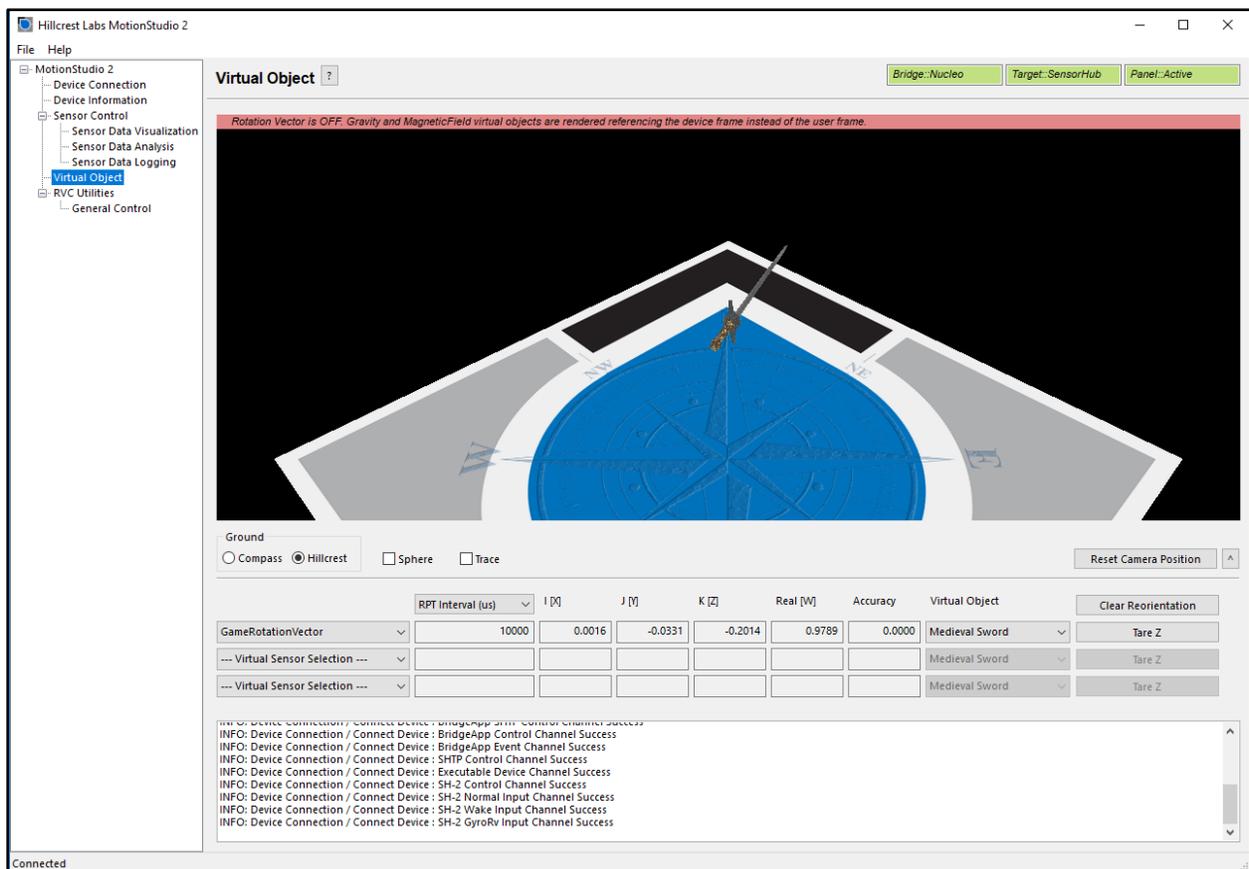
Figure 9: Virtual Object Panel in Freespace™ MotionStudio 2

Figure 10: FSP200 Serial/USB Adapter Board Orientation

Please follow the instructions below to align your device.

- Enable Game Rotation Vector in "*Sensor Control*" panel.
- Switch to Virtual Object panel and move the background so the black corner of the Hillcrest logo on the ground plane points to your forward direction (heading).
- Hold the FSP200 Serial/USB Adapter board Y+ axis points to your forward direction.

- Select "*GameRotationVector*" in drop-down menu and click "*Tare Z*". Now, the sword will point to the edge of the Hillcrest logo and is aligned with your device Y+.
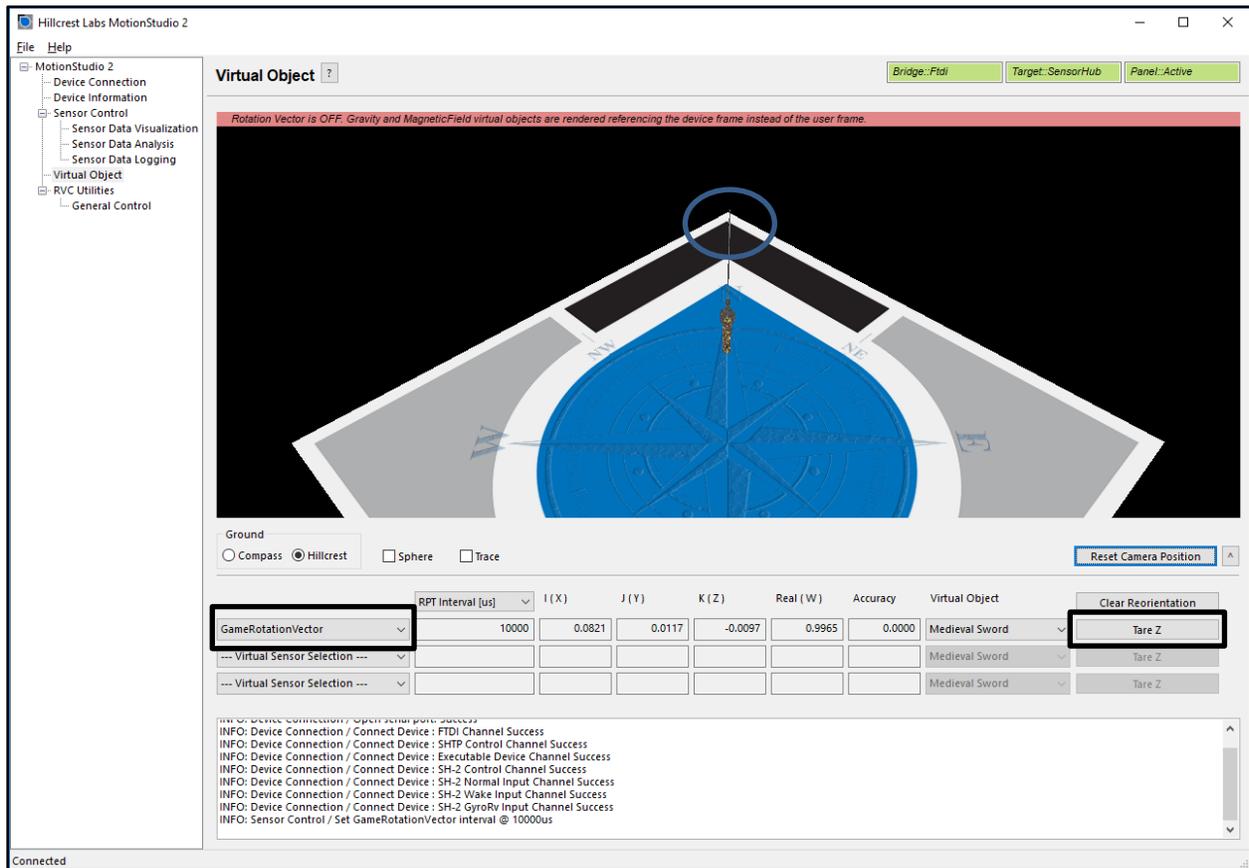
Figure 11: Sensor Orientation in Virtual Object Panel in Freespace™ MotionStudio 2

References

1. 1000-4121 FSP200 Datasheet, Hillcrest Labs
2. 1000-3625 SH-2 Reference Manual, Hillcrest Labs
3. 1000-3535 Sensor Hub Transport Protocol, Hillcrest Labs

Notices

www.ceva-dsp.com

FOR MORE
INFORMATION: