# Motion Tutorial

**Shadow** Version 4.0

www.motionshadow.com

# 1 Getting Started

The **Getting Started** guide is intended for new users of the Motion software or if you need a quick review. This tutorial outlines the most common usage of the Motion Service in more detail.

# 2 Tutorial

This tutorial covers everything you need to configure a device, preview the output, record data, and export it for usage or analysis in your software.

## 2.1 Configure a sensor

The Motion Service operates on a set of devices called the configuration. To record data from a device it must first be a member of the current configuration list. Open the `Devices` panel in the desktop application to view and change the configuration.

## 2.2 Record data

The Motion Service provides logging of all output data to your user data folder. A single session of recorded data is called a *take*. Each *take* is stored in your data folder, ordered by date and sequence.

Even though a device is connected, streaming data, and is available for preview does not mean that the data streams are saved to disk. To record a take, run the **Start Take** command. When the take is active, the command rollout will turn blue and the indicator light on the Shadow device will turn solid blue.

When are finished recording data, run the **Stop Take** command. This will stop the take, save all of the take data files, and run any automatic exporter that is active.

## 2.3 Export data

Once you have a take, you can export the data for easy access from third party applications. The Motion Service provides export to the following formats. We try out best to adhere to the most standard version of the files and may convert measurement data to different units to meet this goal.

- Autodesk FBX (*.fbx)

- Comma Separated Values (*.csv)

- Biovision Hierarchy (*.bvh)

- Coordinate 3D (*.c3d)

To export a take, run the **Export** command. Enter a filename at the prompt. As with all user data, the exported file is stored relative to your user data folder.

By default, we choose the data set based on the file format selected and its most likely use case. The FBX file contains an animated skeleton with a simple mesh suitable for viewing in a 3D content application. The BVH contains only the skeletal hierarchy, the joint rotations, and the position of the skeletal root. The CSV and C3D files contain all of the data in the take, including raw measurements.

## 2.4   Excel

To import orientation and sensor data into Microsoft Excel, or any other similar application, use CSV exporter. Import the Comma Separated Value (CSV) stream file into your spreadsheet application.

The CSV stream format contains the following fields. Note that some fields may not be present depending on your device settings. See the **SDK Reference** manual for more information on the format of the data streams.

- time, in seconds

- Gq[w, x, y, z], global quaternion

- Gdq[w, x, y, z], global delta quaternion

- Lq[w, x, y, z], local quaternion

- r[x, y, z], local Euler angle rotation in radians

- la[x, y, z], global linear acceleration, specified in $g$

- lv[x, y, z], global linear velocity, specified in $cm/second$

- lt[x, y, z], global linear translation, specified in $cm$

- c[w, x, y, z], global positional constraint, specified in $cm$ with unitless weight channel

- a[x, y, z], calibrated accelerometer measurement, specified in $g$

- m[x, y, z], calibrated magnetometer measurement, specified in $\mu T$ (microtesla)

- g[x, y, z], calibrated gyroscope measurement, specified in $^{degree}/_{second}$

- A[x, y, z], raw accelerometer measurement, 16-bit signed integer format

- M[x, y, z], raw magnetometer measurement, 16-bit signed integer format

- G[x, y, z], raw gyroscope measurement, 16-bit signed integer format

- temp, temperature measurement, specified in degrees Celsius

## 2.5   Application Development

The Motion software includes a Software Development Kit (SDK) to simplify integration with your C, C++, C#, Java, or Python application. The Motion Service publishes all output data streams for real-time access from your application. See the **SDK Reference** for more information and full usage examples.

The SDK classes and C API access data streams from the Motion software service. All sensor configuration and management is handled through the desktop application or through Lua scripting commands.