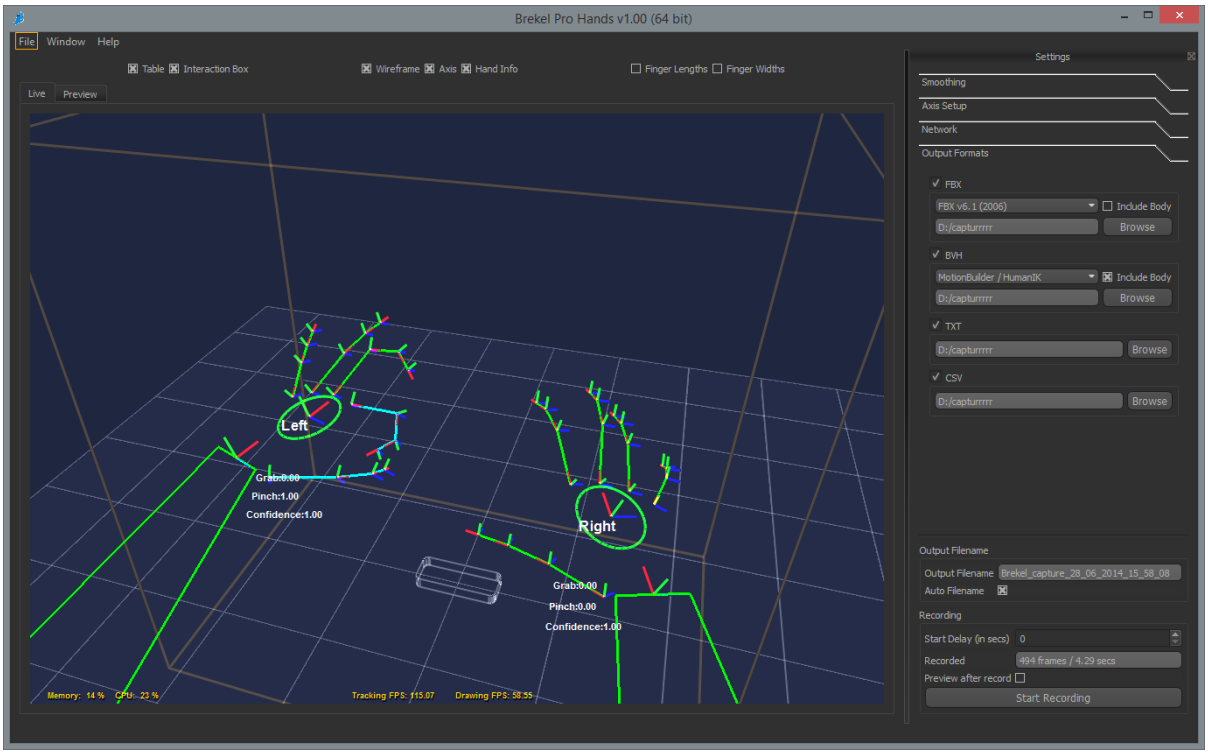
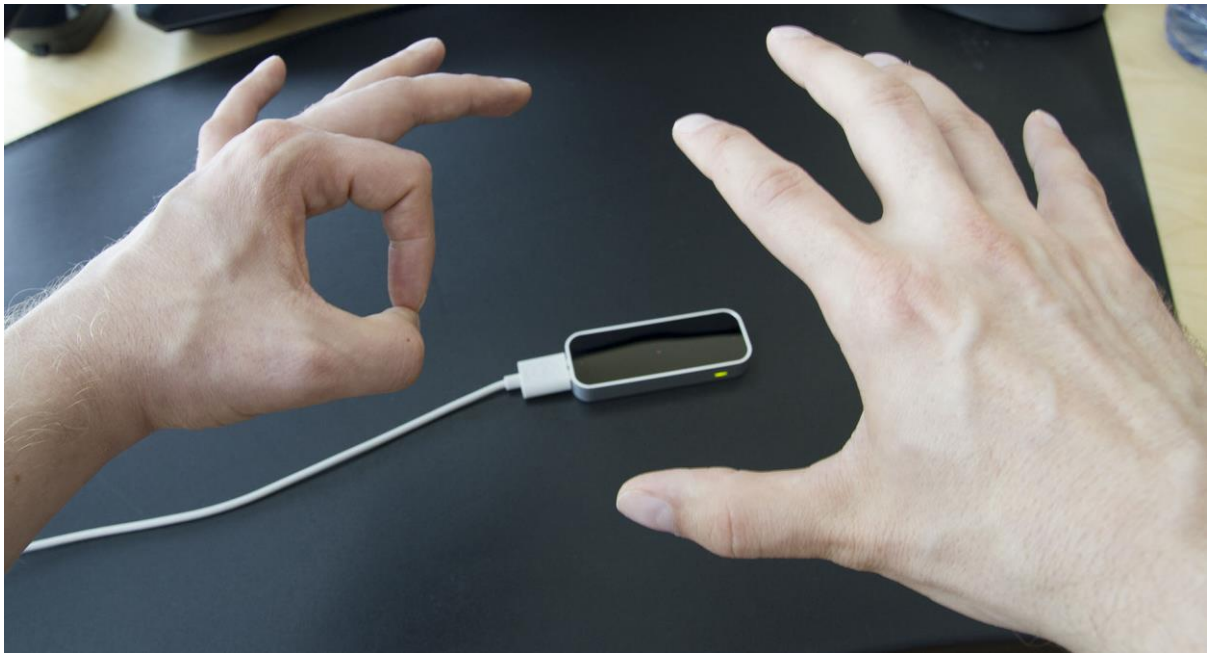
BREKEL

HANDS

WHAT IS “BREKEL HANDS”





“Brekel Hands” is a Windows application that enables 3D animators to record hand&finger Motion Capture data using a Leap Motion sensor.

It is written by Jasper Brekelmans, so in case you’re wondering that’s what “Brekel” refers to.

“Brekel” is pronounced as “Break–uhl”.

REQUIREMENTS

- Leap Motion sensor

- Leap Motion drivers/SDK v2.x or above

- Microsoft Windows 7 or higher

- Core i3, i5 or i7 CPU

- USB 2.0 (or 3.0) port

- 4 GB RAM or more

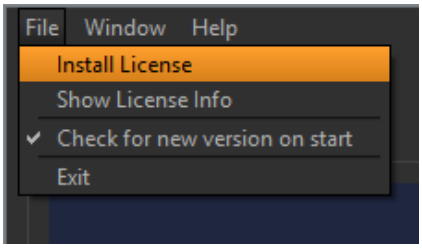
- Graphics card with OpenGL support

LICENSING

With your purchase you should have received a download link for the retail version of the software and an email with your license code. (Please allow up to 24 hours for processing your request and double check your spam filter)

The retail version will work immediately and with no restrictions even without a valid license, but will need activation within 5 days for continuous operation.

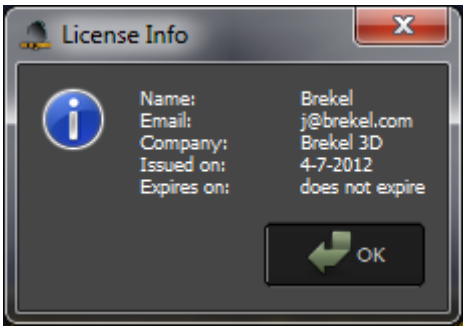
You can activate your copy by using the “File > Install License” option from the menu.



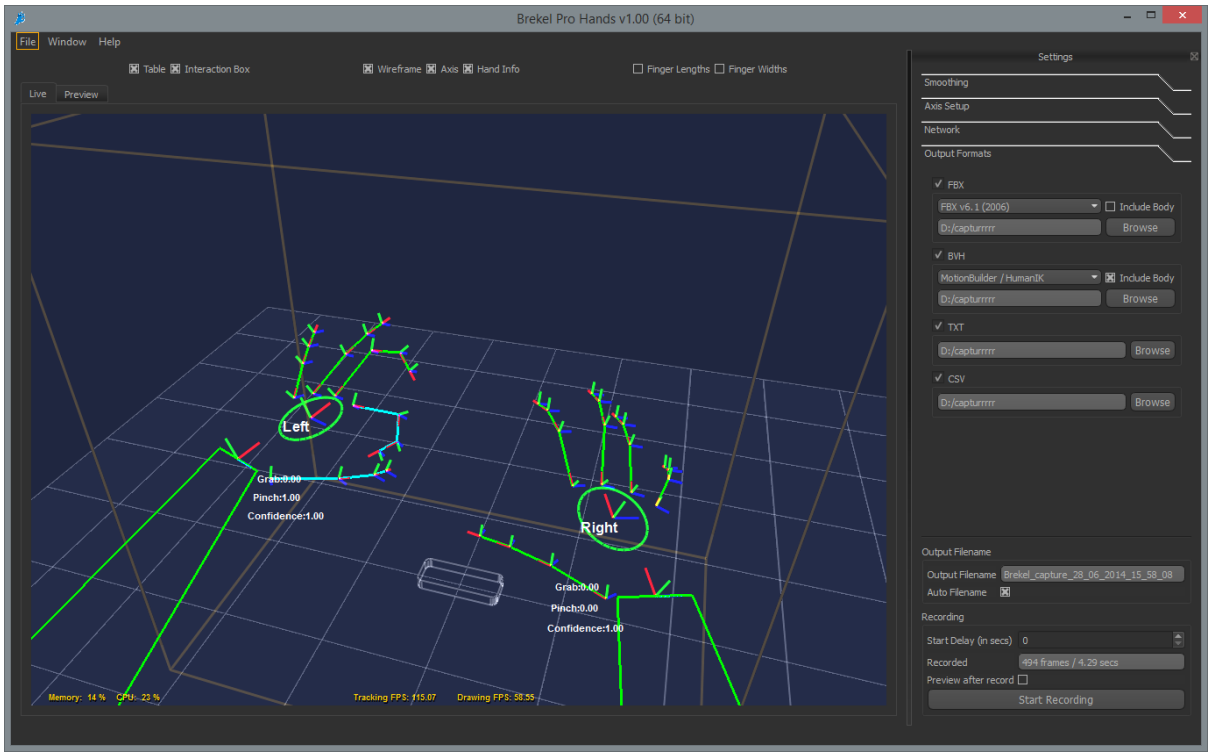
It will ask you to browse for your license file (which was attached to the mail).

The license will automatically be copied to your “C:\ProgramData” folder and be active upon restart of the application.

To display the current license info use the “File > Show License Info” option from the menu to display a window like the following:



THE MAIN INTERFACE



The interface is divided in:

- Top Menu
- 3D View
- Settings

These Settings window can be undocked and turned into a floating window by dragging it from the title bar.

Double clicking on the taskbar of a floating window will dock it back into the main window.

The state will automatically be saved on exit and reloaded on start.

TOP MENU

File > Install License

Installs a new license file, more info in the “Licensing” chapter of this manual.

File > Show License Info

Displays the contents of the currently installed license.

File > Check for new version on start

Checks if a new version is available by accessing the brekel.com website.

File > Exit

Exists the program.

Window > Restore to default

Restores the interface to the default state, including showing hidden windows.

Window > Draw FPS

Toggles drawing of tracking and drawing FPS at the bottom of the 3D view.

Window > Draw Memory/CPU usage

Toggles drawing of the memory and CPU usage at the bottom of the 3D view

Help > Driver Installation

Opens a webpage describing how to install the drivers.

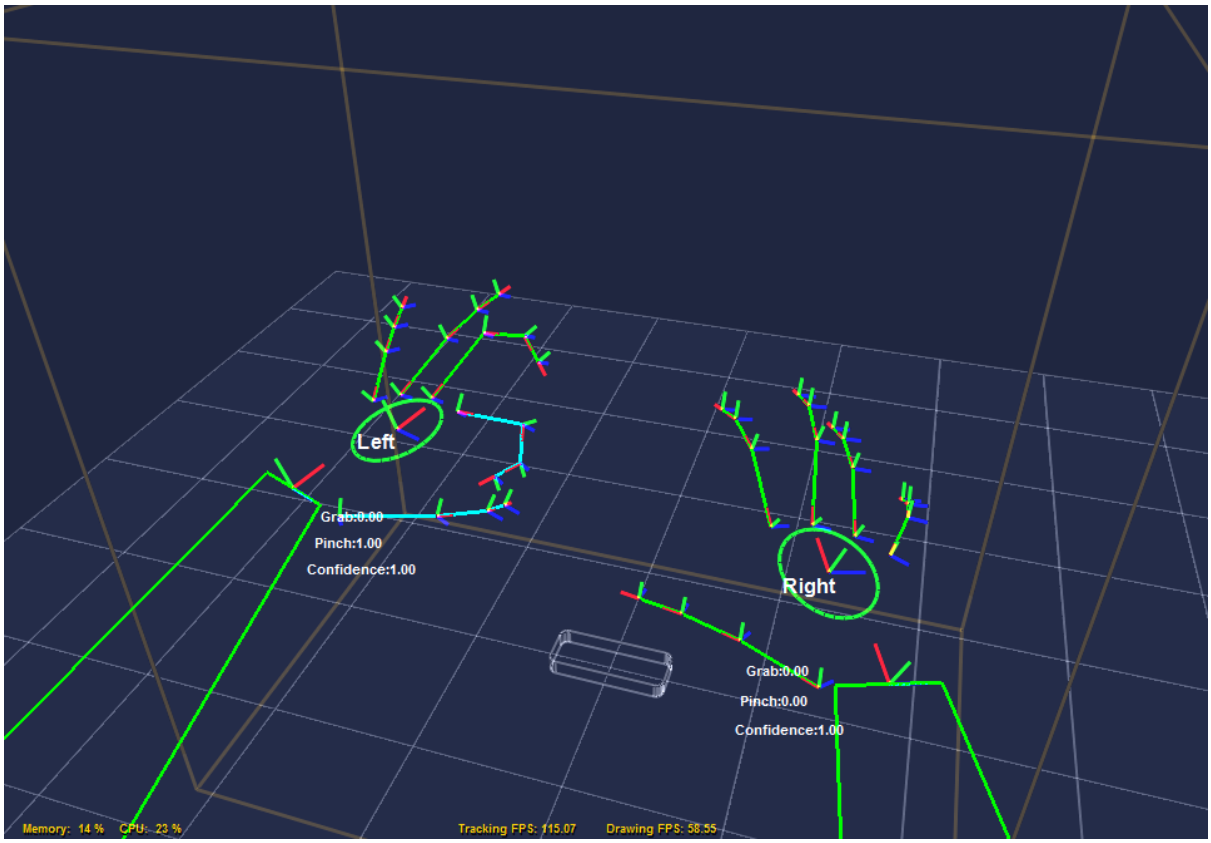
Help > Downloads Page

Opens the download page with current and previous versions.

Help > Forum

Opens a webpage with the user forum.

THE 3D VIEW



The main area displays all the 3D tracking data.

When the “Live” tab is selected it will show live tracking data coming from the sensor.

When the “Preview” tab is selected the last recorded take will be shown.

For navigation:

- Left mouse button for orbit
- Middle mouse button for dolly
- Right mouse button for drag
- Mouse wheel for dolly

Table

This will draw a grid underneath the sensor in the 3D view, visualizing the table.

Interaction Box

This will draw a brown box in the 3D view roughly indicating the area in which hands & fingers can be tracked.

Wireframe

This will draw the hand palms as circles and fingers as lines.

Axis

This will draw a small axis for each palm and each finger joint.

Red represents the X axis, Green the Y axis and Blue the Z axis, these can be adjusted to exactly match your character rig on the “Axis Setup” tab in the “Settings” area.

Hand Info

This will display additional info for each hand, like Left/Right, Grab and Pinch percentages and the tracking Confidence.

Finger Lengths

This will display the length of each finger in the 3D view.

Finger Widths

This will display the width of each finger in the 3D view.

Memory

Indicates how much overall system memory is in use. (by all running applications)

CPU

Indicates how much overall CPU power is in use. (by all running applications)

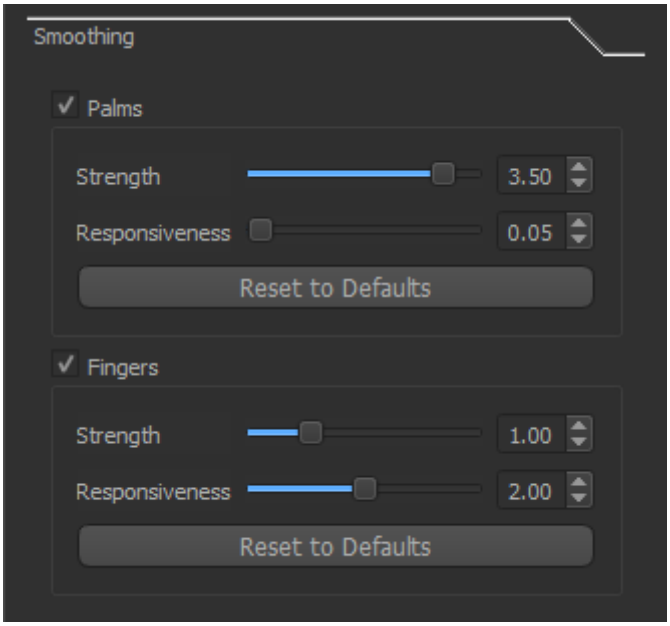
Tracking FPS

Indicates at how many frames per second the tracker is running.

Drawing FPS

Indicates how fast the 3D drawing is running, note that if this is lower than the tracking FPS no data is dropped when recorded to files or streamed across the network.

SMOOTHING



Every vison-based tracking solution inherently contains noise so it's usually a good idea to perform a little bit of smoothing/filtering. Generally you want to apply more smoothing to the hands than the fingers to preserve detail.

Palms

Toggles hand palm smoothing on/off.

Fingers

Toggles finger smoothing on/off,

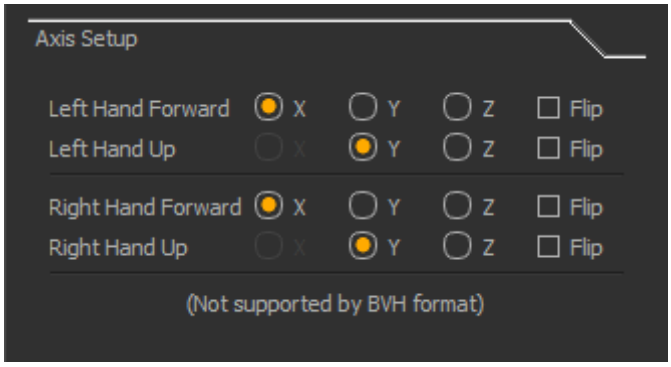
Strength

Amount of smoothing to apply, higher values mean smoother data but also increase lag.

Responsiveness

Increasing this can bring back more sharpness during quick motions while preserving smoothness for slower motions.

AXIS SETUP



In order to make connecting your character rig to the recorded data as easy as possibly it's a good idea to match their coordinate systems.

Using the Axis settings you can align the tracker so it matches your rig, look at the Axis visualization in the 3D view and match your rig.

Different settings for each hand are possible depending on how your rig is mirrored (or not).

Left/Right Hand Forward > X Y Z

Specifies the axis that points along the fingers to be either X (Red), Y (Green) or Z (Blue).

Left/Right Hand Forward > Flip

When ON the positive side of the selected X/Y/Z axis points along the finger, when OFF the negative side points along the finger.

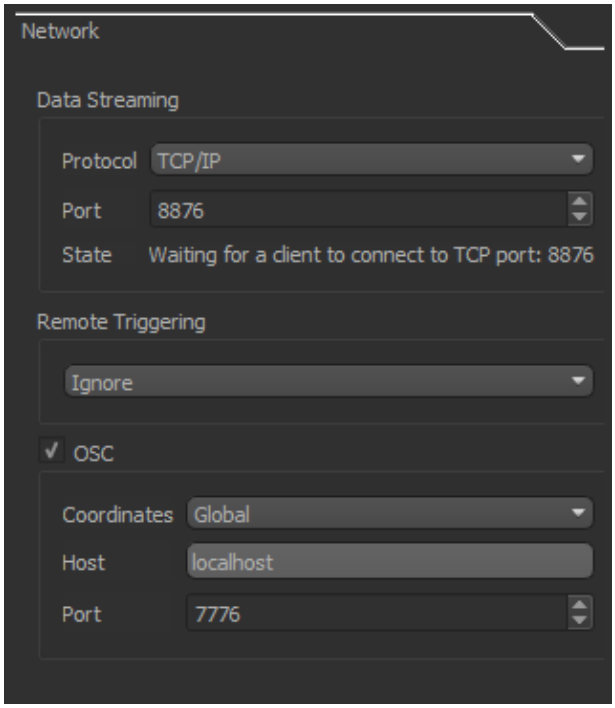
Left/Right Hand Up > XYZ

Specifies the remaining axis that points up, away from the palm.

Left/Hand Up > Flip

When ON the positive side of the selected axis points away from the palm, when OFF the negative side.

NETWORK



Protocol

Selects either TCP/IP or UDP as the streaming protocol, or turns streaming off.

Port

The network port used for streaming the data (default 8876)

Make sure your firewall isn't blocking this!

State

The current state of the network streaming, depicts if there are any clients connected or any errors.

Record Triggering

Allows synchronized recording across multiple Brekel applications.

One application can be in Primary mode, all others in Secondary or Ignore mode.

The Primary application will send a signal when recording is started and stopped so all applications start/stop at the same time and are using matching filenames.

Note that this works across multiple apps on the same machine and even across multiple machines on the same network.

Make sure your firewall isn't blocking port 8880-8890.

OSC

Enable/disable sending data out over UDP in OSC (Open Sound Control) format.

See chapter at the end of this manual for a description of the OSC messages that are sent.

Coordinates

Specifies whether to send global or local coordinates over the OSC port.

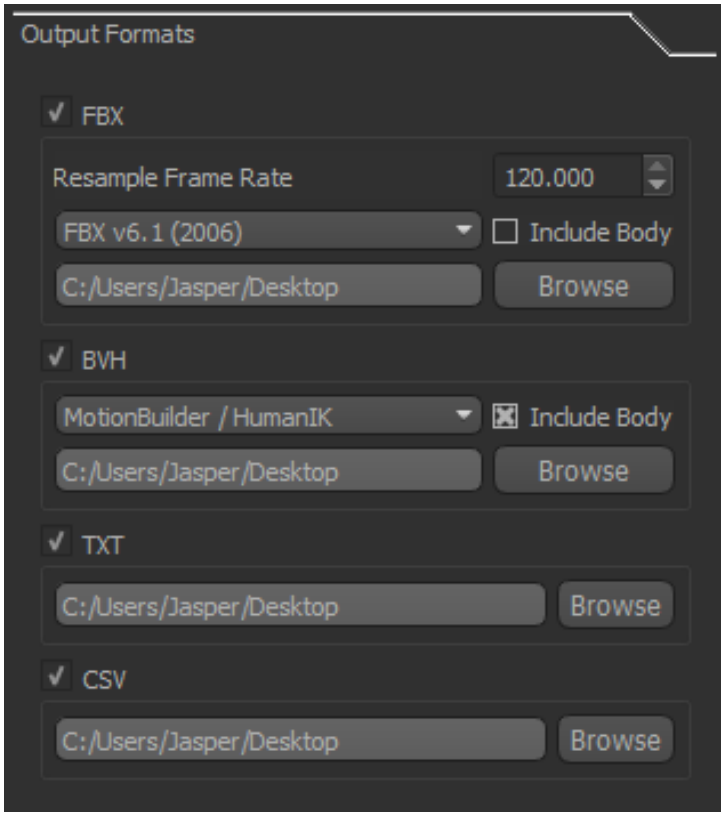
Host

Hostname / IP of machine to send the OSC data to (localhost if receiving application is running on the same machine as the Brekel application).

Port

Network port over which to send the OSC data.

OUTPUT FORMATS



FBX

FBX files are the preferred format since they can contain a 100% accurate representation of the tracking data, and should be supported by most 3D applications.

Resample Frame Rate

Specifies at which framerate the raw data should be resampled.

You can switch between V7.3 and V6.1 of the file format in case your FBX importer only supports an older format.

Include Body

When disabled a hierarchy of 2 hands (just like in the 3D view window) will be exported. With position/rotation for the hand and rotations for each finger joint.

When enabled a static full body skeleton with rotation data for the fingers will be exported.

Depending on your character rig and preferences you may find one or the other more convenient to work ith.

BVH

BVH is a common, yet 20 year old skeleton format supported by some 3D applications.

Note that the format is not as accurate as FBX since it can't contain custom axis configurations, nor can it hold small interframe timing fluctuations.

Also some BVH importers in various 3D apps work better than others, and some are not designed to handle fingers at all.

You can select BVH variations for MotionBuilder/HumanIK, 3DMax Biped and Poser/DAZ. This will internally match the default bone-naming template as well as basepose.

Include Body

When disabled a hierarchy of 2 hands (just like in the 3D view window) will be exported. With position/rotation for the hand and rotations for each finger joint.

When enabled a static full body skeleton with rotation data for the fingers will be exported.

Depending on your character rig and preferences you may find one or the other more convenient to work with.

TXT

Saves all the data in a readable text format.

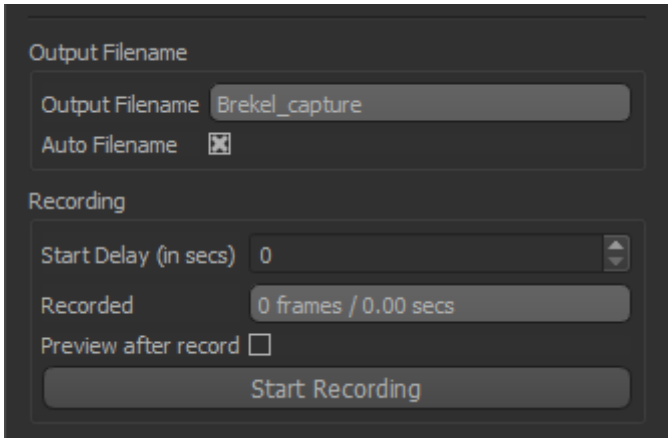
For example in case you want to write a custom importer to interpret and use the data.

CSV

Writes to a Comma Separated Values file containing angles for the joints.

This could for example be used to analyze the data in a spreadsheet.

RECORDING



Output Filename

The name of the output file(s), note that the output folders can be specified for each format individually

Auto Filename

When turned ON the filename will be automatically generated using the current date & time.

Start Delay (in secs)

When bigger than 0 a countdown will start after starting a recording, giving you a few seconds to get into position before capture will start.

During countdown there will be beeps played over the speakers every second, and the amount of remaining seconds will also be shown visually in the 3D window.

Preview after record

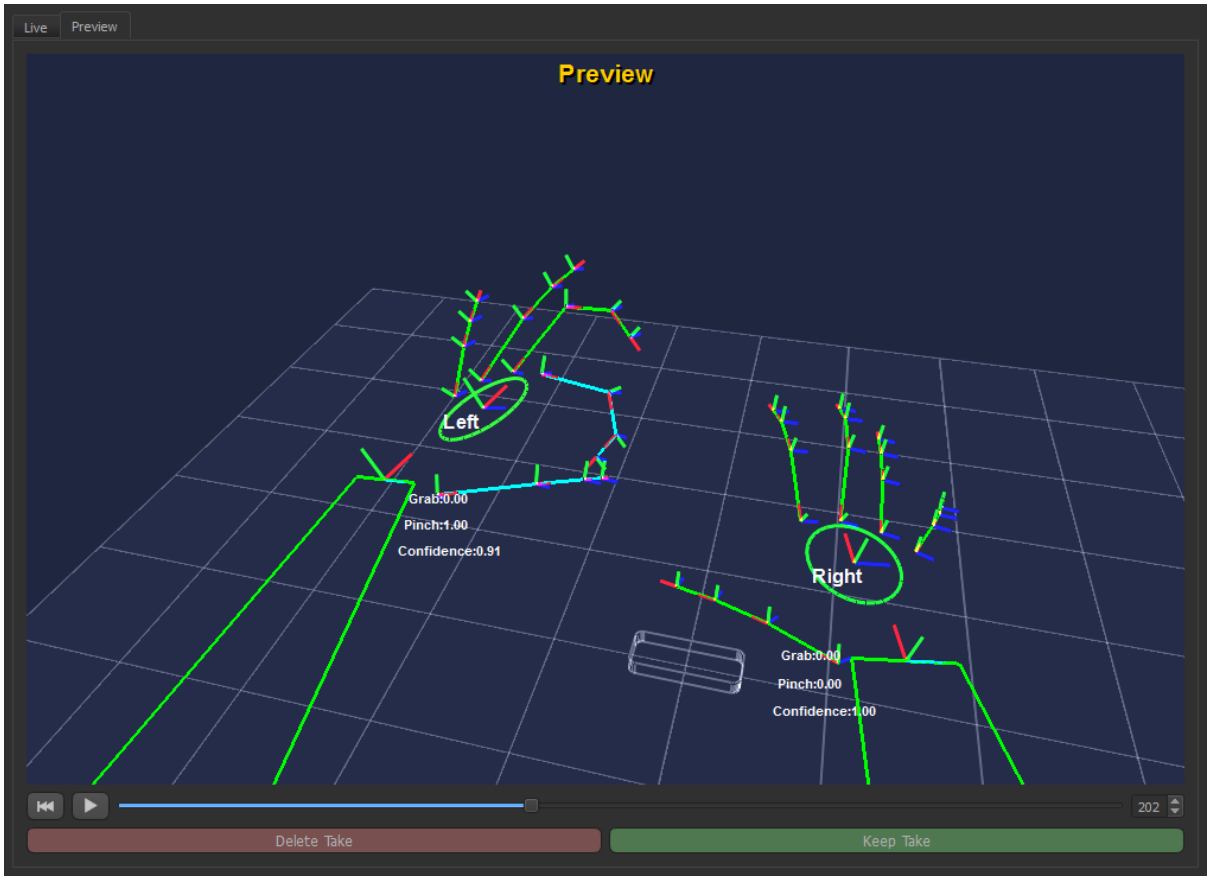
When turned ON the 3D view will automatically swap to the “Preview” tab and display the last recorded file.

When turned OFF it will stay on the “Live” tab but you still have the option to manually switch to the “Preview” tab and look at the last recording.

Start/Stop Recording

Toggle button for starting & stopping the recording. (Note the button turns red while recording)

PREVIEW



When switching the 3D view to the Preview tab it will display the last recorded take instead of live data from the sensor.

You can play/pause/scrub trough the data using the standard video player and slider controls.

Delete Take

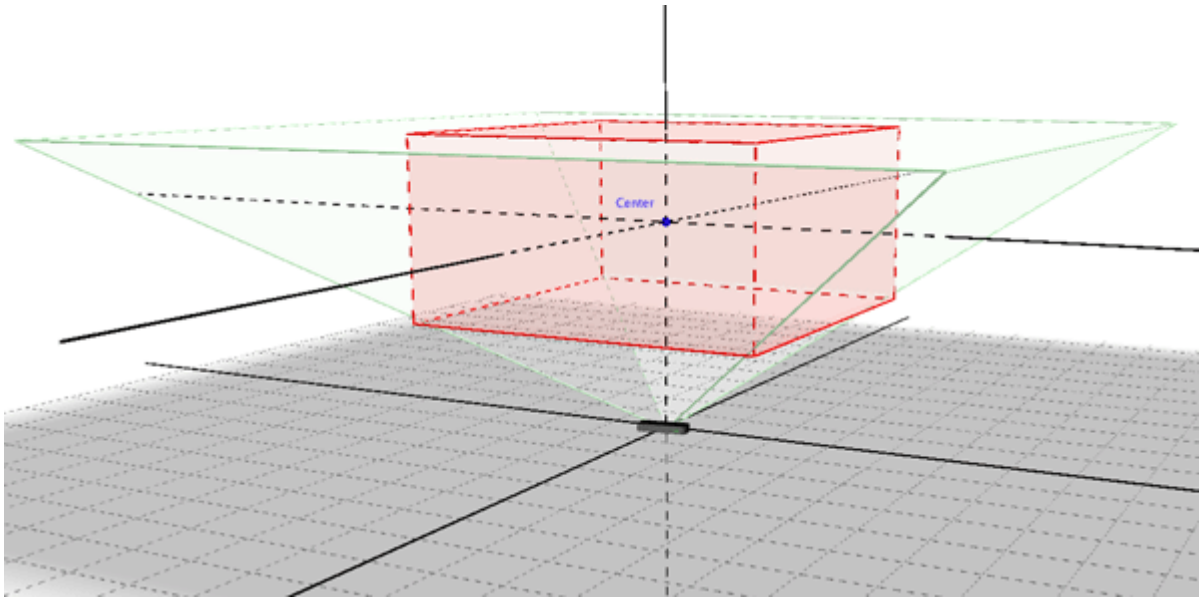
Will delete the recorded data from disk.

Keep Take

Will keep the recorded data and switch back to streaming Live data.

(Note, this is the same as simply switching back to the Live tab manually)

SENSOR PLACEMENT



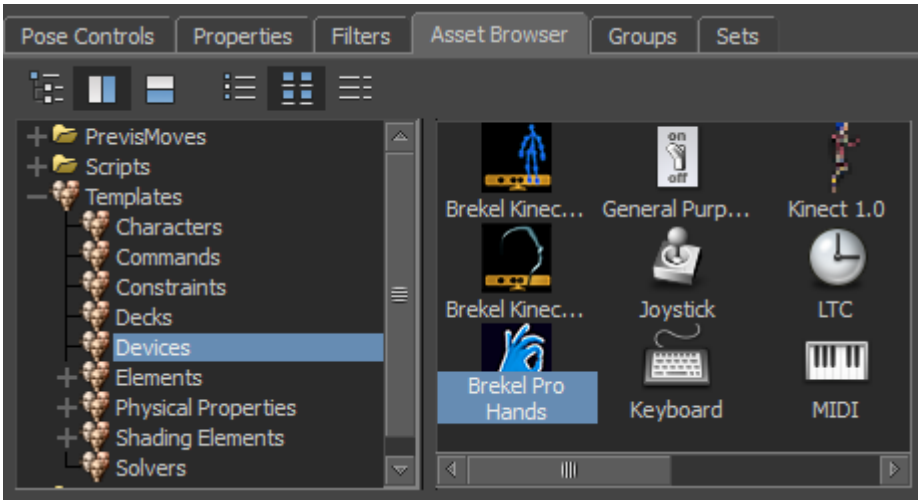
Normally you want to place the Leap Motion device flat on a table with your hands hovering above it.

Note that there is a setting in the Leap Motion Control Panel that optimizes the tracker for top-down use, but due to finger visibility this may not work as well.

MOTIONBUILDER PLUGIN INSTALLATION

The installer should have automatically installed the plugins for the available versions of MotionBuilder.

And you should now have a “Brekel Pro Hands” Device listed under the “Devices” folder of the “Asset Browser”.



If it doesn’t show up, you can find all the plugins for the various MotionBuilder versions (2009-2015 both 32- and 64 bit) in the “Brekel Pro Hands” installation folder, usually in:

C:\Program Files\Brekel Pro Hands\MotionBuilder plugins

Simply copy the .dll file of your particular MotionBuilder version to it’s plugin folder.

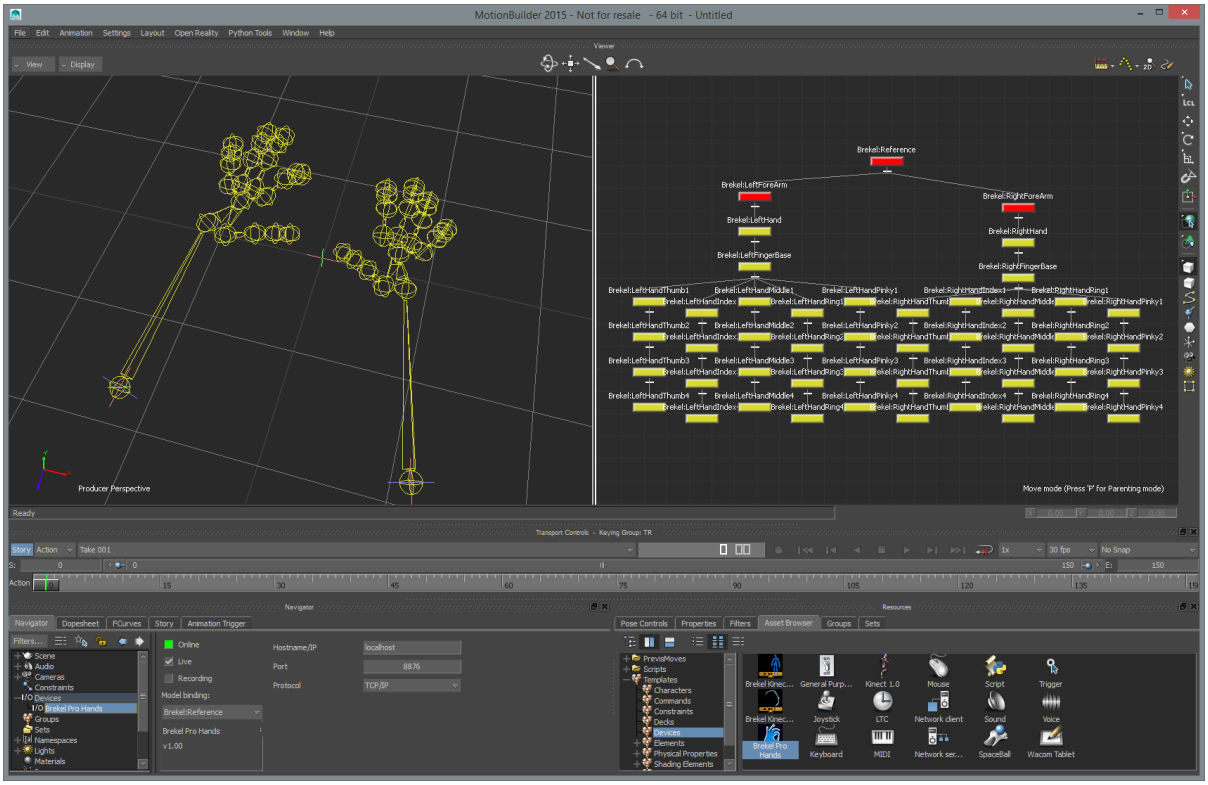
Typically for a 32 bit version:

C:\Program Files (x86)\Autodesk\MotionBuilder 2013\bin\win32\plugins

For a 64 bit version:

C:\Program Files\Autodesk\MotionBuilder 2013\bin\x64\plugins

USING THE MOTIONBUILDER PLUGIN



First make sure “Brekel Pro Hands” is running.

To setup a MotionBuilder scene go through the following steps:

- drag a “Brekel Pro Hands” Device from the “Devices” folder in the “Asset Browser” into your scene.
- In the GUI for the device make sure the “Hostname/IP” points to the machine running the “Brekel Pro Hands” application. This can either be a separate machine that is reachable over a network connection or the same machine.
- (Note: if both applications are running on the same machine you can simply use the default Hostname/IP of “127.0.0.1”)
- Toggle the “Online” button to turn the device on
- Under “Model binding:” hit the “None” option and then “Create”, this will create a model hierarchy in your scene containing the skeletons

Hostname/IP

Should point to the machine running Brekel Pro Hands.

If both MotionBuilder and Pro Hands run on the same machine you can also leave this at the default of localhost or 127.0.0.1

Port

Should be the same port as used in the Brekel Pro Hands application. (default 8876)

Protocol

Should be the same protocol (TCP/IP or UDP) as used in the Brekel Pro Hands application.

To record a sequence:

- Make sure “Online” on the device is toggled ON
- Make sure “Live” on the device is toggled ON
- Make sure “Recording” on the device is toggled ON
- Make sure the “Record” button on the timeline transport controls is toggled ON
- Hit the Play button, and Stop button once the action is over

To play back a recording:

- Make sure “Online” on the device is toggled ON
- Make sure “Live” on the device is toggled OFF
- Hit Play on the timeline transport controls or scrub trough the timeline

OSC (OPEN SOUND CONTROL) MESSAGES

The following messages are sent:

```
Address pattern: /hand_L    (or /hand_R)

int:     ID of the hand

int:     forward axis               0=X      1=Y      2=Z

int:     up axis                    0=X      1=Y      2=Z

bool:    flip forward               is forward axis reversed or not

bool:    up forward                 is up axis reversed or not

float:   timestamp

float:   tracking confidence        0.0 not confident - 1.0 fully confident

float:   grab strength

float:   pinch strength

float:   palm width

float:   arm width
```

```
Address pattern: /elbow_L   (or /elbow_R)

int:     ID of the hand it belongs to

float:   X position         in global space

float:   Y position         in global space

float:   Z position         in global space

float:   X rotation         in global space and in euler angles

float:   Y rotation         in global space and in euler angles

float:   Z rotation         in global space and in euler angles
```

```
Address pattern: /wrist_L   (or /wrist_R)

int:     ID of the hand it belongs to

float:   X position

float:   Y position

float:   Z position

float:   X rotation         in euler angles

float:   Y rotation         in euler angles

float:   Z rotation         in euler angles
```

Note that the "OSC Coordinates" setting in GUI depicts if these are in global coordinates (relative to sensor) or local coordinates (relative to parent joint)

```
Address pattern: / palm_L   (or / palm_R)

int:     ID of the hand it belongs to

float:   X position

float:   Y position

float:   Z position

float:   X rotation         in euler angles

float:   Y rotation         in euler angles

float:   Z rotation         in euler angles

float:   X palm velocity

float:   Y palm velocity

float:   Z palm velocity
```

Note that the "OSC Coordinates" setting in GUI depicts if these are in global coordinates (relative to sensor) or local coordinates (relative to parent joint)

```
Address pattern: /<fingerName>_base_L (or /<fingerName>_base_R)

(see list below for possible fingerName)

int:     ID of the hand it belongs to

float:   finger length

float:   finger width

float:   X position

float:   Y position

float:   Z position

float:   X rotation         in euler angles

float:   Y rotation         in euler angles

float:   Z rotation         in euler angles
```

Note that the "OSC Coordinates" setting in GUI depicts if these are in global coordinates (relative to sensor) or local coordinates (relative to parent joint)

```
Address pattern: /<fingerName>_knuckle1_L      (or /<fingerName>_ knuckle1_R)

(see list below for possible fingerName)

int:     ID of the hand it belongs to

float:   X position

float:   Y position

float:   Z position

float:   X rotation         in euler angles

float:   Y rotation         in euler angles

float:   Z rotation         in euler angles
```

Note that the "OSC Coordinates" setting in GUI depicts if these are in global coordinates (relative to sensor) or local coordinates (relative to parent joint)

```
Address pattern: /<fingerName>_knuckle2_L      (or /<fingerName>_ knuckle2_R)

(see list below for possible fingerName)

int:     ID of the hand it belongs to

float:   X position

float:   Y position

float:   Z position

float:   X rotation        in euler angles

float:   Y rotation        in euler angles

float:   Z rotation        in euler angles
```

Note that the "OSC Coordinates" setting in GUI depicts if these are in global coordinates (relative to sensor) or local coordinates (relative to parent joint)

```
Address pattern: /<fingerName>_tip_L  (or /<fingerName>_ tip_R)

(see list below for possible fingerName)

int:     ID of the hand it belongs to

float:   X position

float:   Y position

float:   Z position

float:   X rotation        in euler angles

float:   Y rotation        in euler angles

float:   Z rotation        in euler angles

float:   X palm velocity

float:   Y palm velocity

float:   Z palm velocity
```

Note that the "OSC Coordinates" setting in GUI depicts if these are in global coordinates (relative to sensor) or local coordinates (relative to parent joint)

Available joint names for <fingerNames>

thumb

index

middle

ring

pinky