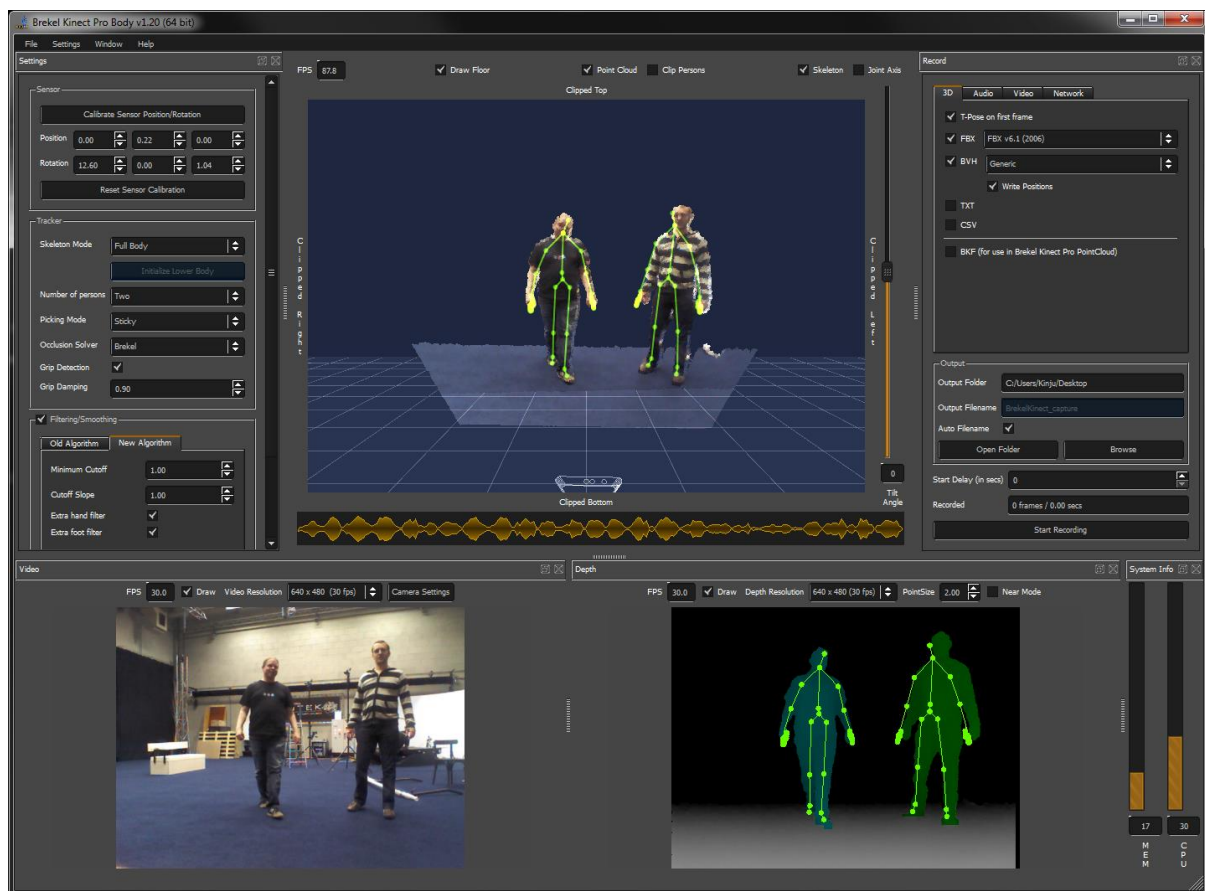


BREKEL

BODY

V1

WHAT IS “BREKEL BODY”



“Brekel Body” is a Windows application that enables 3D animators to record body Motion Capture data in their living room or office using a Microsoft Kinect sensor.

Internally tracking is done using the Microsoft Kinect SDK.

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

- Kinect for Windows or Kinect for XBox sensor
- Power supply for the Kinect sensor
- Microsoft Windows 7 or higher
- Core i5 or i7 CPU
- Dedicated USB 2.0 (or 3.0) bus
- 4 GB RAM or more
- Graphics card with OpenGL support

A Kinect for Windows sensor will also support 'near mode' allowing capture as close to 40 cm from the sensor, the minimum distance for a Kinect for Xbox sensor is 80 cm.

The Kinect for Windows sensor also supports control of the color camera settings like auto exposure, whitebalance etc.

Note: when you bought your Kinect for Xbox separately you should have a separate power supply.

If you've bought it bundled with an Xbox360 game console you need to buy a separate power supply, USB only will not be enough.

INSTALLATION

In order for “Brekel Kinect Pro Body” to work you will need to have the Microsoft drivers installed for your Kinect sensor. If you’ve got a different set of Kinect drivers installed (OpenNI, OpenKinect or CLNui for example) please first uninstall them.

(Note that the free “Brekel Kinect” application uses the OpenNI drivers)

The installer should have taken care of installing the drivers already but in case you want more details:

Please consult the following page for driver download and installation help:

<http://www.microsoft.com/en-us/kinectforwindows/develop/developer-downloads.aspx>

Kinect for Xbox sensors will ONLY work with the full SDK

Step 1: Set-up Kinect for Windows SDK

Includes drivers for using Kinect sensor on a computer running Windows 7, Windows 8 Consumer Preview, and Windows Embedded Standard 7. In addition, the download includes application programming interfaces (APIs) and device interfaces.

Version 1.5, updated 05/21/2012, 221 MB, English.

[Explore the features >](#)

DOWNLOAD LATEST SDK



[View Release Notes >](#)

Kinect for Windows sensors will work with the full SDK as well as the runtime (which is smaller to download)



Related downloads

- [Kinect for Windows Runtime v1.5](#)

The “Brekel Kinect Pro Body” installer will try to automatically detect any installed MotionBuilder versions (in the default locations) and install the appropriate plugins for streaming.

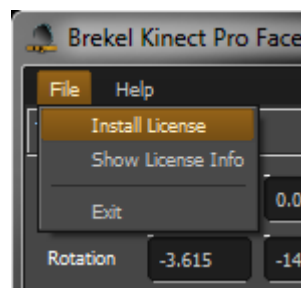
You can also manually copy the MotionBuilder plugins from the installed folder.

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.

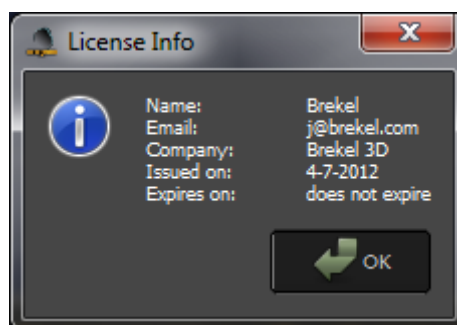
You can activate your copy by using the “File > Install License” option from the menu.



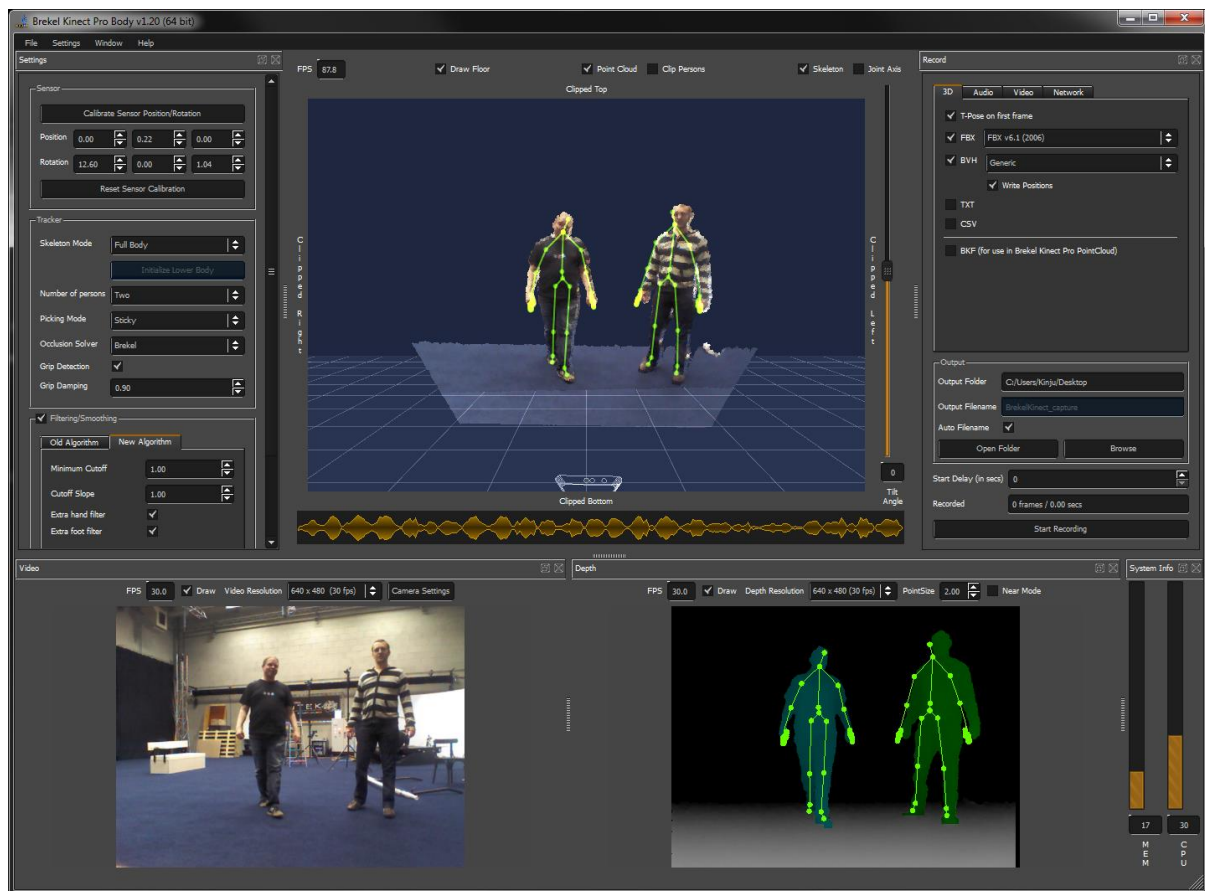
It will ask you to browse for your license file (which was attached to the mail).

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 5 main groups.

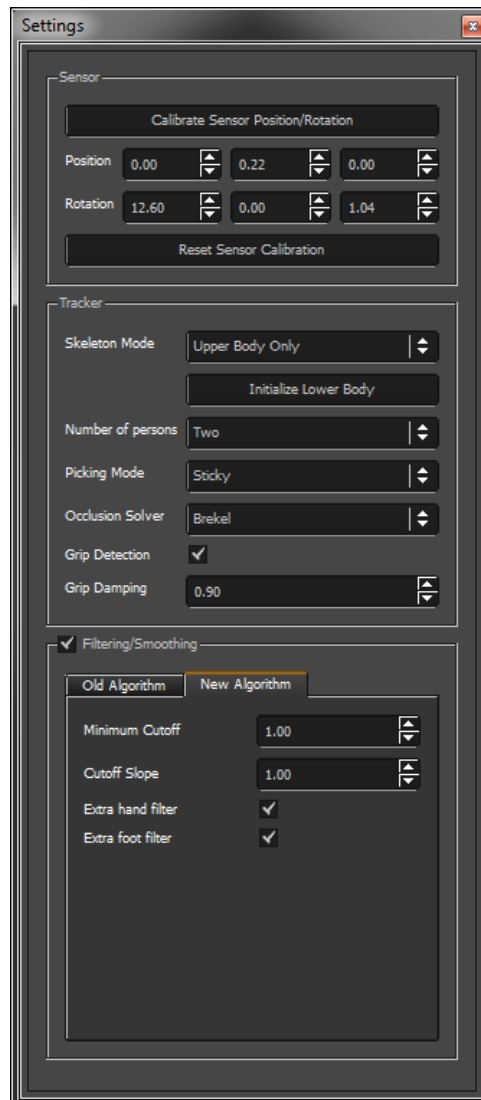
- Settings
- 3D View
- Record
- Video
- Depth
- System Info

These groups can be undocked and turned into a floating window by dragging them from their 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.

SETTINGS



Calibrate Sensor Position/Rotation

Using this button you can calibrate the software so the pointcloud and tracking is adjusted for a sensor that is tilted up or down and adjust for the height of the sensor from the ground.

First set the desired tilt using the slider on the right of the 3D view, make sure you are fully in view.

During calibration the tilt motor will be adjusted so the sensor is horizontal.

The lowest visible point will then be measured and be used to estimate the sensor's height from the ground.

The tilt motor will then be adjusted back to the previously set angle.

Angle estimation is done using the sensor's internal accelerometer.

Sensor Position

Adjusting these XYZ values will translate the pointcloud and resulting skeleton, the main value of interest is the Y value depicting the height of the sensor above the ground.

These values will be filled out by the automatic calibration, but can also be changed manually.

Sensor Rotation

Adjusting these XYZ values will rotate the pointcloud and resulting skeleton, which can be of use when the sensor is tilted.

These values will be filled out by the automatic calibration, but can also be changed manually.

Reset Sensor Calibration

Resets the Sensor Position and Rotation values back to 0

Skeleton Mode

“Full Body” mode will detect and track persons from head to toe using 20 joints.

Users are detected and segmented from the environment based on their distance from the background.

“Upper Body Only” mode will only track the torso, arms and head using ten joints, this is best used for when the feet are not visible to the sensor.

Users are detected and segmented from the environment based on movement.

Initialize Lower Body

Will snap the lower body to the correct position when in “Upper Body Only” tracking mode.

Number of persons

Selects either One or Two person tracking.

Picking Mode

“Sticky” will try to keep tracking people continuously without swapping.

“Closest to Sensor” will try to pick the people that are closest to the sensor for tracking.

Occlusion Solver

Choose algorithm that tries to solve joints that are hidden for the sensor.

“Brekel” tends to generate slightly better results than the standard “Microsoft Kinect SDK” one.

Grip Detection

Detect open/closed hands and create finger skeletons, note that this ONLY works if the hands are in front of the body.

Grip Damping

Smoothly blend between open and closed hand

Filtering

Since the sensor data and markerless tracking inherently contains noise this enables specially designed filters to reduce the noise but retain the data as well as possible. Note that this will always introduce some additional lag.

Old Algorithm

You can use the Light/Medium/Heavy presets or tune the parameters further yourself.

Smoothing

Increasing the smoothing parameter value leads to more highly-smoothed skeleton position values being returned.

It is the nature of smoothing that, as the smoothing value is increased, responsiveness to the raw data decreases.

Thus, increased smoothing leads to increased latency in the returned skeleton values.

Correction

Lower values are slower to correct towards the raw data, and appear smoother, while higher values will correct toward the raw data more quickly.

Prediction

The number of frames to predict into the future.

Values greater than 0.5 will likely lead to overshooting when moving quickly.

This effect can be damped by using small values of MaxDeviationRadius.

Jitter Radius

The radius in meters for jitter reduction.

Any jitter beyond this radius is clamped to the radius.

Max Deviation Radius

The maximum radius in meters that filtered positions are allowed to deviate from raw data.

Filtered values that would be more than this radius from the raw data are clamped at this distance, in the direction of the filtered value.

New Algorithm

Generally provides results that are closer to the original data, with better smoothing characteristics and less lag.

Tuning is best done by first lowering the Minimum Cutoff until the desired amount of smoothing is reached.

Then raising the Cutoff Slope to reduce the lag just until it gets noisy again.

Good default values are 1.0 for both.

Minimum Cutoff

Lower numbers for more smoothing.

Cutoff Slope

Higher numbers to reduce lag.

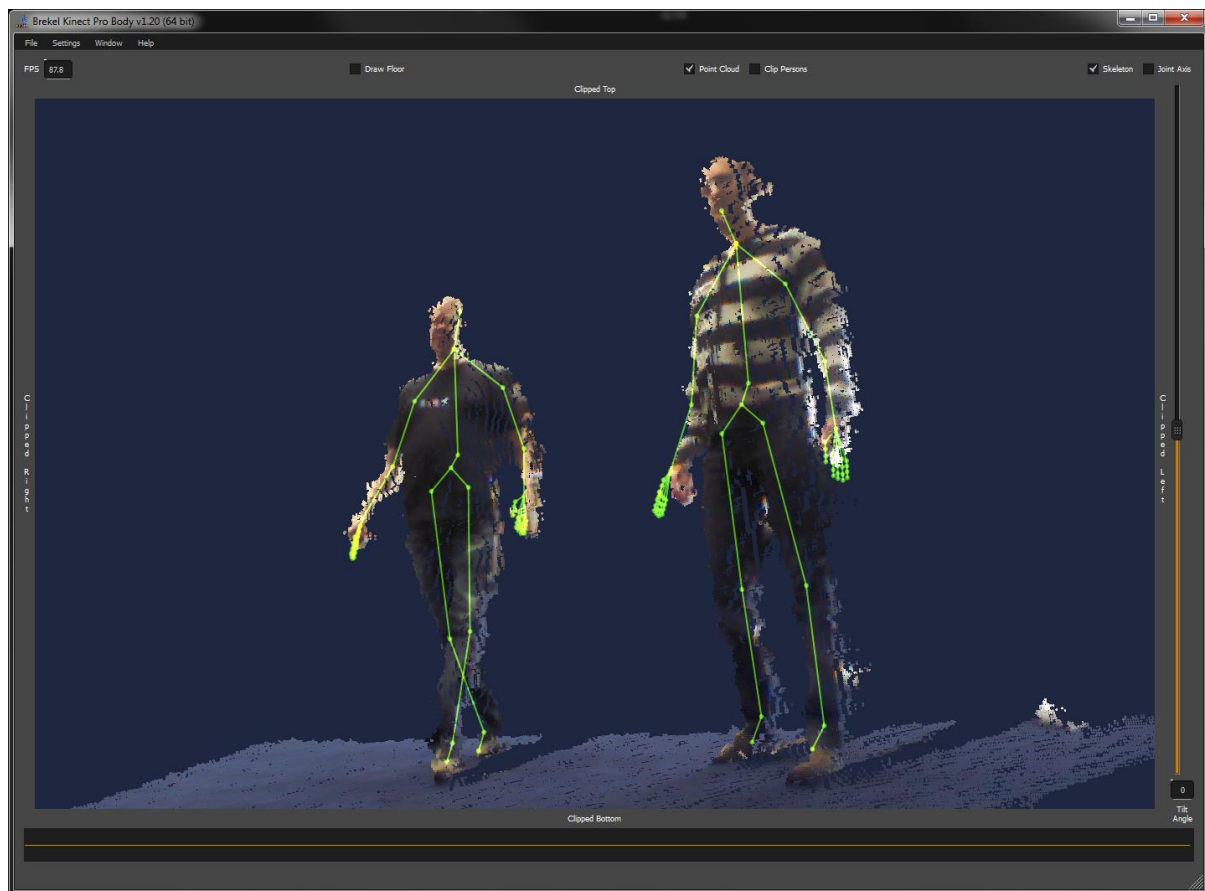
Extra hand filter

Extra filter pass for hands rotations.

Extra foot filter

Extra filter pass for foot rotations.

THE 3D VIEW



The main area displays the 3D pointcloud data and tracked skeletons.

For navigation:

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

Below the 3D view the audio (coming from the built in microphones) is displayed as a waveform.

FPS

The speed (in frames per second) the tracker is running at, note that this can be higher than the video/depth input streams since filtering/smoothing can be applied to the data on inbetween frames.

Draw Floor

Toggles showing the floor grid in the 3D view.

Point Cloud

Toggles drawing of the 3D pointcloud, not that disabling this can speed up the application on slow machines.

Clip Persons

This will remove points in the pointcloud that do not belong to any of the identified persons .

Skeleton

Toggles display of the tracking skeletons in the 3D view.

Joint Axis

Shows the axis for each of the joints of the tracked skeletons.

Clipped Top/Bottom/Left/Right

These indicators light up when the skeleton is clipped by the edge of the (depth) sensor.

For best tracking results keep the bodyparts within view.

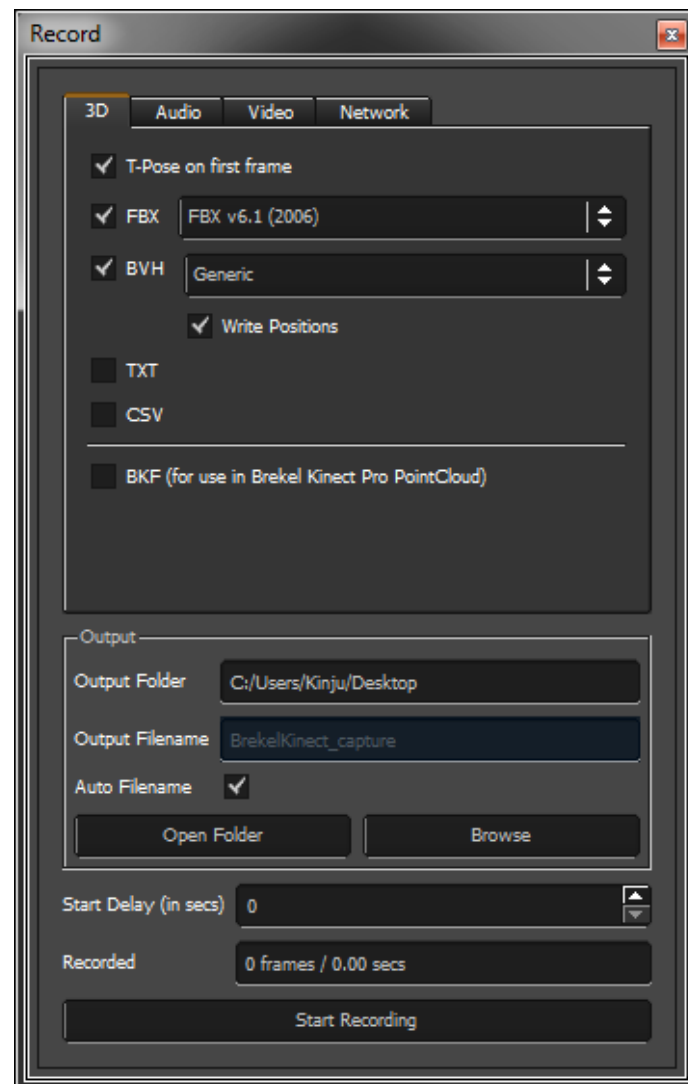
Tilt Angle slider

Use this to adjust the sensor's tilt motor to point the viewing direction up or down.

After making adjustments it's best to hit the Calibrate Sensor Position/Rotation button again so the pointcloud and skeletons can be adjusted automatically.

RECORD

3D Tab



T-Pose on first frame

Creates an artificial T-Pose on the first frame when exporting.

Note that it's usually better to capture a T-Pose from your actor as this will include any offsets that the tracker produces and will usually retarget more accurately.

FBX file format

FBX files should be readable by most 3D packages it contains the most accurate representation of the tracked skeletons.

V7.3 is the latest version, v6.1 should be compatible with older 3D packages.

If two person tracking is enabled, a single FBX file will contain both skeletons in separate hierarchies.

BVH

BVH are a common skeleton format for which a lot of 3D packages have importer plugins/scripts.

If two person tracking is enabled, two BVH files will be saved, each containing a single skeleton.

Note that BVH is a legacy format which is not implemented correctly in some 3D packages, it is strongly recommended to use an FBX workflow for best results.

BVH naming convention

Specifies which bone-name template is used, note that each type has the exact same hierarchy but with different names for the bones to comply with different software packages. The following templates are available:

- Generic (same as Autodesk HumanIK / MotionBuilder standard naming convention)
- 3DMax Bipod
- Second Life
- Poser / DAZ

Write Positions

The markerless tracking algorithm tracks joint positions and therefore can produce bones that slightly vary in length during tracking.

To retain this information in the BVH files bones can be saved with both rotational and positional information.

Note that if this function is turned off, or if your importer can't deal with positions, the skeletons may appear to float a bit more.

TXT

Toggles if the skeleton tracking data should be exported to disk as a text file.

A Maya mel script is included in the installation folder that shows how to parse these text files.

If two person tracking is enabled, two TXT files will be saved, each containing a single skeleton.

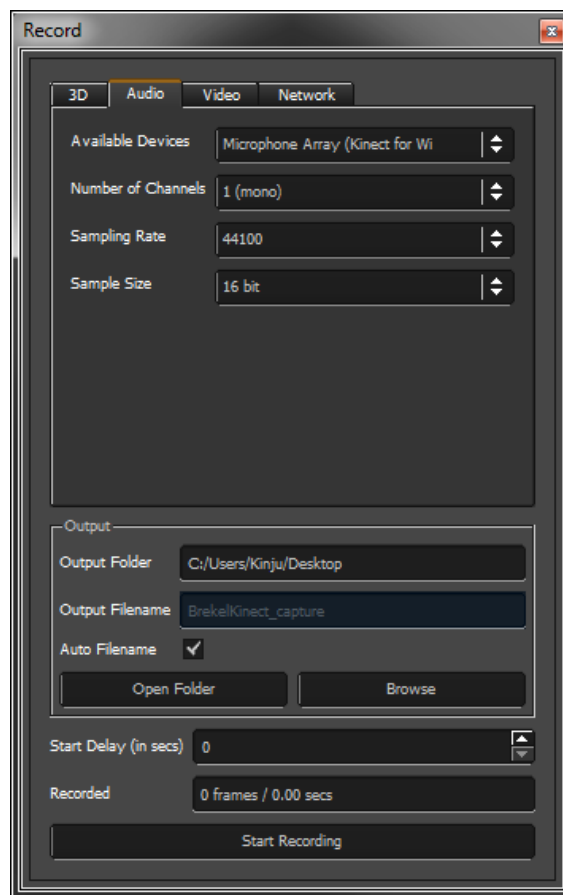
CSV

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.

If two person tracking is enabled, two CSV files will be saved, each containing a single skeleton.

Audio Tab



Available Devices

List the available audio devices that can be used for recording and allows you to select one of them.

Number of Channels

Switches between Mono and Stereo recording.

Sampling Rate

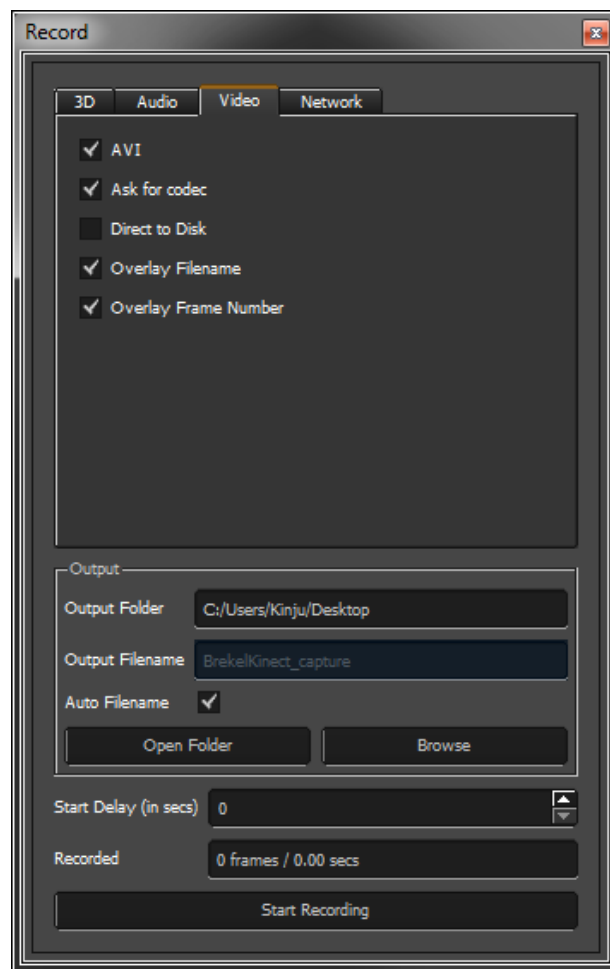
Sample rate to record (in Hz).

Sample Size

Amount of bits (8 or 16) used for recording.

Note that audio is always recorder in the WAV format.

Video Tab



AVI

Toggles if the video data should be exported to disk in the AVI movie format.

Ask for codec

When turned ON the program will ask which codec to use for the AVI file. (Available codecs will depend on what is installed on your system)

When turned OFF the XVID codec will automatically be used. Since it has a nice tradeoff of quality, filesize and speed.

If you're having trouble with codecs I can recommend the K-Lite codec pack and/or Xvid:

http://www.codecguide.com/download_kl.htm

<http://www.xvid.org/>

Remember to also install the x64 version of the codec if you're using the x64 version of Brekel Kinect Pro Body.

Direct to Disk

When turned ON, video frames will be compressed and saved to disk during the recording. Depending on your CPU speed, selected codec and disk speed this uses the least amount of memory but has a chance of dropping frames on slow machines.

When turned OFF, video frames will be recorded in memory first and compressed to disk after the recording is stopped. If your system has enough memory this is the fastest method and has the lowest risk of frames being dropped.

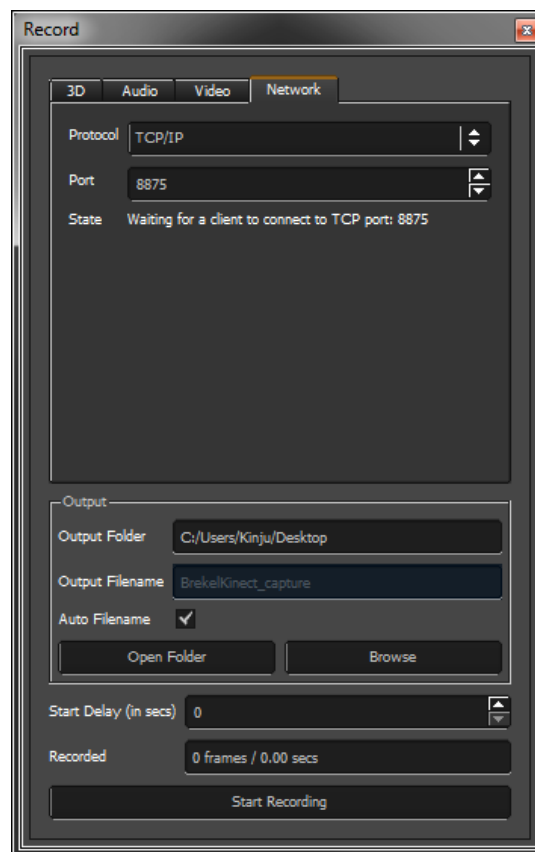
Overlay Filename

Prints the filename into the video

Overlay Frame Number

Prints the frame number into the video

Network Tab



Protocol

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

Port

The network port from which data will be streamed out of. (default 8875)

State

The current state of the network streaming.

Please make sure security software (firewall) is not blocking network streaming!

Bottom part of Record window

Output Folder

The folder where the recorded output files will be placed.

Output Filename

The filename of the recorded files. (disabled when Auto Filename is turned on)

Auto Filename

When turned on a filename will automatically be created using the current date/time.

Open Folder

Opens the output folder in Windows Explorer.

Browse

Opens a file browser so you can specify the output folder.

Start Delay

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.

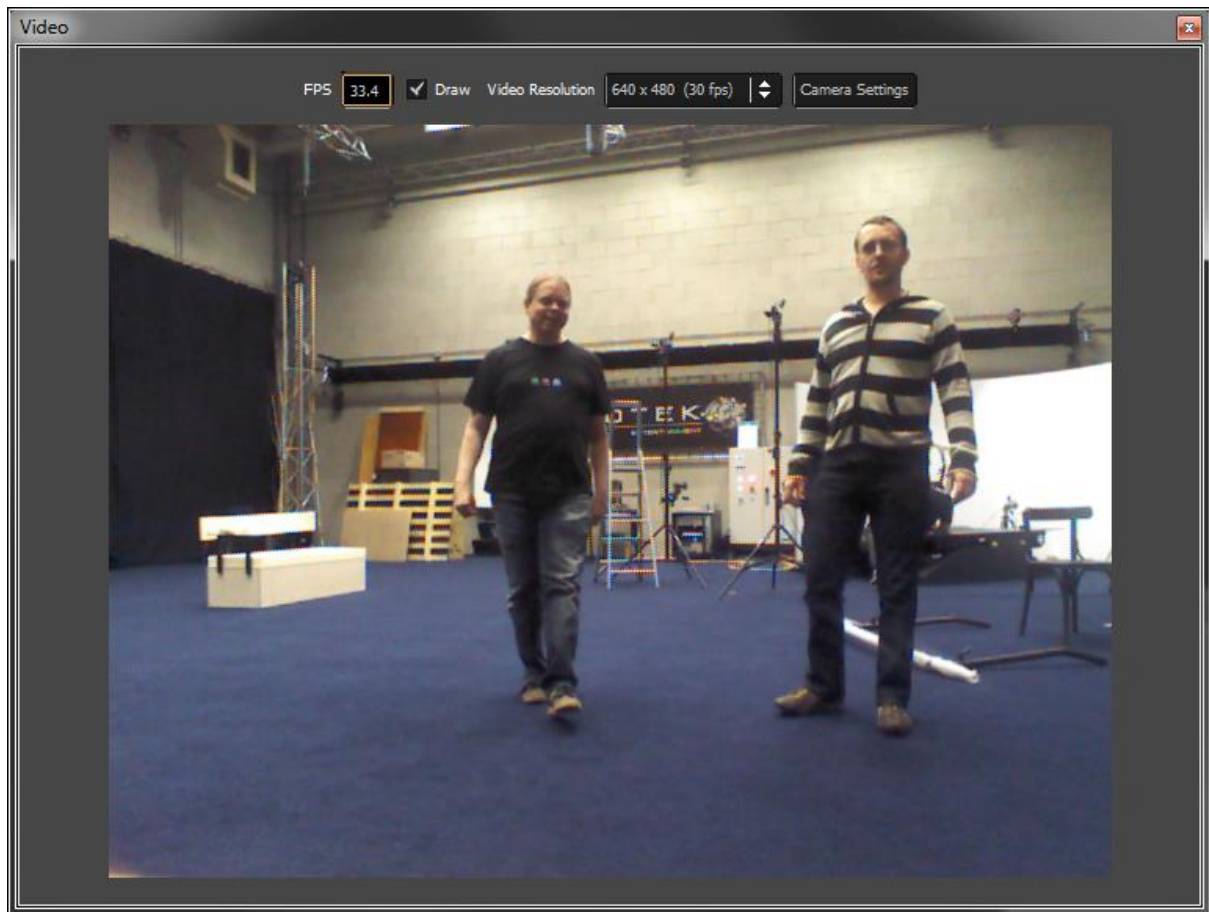
Recorded

Displays the amount of frames and seconds recorded in the last take.

Start/Stop Recording

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

VIDEO



Shows the incoming video stream from the Kinect sensor.

FPS

The speed (in frames per second) of the incoming video stream, this should be roughly the same as depicted in the chosen "Video Resolution". If it is drastically lower your system may be too slow.

Draw

Turns drawing in the GUI ON/OFF, this may save a few CPU cycles on slow machines.

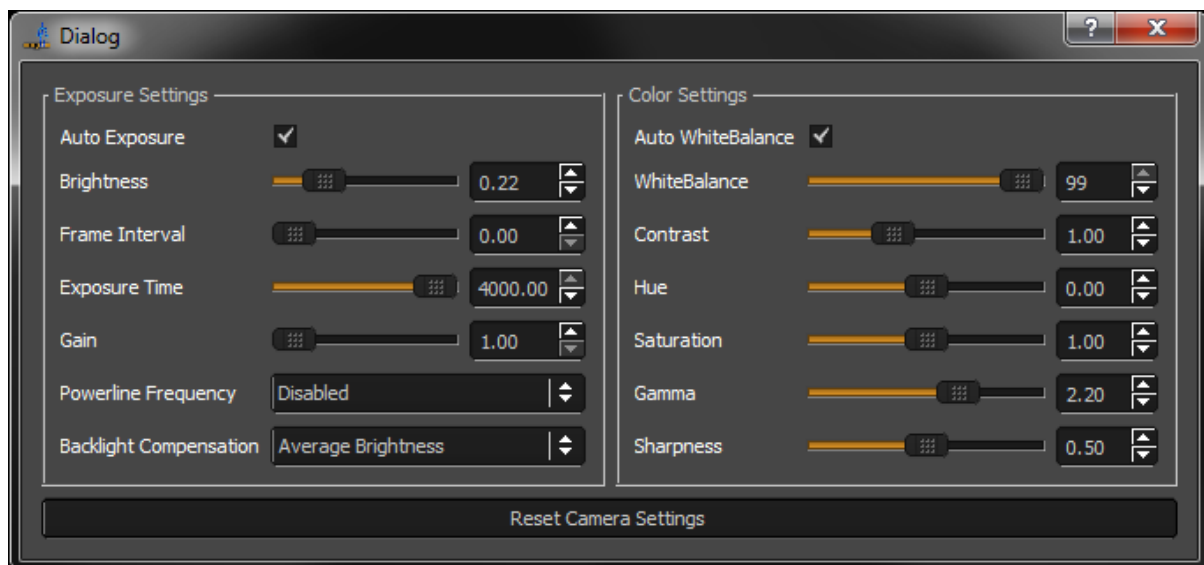
Video Resolution

The Kinect can work at 640x480 at 30fps, or at 1280x960 12fps.

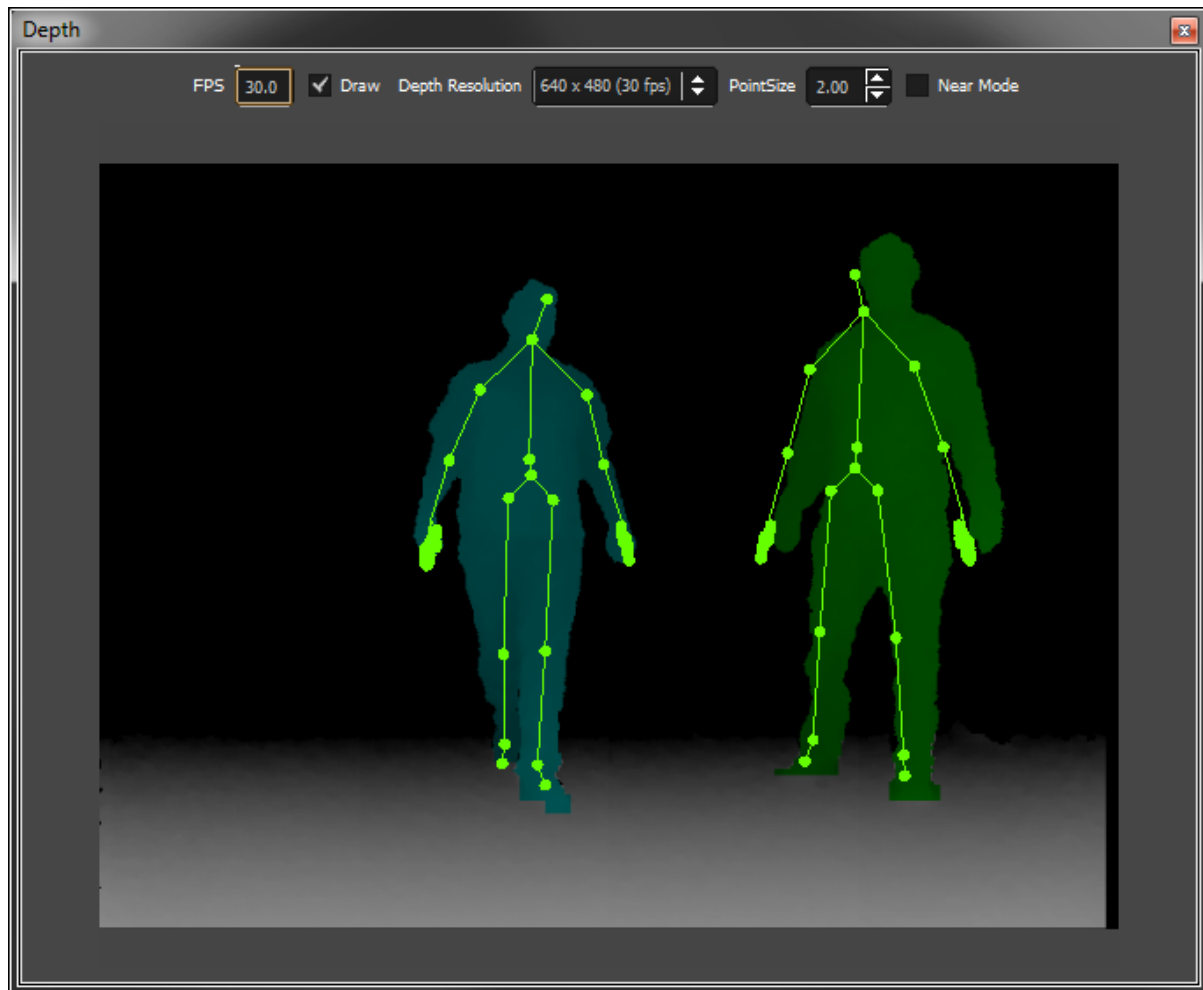
Note that the application needs to restart for the new resolution to take effect.

Camera Settings (only available on Kinect for Windows devices)

Opens a floating window that allows control over Exposure and Color settings, useful when working in low light situations or when you want manual control instead of automatically adjusting settings.



DEPTH



Shows the incoming depth stream from the Kinect sensor.

FPS

The speed (in frames per second) of the incoming depth stream, this should be roughly the same as depicted in the chosen "Depth Resolution". If it is drastically lower your system may be too slow.

Draw

Turns drawing in the GUI ON/OFF, this may save a few CPU cycles on slow machines.

Depth Resolution

The Kinect can work at 640x480 or at 320x240, both are at 30fps.

Note that the application needs to restart for the new resolution to take effect.

Point Size

Visually adjusts the size of the tracking points

Near Mode (only available on Kinect for Windows devices)

When turned ON the Kinect will sense depths roughly between 40cm and 3 meters from the sensor.

When turned OFF the Kinect will sense depths roughly between 80cm and 4 meters from the sensor.

Note that when a person is detected the Depth view will reflect this by drawing the pixels belonging to that user in a different color.

In Full Body mode user detection needs some distance between the person(s) and the background.

In Upper Body Only mode user detection will usually need a few frames of movement.

When persons are detected and tracked their joints and skeleton are drawn as an overlay.

Joints in green are visible to the sensor and can be tracked.

Joints in orange are not fully visible and are inferred from existing data and therefore can be less accurate.

TOP MENU

File > Install License

Let's you browse to a license file and installs it to be used for the next time the application is run.

File > Show License Info

Shows if a license is installed and who it belongs to.

File > Exit

Saves settings and exits the application (same as clicking the X in the top right corner)

Settings > Check for new version on start

Will check online if a new version is available and lets the user know if there is one.

Settings > Use Multi Threading

When turned ON does more processing in parallel for multi-core/multi-cpu machines.

Note that depending on your machine's configuration, and especially the amount of available cores and their speed, this may be faster or slower.

Settings > Tweak Sleep Time (advanced users)

Internally processing is done on multiple threads, when no new data is available these threads go to sleep for a few milliseconds until they request new data.

Advanced users may want to tweak this setting to gain a few FPS on slower machines, or gain responsiveness on faster machines that still have CPU time to spare.

Note that bumping this too high will force evaluation to run at speeds lower than 30 FPS and therefore drop frames.

Window > Dark Skin

Toggles between the regular style (light) GUI and the dark style.

Window > Record

Toggles visibility of the “Record” dock.

Window > Settings

Toggles visibility of the “Settings” dock.

Window > Video

Toggles visibility of the “Video” dock.

Window > Depth

Toggles visibility of the “Depth” dock.

Window > System Info

Toggles visibility of the “System Info” dock.

Help > Open Help File (PDF)

Opens this help file, which can also be found in the installation folder.

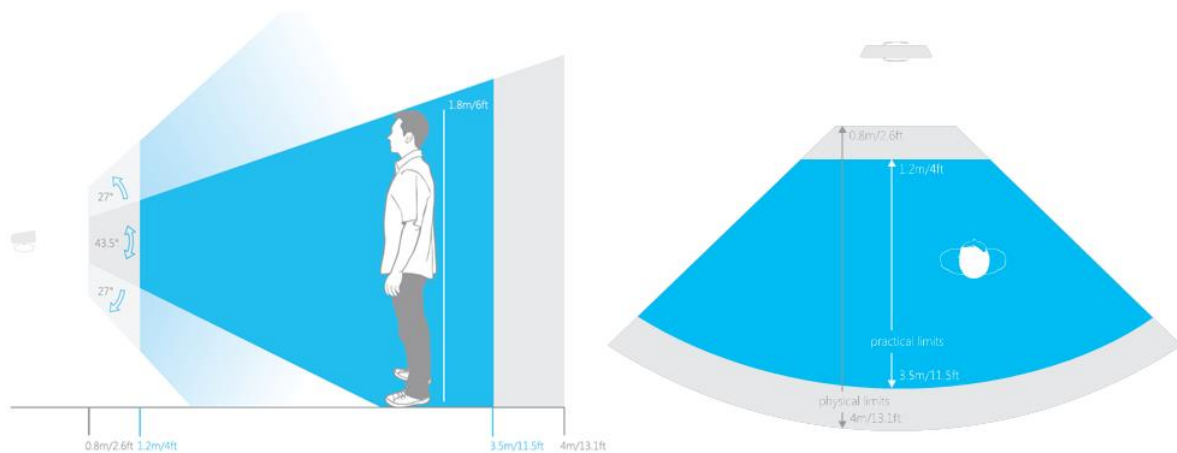
Help > Open Downloads Page

Opens the standard web browser and directs it to the webpage with the latest installer downloads.

Help > Open Forums

Opens the standard web browser and directs it to the user forums.

SENSOR PLACEMENT



In default mode the Kinect sensor can see people standing between 0.8 meters (2.6 feet) and 4.0 meters (13.1 feet) away.

A practical range is between 1.2 and 3.5 meters to allow for enough room for the user to move their arms.

In near mode the maximum range is between 0.4 meters (1.3 feet) and 3.0 meters (9.8 feet), with a practical range of 0.8 to 2.5 meters.

Sensor height is ideally at about hip height, but the software will try to correct for sensor placement ranging from ground level to above-head level.

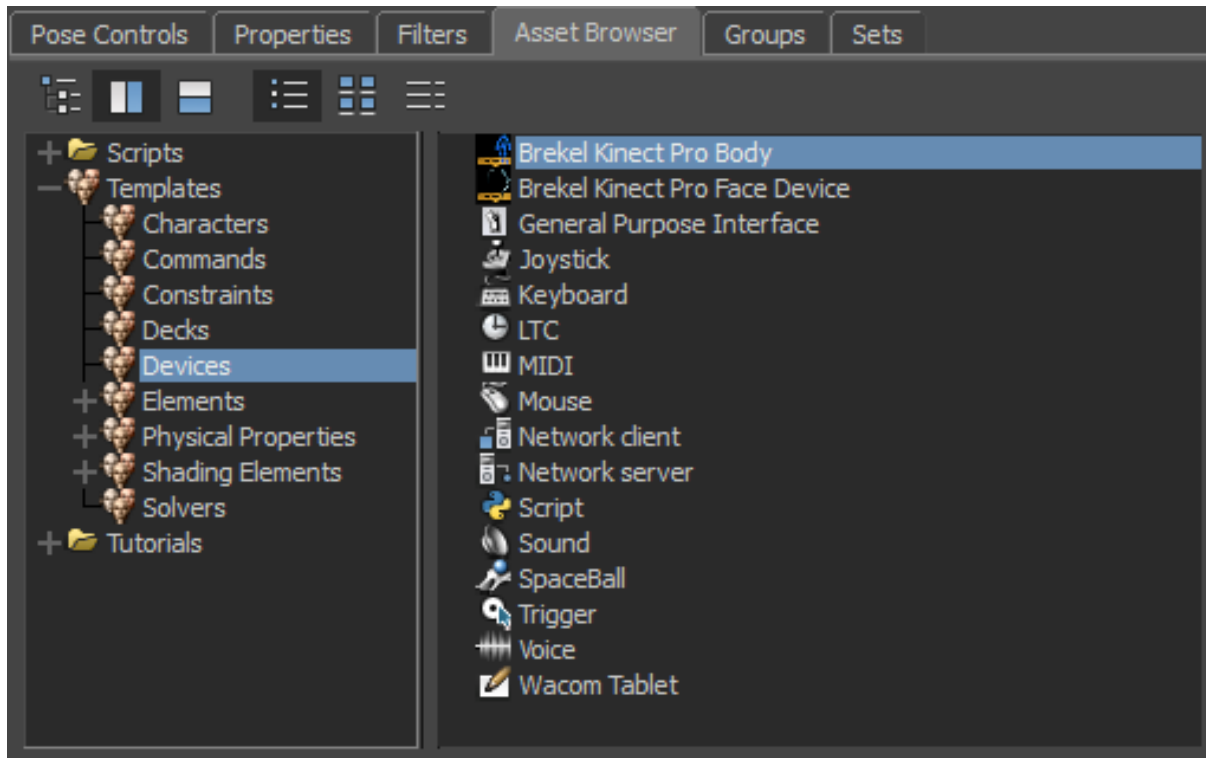
Note that the sensor can not be mounted sideways or upside down since users can not be tracked in those orientations.

Tracking will always assume the person is facing the sensor.

MOTIONBUILDER PLUGIN INSTALLATION

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

And you should now have a “Brekel Kinect Pro Body 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 (2009-2014 both 32- and 64 bit) in the “Brekel Kinect Pro Body” installation folder, usually in:

C:\Program Files\Brekel Kinect Pro Body\MotionBuilder plugins

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

Typically for a 32 bit version:

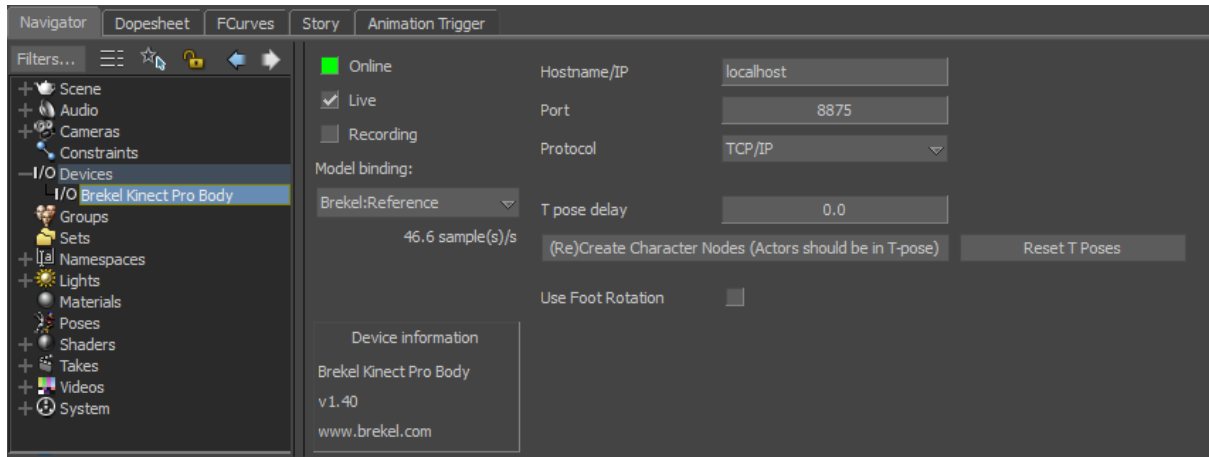
C:\Program Files (x86)\Autodesk\MotionBuilder 2013\bin\win32\plugins

For a 64 bit version:

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

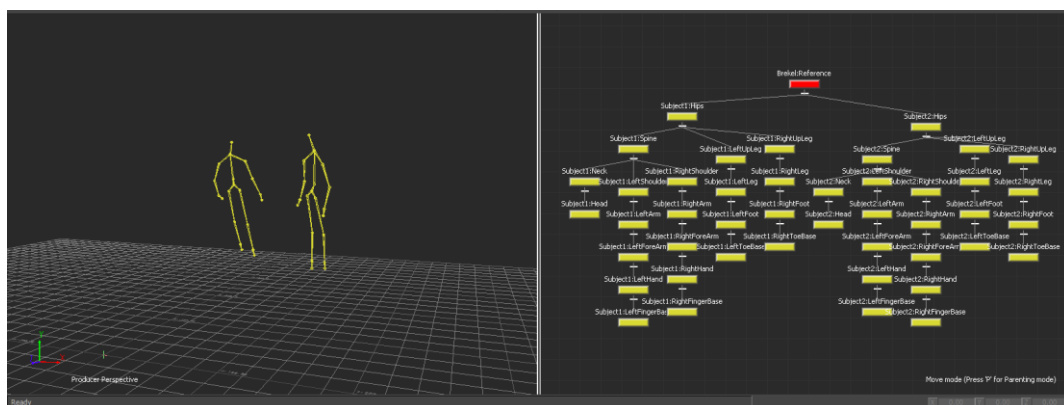
USING THE MOTIONBUILDER PLUGIN

First make sure “Brekel Kinect Pro Body” is running.



To setup a MotionBuilder scene go through the following steps:

- drag a “Brekel Kinect Pro Body 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 Kinect Pro Body” 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 Kinect Pro Body.

If both MotionBuilder and Pro Body 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 Kinect Pro Body application. (default 8875)

Protocol

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

T pose delay

When bigger than 0 a countdown will start after hitting the (Re)Create Character Nodes button, giving you a few seconds to get into position in a T-pose.

Note that on MotionBuilder 2012 and higher a visual indicator should also appear in the 3D viewport indicating the amount of seconds left.

(Re)Create Character Nodes

Creates (or recreates if they already exists) Character nodes for the Kinect skeletons, allowing for quick retargeting setups to other characters.

Note that the actors should be in a T-pose for this to work correctly, since MotionBuilder uses that poses to map from one character to another.

Reset T Poses

Resets existing Character nodes without recreating them. (Note that the actors should be in a T-pose)

Use Foot Rotation

Depending on your character the MotionBuilder's retargeting can have some problems with the noise on the feet coming from the Kinect's tracker. So it can be a good idea to keep these disabled and rely on floor contacts.

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 through the timeline

To setup a Character Node

- MotionBuilder can retarget motion from one skeleton to another as long as Character Nodes are created. The device can automatically create one for the Kinect skeletons
- Make sure the actor(s) assume a T-pose
- Note that when you are both the operator and actor you can simply record a clip and scrub through the T-pose frame
- Hit the "(Re)Create Character Nodes" button and note that "Brekel Kinect" Characters will be placed in the scene
- Note that you can always recreate the nodes, or hit the "Reset T Poses" button in case the T-pose was not accurate enough.
- You can now go to the Character Node of the character you want to drive with the Kinect data and set
 - o Input Type to "Character"
 - o Input Source to one of the Kinect character nodes
 - o Active to ON
- Your character should now be driven by the live or recorded Kinect data

LIVE STREAMING INTO UNITY

You can find the Unity example script/scene for streaming live network data in the “Unity3D” folder inside the Brekel installation folder, usually something like here:

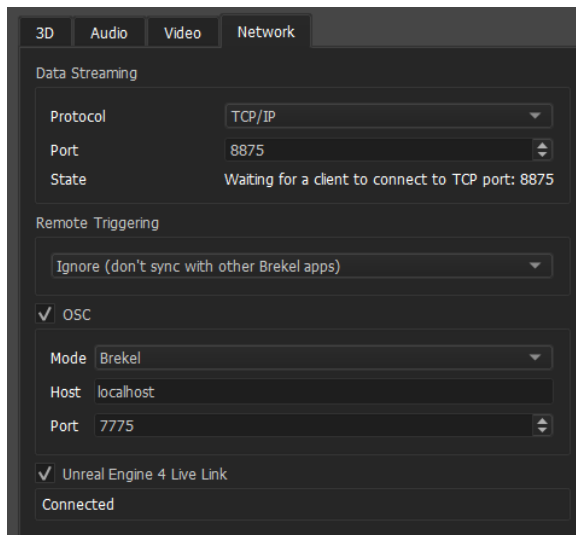
C:\Program Files\Brekel Kinect Pro Body x64\Unity3D

You can also find the latest ReadMe.txt file here with instructions

LIVE STREAMING INTO UNREAL ENGINE 4

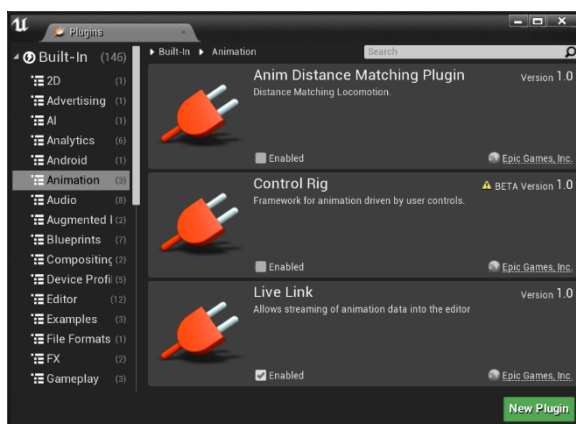
Live data can be streamed into the Unreal Engine 4 engine using its Live Link feature.

In the Brekel app make sure "Unreal Engine 4 Live Link" is enabled on the "Network" panel

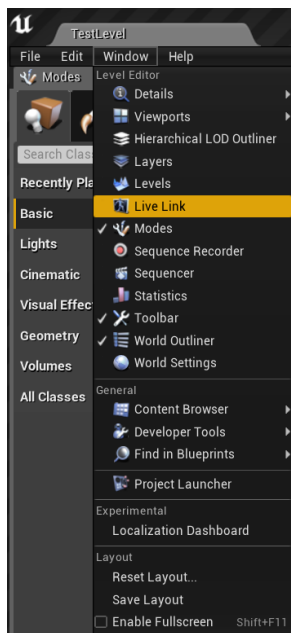


First make sure you enable this feature in the UE4 engine:

- Click Edit > Plugins
- Enable "Live Link" under "Animation"

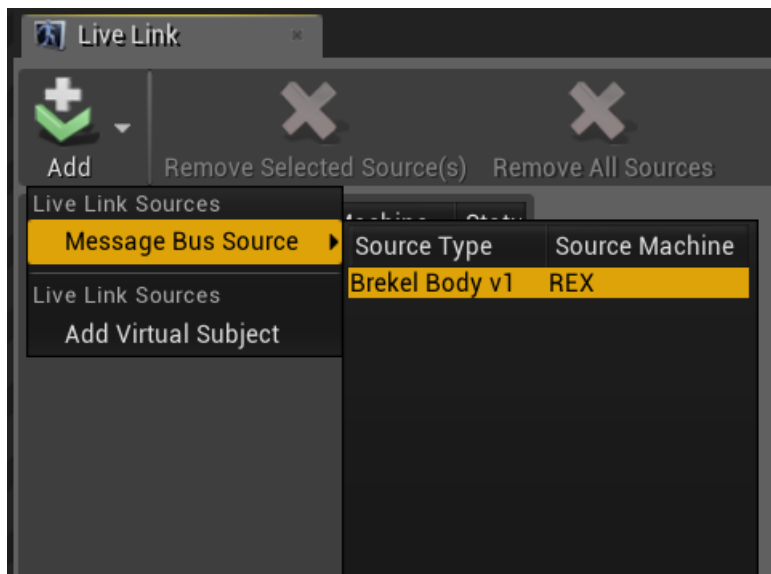


Click Window > Live Link

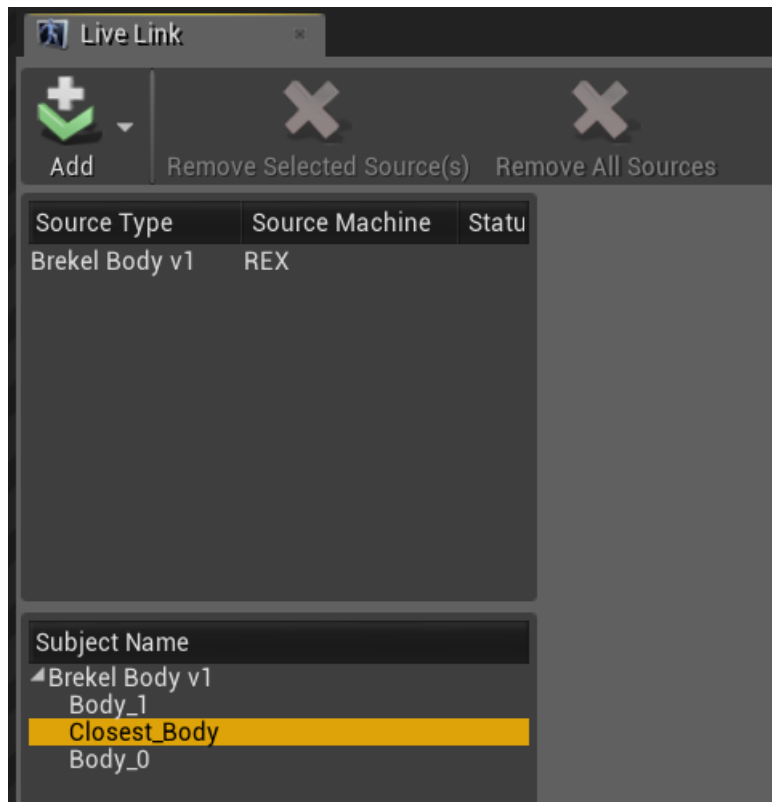


In Live Link Window

- click Add > Message Bus Source
- "Brekel Body v2" should be listed under Source Type/Machine, click it and hit Ok

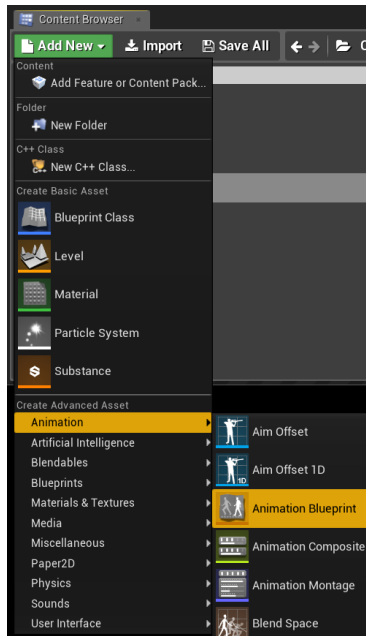


- Any visible and tracked bodies should be listed under "Subject Name"
- Take note of the body name you want to use
- "Closest_Body" for the body that is closest to the sensor
- "Body_0" - "Body_5" for a specific body, note that the body IDs can be displayed in the Brekel 3D viewport for reference

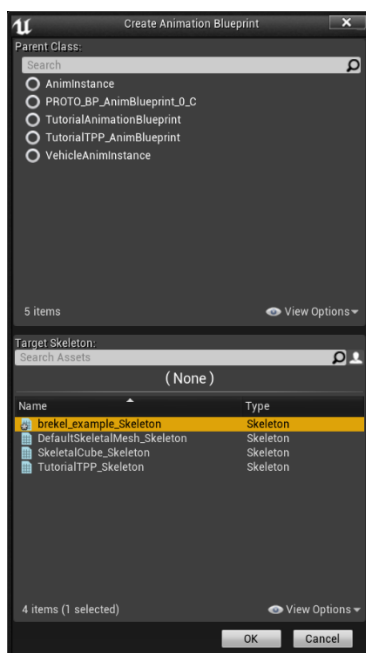


In the Content Browser:

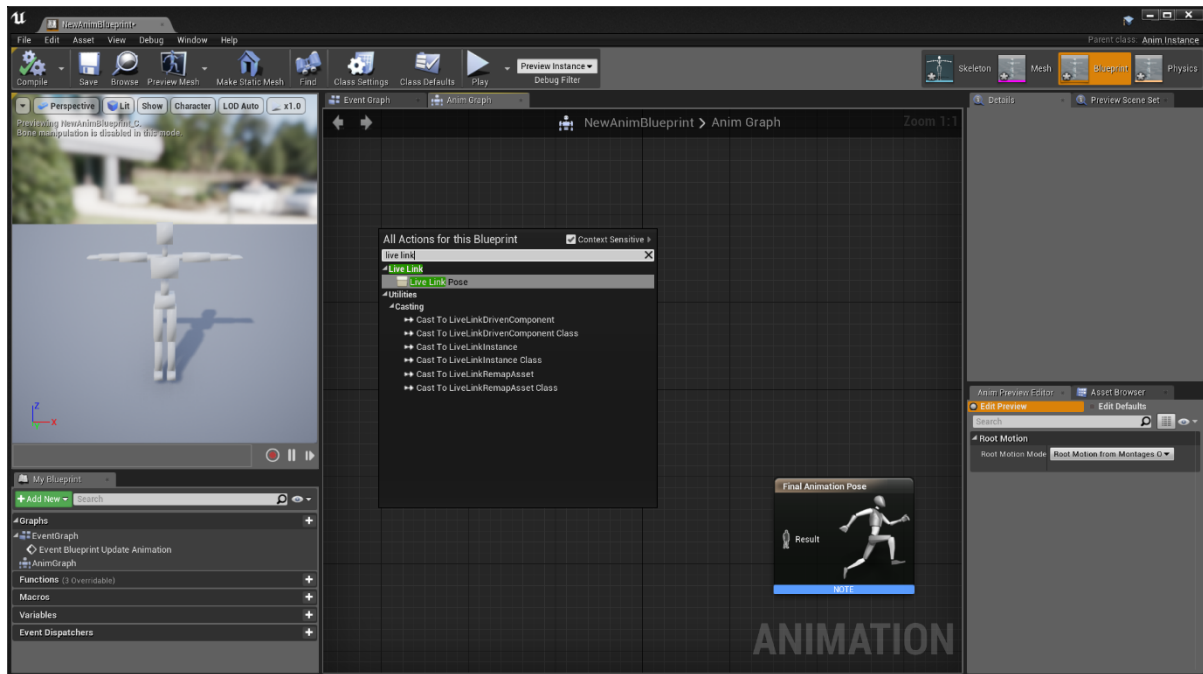
- Import "base_skeleton.fbx"
 - You can find this file in the "UnrealEngine4" folder inside the Brekel installation folder, usually something like here:
 - C:\Program Files\Brekel Kinect Pro Body x64\UnrealEngine4
-
- Add New - Animation BluePrint



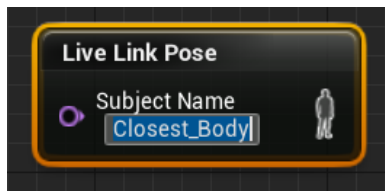
- Pick "brekel_example_Skeleton" from the list



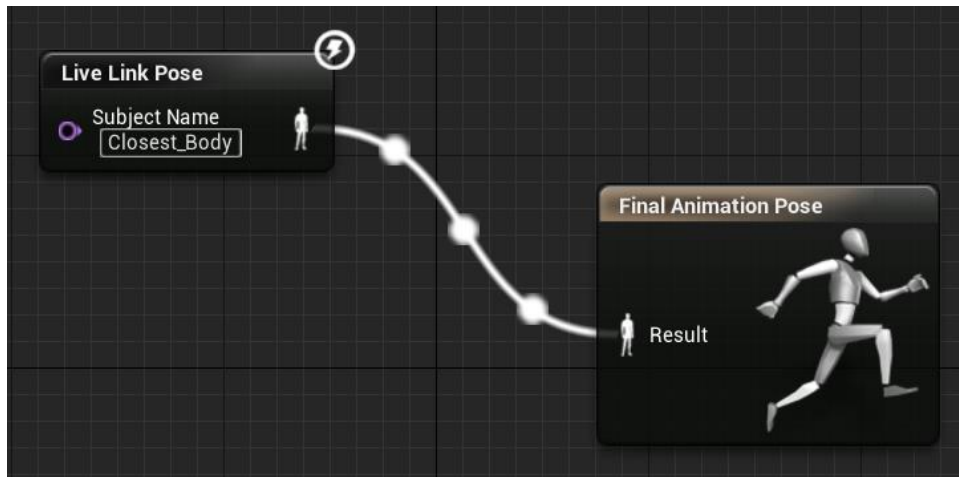
- Open the newly created blueprint by double clicking on it
- Right click in empty blueprint area
- Create a new "Live Link Pose" node



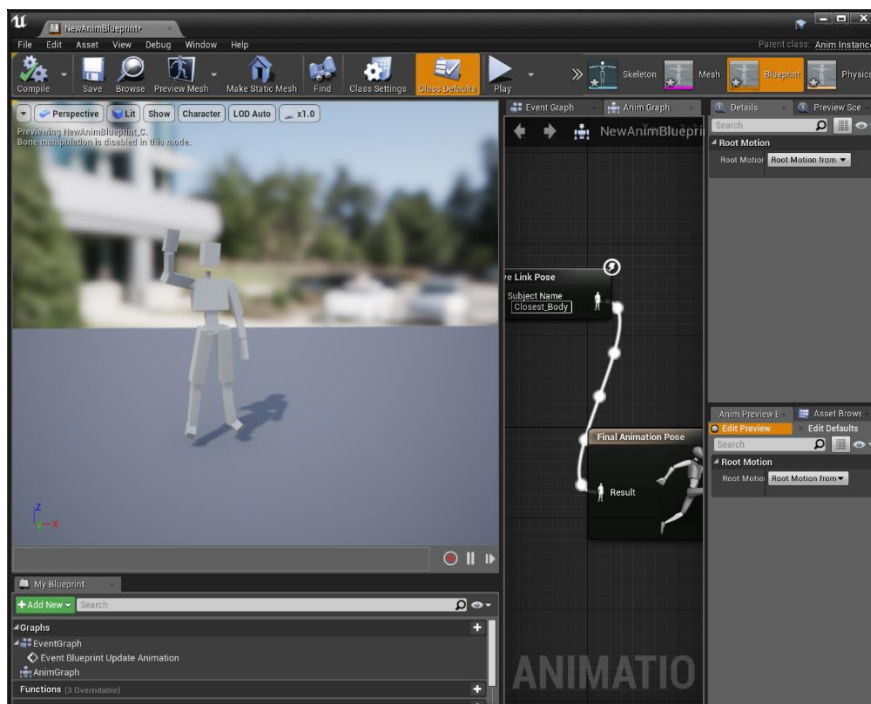
- Change Subject Name - None into the body you want to use ("Closest_Body" most probably)



- Connect Live Link Pose node to Final Animation Pose node



- Hit save and compile
 - You should now see a live data connection between the nodes
 - You should now see live data in the 3D window



STREAMING PROTOCOL

“Brekel Kinect Pro Body” has a TCP server running on port 8875.

Once a connection is established for each frame the following struct is passed twice in a row.

Once for the first tracked person, then for the second person, even when single person tracking is selected. In that case the second person’s struct can be considered empty.

```
struct
{
    int        isTracked;
    int        seatedSkeleton;
    int        clipped_left;
    int        clipped_right;
    int        clipped_top;
    int        clipped_bottom;
    double     timeStamp;
    float      grip_left;
    float      grip_right;

    float      conf_waist;
    float      conf_spine;
    float      conf_neck;
    float      conf_head;
    float      conf_upperLeg_L;
    float      conf_lowerLeg_L;
    float      conf_foot_L;
    float      conf_toes_L;
    float      conf_upperLeg_R;
    float      conf_lowerLeg_R;
    float      conf_foot_R;
    float      conf_toes_R;
    float      conf_collar_L;
    float      conf_upperArm_L;
    float      conf_foreArm_L;
    float      conf_hand_L;
    float      conf_fingers_L;
    float      conf_collar_R;
    float      conf_upperArm_R;
    float      conf_foreArm_R;
    float      conf_hand_R;
    float      conf_fingers_R;

    float      pos_waist[3];
    float      pos_spine[3];
    float      pos_neck[3];
    float      pos_head[3];
    float      pos_upperLeg_L[3];
    float      pos_lowerLeg_L[3];
    float      pos_foot_L[3];
    float      pos_toes_L[3];
    float      pos_upperLeg_R[3];
    float      pos_lowerLeg_R[3];
    float      pos_foot_R[3];
    float      pos_toes_R[3];
    float      pos_collar_L[3];
    float      pos_upperArm_L[3];
    float      pos_foreArm_L[3];
    float      pos_hand_L[3];
    float      pos_fingers_L[3];
    float      pos_collar_R[3];
    float      pos_upperArm_R[3];
    float      pos_foreArm_R[3];
    float      pos_hand_R[3];
    float      pos_fingers_R[3];

    float      rot_waist[3];
    float      rot_spine[3];
    float      rot_neck[3];
    float      rot_head[3];
    float      rot_upperLeg_L[3];
    float      rot_lowerLeg_L[3];
    float      rot_foot_L[3];
    float      rot_toes_L[3];
    float      rot_upperLeg_R[3];
    float      rot_lowerLeg_R[3];
    float      rot_foot_R[3];
    float      rot_toes_R[3];
    float      rot_collar_L[3];
    float      rot_upperArm_L[3];
    float      rot_foreArm_L[3];
    float      rot_hand_L[3];
    float      rot_fingers_L[3];
    float      rot_collar_R[3];
    float      rot_upperArm_R[3];
    float      rot_foreArm_R[3];
    float      rot_hand_R[3];
    float      rot_fingers_R[3];

    float      conf_thumb_L[4];
    float      conf_index_L[4];
    float      conf_middle_L[4];
    float      conf_ring_L[4];
    float      conf_pinky_L[4];
    float      conf_thumb_R[4];
    float      conf_index_R[4];
    float      conf_middle_R[4];
    float      conf_ring_R[4];
    float      conf_pinky_R[4];

    float      pos_thumb_L[3][4];
    float      pos_index_L[3][4];
    float      pos_middle_L[3][4];
    float      pos_ring_L[3][4];
    float      pos_pinky_L[3][4];
    float      pos_thumb_R[3][4];
    float      pos_index_R[3][4];
    float      pos_middle_R[3][4];
    float      pos_ring_R[3][4];
    float      pos_pinky_R[3][4];

    float      rot_thumb_L[3][4];
    float      rot_index_L[3][4];
    float      rot_middle_L[3][4];
    float      rot_ring_L[3][4];
    float      rot_pinky_L[3][4];
    float      rot_thumb_R[3][4];
    float      rot_index_R[3][4];
    float      rot_middle_R[3][4];
    float      rot_ring_R[3][4];
    float      rot_pinky_R[3][4];
};
```

After the body structs the following data is sent:

```
int        mNumPeopleSeen;
float      bodyPositions[3][6];
```

The int values are either 0 or 1 depicting an on/off state

The timestamp is in seconds

The grips vary between 0.0 (open hand) and 1.0 (closed hand)

The confidences can be

0.0 for non-tracked joints

0.5 for inferred joints (hidden from the sensor but estimated using other joints)

1.0 for tracked joints

Each finger comes in an array of 4 elements depicting 3 knuckles and the tip.

Fingers only contain valid data if “Grip Detection” is turned ON in the base application.

The positions are in XYZ order and in local space

The rotations are euler angles in degrees in XYZ order and in local space

Parenting is like this:

Joint	parent
waist	root
spine	waist
neck	spine
head	neck
upperleg	waist
lowerleg	upperleg
foot	lowerleg
toes	foot
collar	spine
upperarm	collar
forearm	upperarm
hand	forearm
fingers	hand

Every data packet starts with 3 bytes describing the start of a packet and buffersize, you can ignore these and can start parsing all of the above information starting at the 4th byte in the packet you receive. Or use them for validity checking.

The bodyPositions are 3D positions vectors for a total of up to 6 people.

When fewer than 6 people are in front of the sensor the positions are 0,0,0

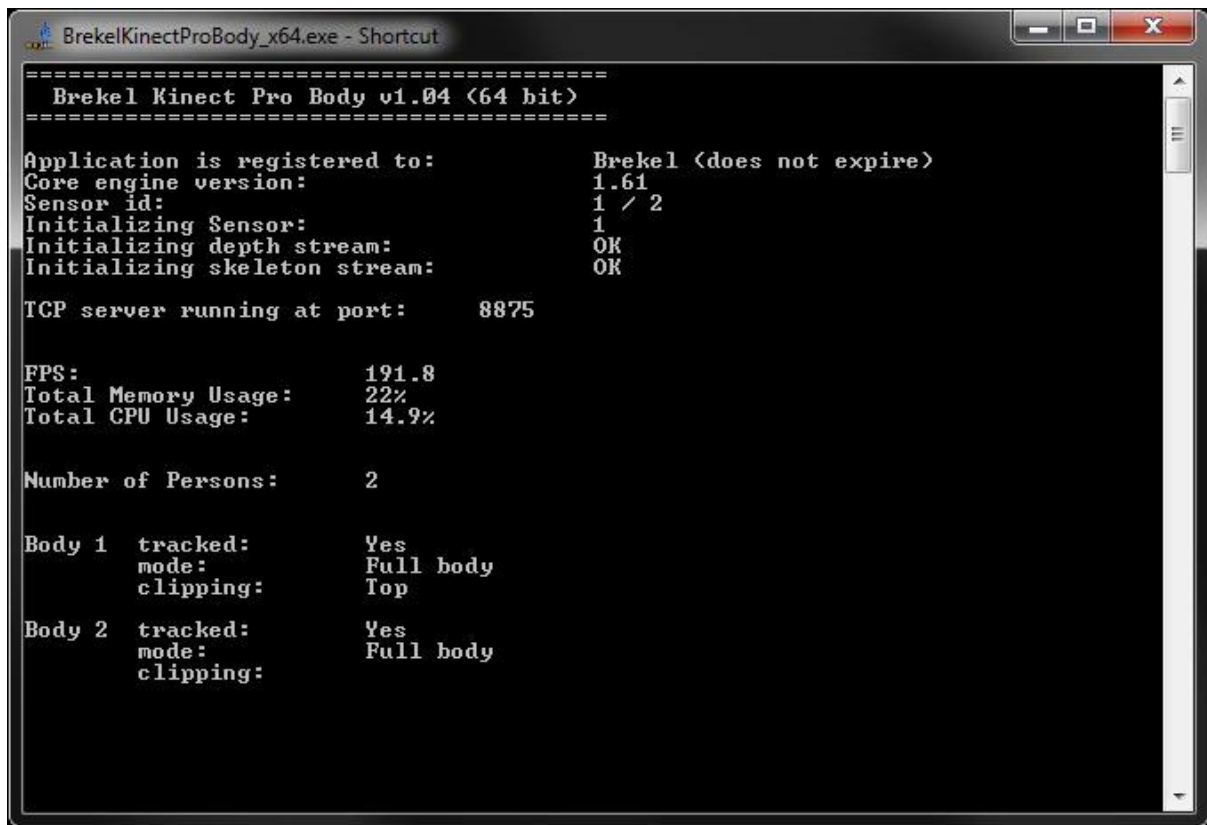
Note that people are assigned a semi-random slot of the available 6. (note that only 2 people can be fully tracked at a time)

RUNNING IN COMMANDLINE MODE

For advanced users who are only interested in using the network streaming it is possible to run Brekel Kinect Pro Face in command line mode so it uses as few CPU power as possible.

Simply add the “-commandline” argument when starting the application and it will run without the GUI and still stream out the data over the TCP/UDP network socket.

Note that settings will be loaded from the registry as usual, so you can use the GUI to set things like tilt angle, near mode, smoothing settings etc.



```
=====
Brekel Kinect Pro Body v1.04 (64 bit)
=====

Application is registered to:      Brekel (does not expire)
Core engine version:              1.61
Sensor id:                        1 / 2
Initializing Sensor:              1
Initializing depth stream:        OK
Initializing skeleton stream:     OK

TCP server running at port:      8875

FPS:                              191.8
Total Memory Usage:               22%
Total CPU Usage:                  14.9%

Number of Persons:                2

Body 1  tracked:                  Yes
        mode:                    Full body
        clipping:                 Top

Body 2  tracked:                  Yes
        mode:                    Full body
        clipping:                 
```

COMMANDLINE OPTIONS

Advanced users can use one or more of the following commandline options:

`-sensorId 0`

In case you have multiple sensors connected to one machine you can specify which one to use by changing the value of 0 to a higher number. (note that this currently cannot be set from the GUI)

`-noVBO`

Adding this will force the rendering to not use any Vertex Buffer Object optimizations, which may cause problems on certain graphics cards and/or drivers. (note that this currently cannot be set from the GUI)

`-commandline`

Runs without a GUI, enabling only the network streaming, but still loads the settings that were used by the GUI version.

See next chapter for more info.

`-elevationAngle 0`

Sets the device's tilt angle to the chosen value, valid range is from -27 to +27

`-videoResolution 0`

0 sets video resolution to 640 x 480 (30 fps)

1 sets video resolution to 1280 x 960 (12fps)

`-depthResolution 0`

0 sets depth resolution to 320 x 240 (30 fps)

1 sets video resolution to 640 x 480 (30 fps)

-nearMode 0

0 turns nearMode OFF

1 turns nearMode ON (Kinect for Windows devices only)

-sleepTime 10

Sets how many milliseconds the internal threads will wait before they check for fresh data.

-multiThreading

Forces multi threading to be used wherever possible.

-networkNone

turns network streaming OFF

-networkTCP

sets network streaming protocol to TCP

-networkUDP

sets network streaming protocol to UDP

-networkPort 8875

Sets the network streaming to the chosen port.

-skeletonMode 0

0 for Full Body tracking mode

1 for Upper Body Only tracking mode

-numPersons 1

1 for single person tracking

2 for two person tracking

-filtering 0

0 turns filtering OFF

1 turns filtering ON

-useOldFiltering

Uses Old Algorithm for filtering the data

-useNewFiltering

Uses New Algorithm for filtering the data

-smoothing 0.5

Sets the amount of filter smoothing, valid range is from 0.0 to 1.0 (for Old Algorithm)

-corection 0.5

Sets the amount of filter correction, valid range is from 0.0 to 1.0 (for Old Algorithm)

-prediction 0.5

Sets the amount of filter prediction, valid range is from 0.0 to 2.0 (for Old Algorithm)

-jitterRadius 0.05

Sets the jitter radius for the filtering, valid range is from 0.0 to 1.0 (for Old Algorithm)

-maxDeviationRadius 0.04

Sets the max deviation radius for the filtering, valid range is from 0.0 to 1.0
(for Old Algorithm)

-filterPreset 0

0 sets the filtering settings to the Light preset

1 sets the filtering settings to the Medium preset

2 sets the filtering settings to the Heavy preset

(for Old Algorithm)

-minimumCutoff

Sets Minimum Cutoff, valid range is 0.0 and higher (for New Algorithm)

-cutoffSlope

Sets Cutoff Slope, valid range is 0.0 and higher (for New Algorithm)

-extraFilterHands

Turns on additional filter pass for hand rotations (for New Algorithm)

-extraFilterFeet

Turns on additional filter pass for foot rotations (for New Algorithm)

-gripDetection 0

0 turns Grip Detection OFF

1 turns Grip Detection ON

-gripDamping 0.5

Sets the amount of filtering on the grip detection hands open/closed pose, valid range is from 0.0 to 1.0

-OSC_enable 0

0 disable OSC data streaming

1 enable OSC data streaming

-OSC_host localhost

Sets the hostname/IP of the machine to which to stream OSC data

-OSC_port 7775

Sets the port over which to stream OSC data

-OSC_mode 0

Sets the formatting of the OSC data

0 Brekel

1 Synapse

2 OSCeleton

3 OSCeleton Kitchen

4 OSCeleton Quartz Composer