



# ***BVH* Importer**

*for After Effects*

Make your skeletons dance

manual for v1.5

# ***BVH Importer***

Motion capture data importer for After Effects

## **Content**

1. Introduction .....	3
2. Installation .....	3
3. Interface .....	4
4. Script workflow .....	6
5. What is BVH file .....	7
6. Where to get BVH files .....	9

# Introduction

BVH file format was developed by Biovision, a motion capture services company, as a way to provide motion capture data and skeleton hierarchy information in addition to the motion data. A .bvh file is nothing more than a text file that has data that was captured from a moving skeletal system. Another name for this type of data capture is "Motion Capture" which has been abbreviated as mocap.

You can find tons of free BVH motion data on the web or motion libraries for sale in BVH format. By using BVH Importer you can convert all these available resources to something that AE can handle and enrich your motion content.

The goal of this script is to use motion capture on an avatar, or an articulated figure, which could be the first step in creating real world motion gestures in After Effects.

# Installation

Follow these two simple steps to install script:

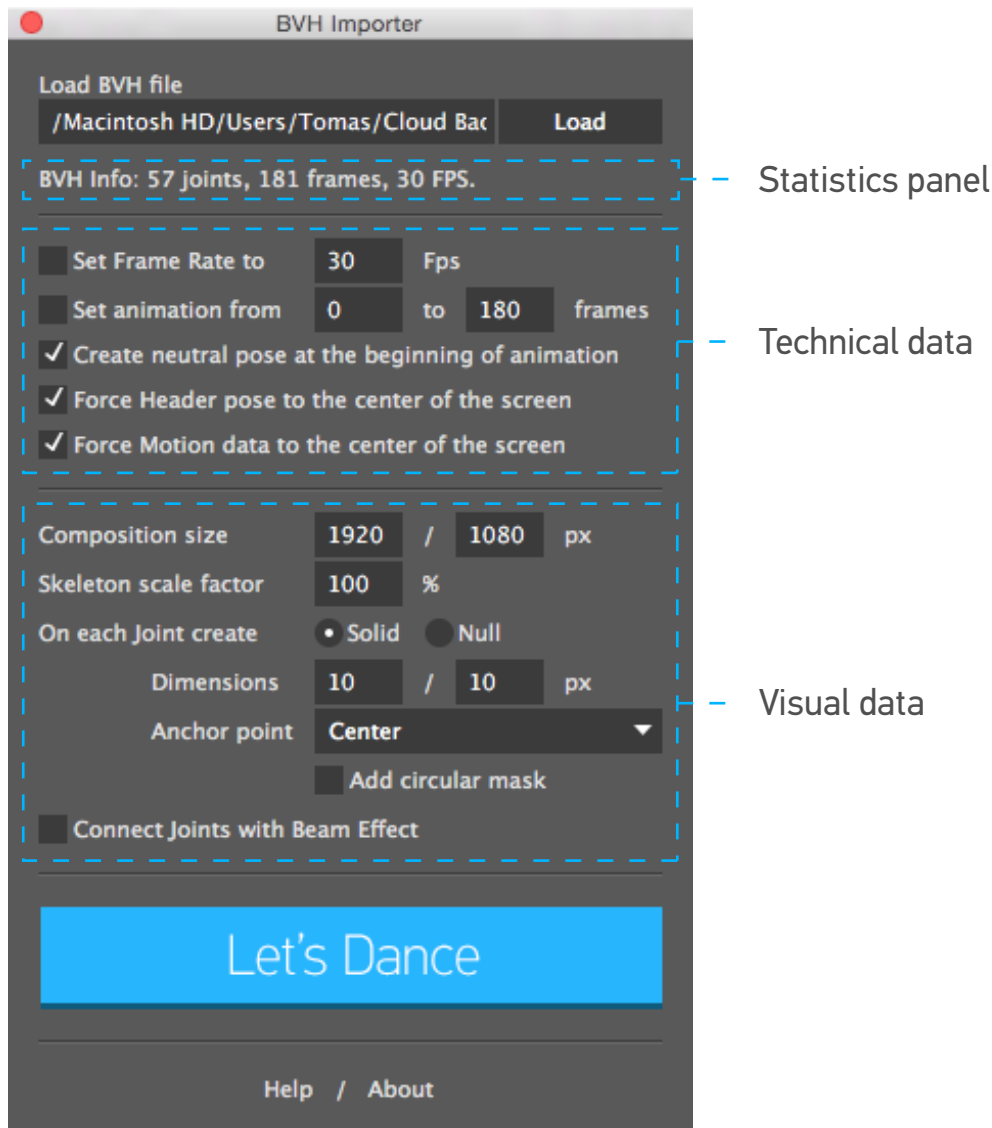
1. Unpack the archive you have downloaded and copy/paste files (both "BVH Importer.jsx" and "BVH Importer Help.pdf") to "ScriptUI Panels" folder:
  - Windows: [Program Files\Adobe\Adobe After Effects <version>\Support Files\Scripts](#)
  - Mac OS: [Applications/Adobe After Effects <version>/Scripts](#)

If folder [ScriptUI Panels](#) does not exist, create a folder and name it "ScriptUI Panels". Then paste the copied files into it.

2. Allow script to access network to avoid unnecessary problems while loading GUI. This option is under [General](#) tab of After Effects [Preference](#) pane:
  - Windows: [Edit > Preferences > General](#)
  - Mac: [After Effects > Preferences > General](#)

Once Installation is finished run the script in After Effects by clicking [Window > BVH Importer](#)

# Interface



## Statistics panel

**Number of Joins** found in BVH file. It also also represents the number of Layers/Nulls that with be created in After Effects;

**Duration** indicates the number of frames or motion samples in BVH file. You can manually define animation range in **Set animation From XX to YY**;

**Frame rate** - the sampling rate of the data. You can manually set frame rate in **Set Frame Rate to XX**. *NOTE After Effects does not support frame rate greater then 99.*

## Technical data

**Set Frame Rate to** defines custom frame rate of animation. *NOTE After Effects does not support frame rate greater than 99.*

**Set animation from XX to YY** defines custom animation range from BVH file.

**Create Neutral Pose at the beginning of animation** - create initial rest pose at time 00:00 without any motion data deformations.

**Force Header pose to the center of the screen** - this option forces *ROOT* joint to be positioned in the center of After Effects composition. Otherwise position will be offset by *Offset* value from BVH files header section.

**Force Motion data to the center of the screen** - same as previously, only *MOTION* data will be offset accordingly.

## Visual data

**Composition size** defines custom compositions Width and Height;

**Skeleton scale factor** define the scaling factor between the joints. Depending on world scale used in BVH file, skeletons might come very small or very huge. This options enables user to define initial scaling.

**On each Joint create Solid/Null** - chose whether you wish to have Solids or Nulls in place of Joints.

**Dimensions** define the Width and Height of the Solid layer;

**Anchor point** defines the position of anchor point of the Solid layer.

**Add circular mask** will add circular mask on a layer so it looks as a circle;

**Connect Joints with Beam Effect** will add a new layer that will have *Beam effect* on it and will create visual lines between each joint.

# Script workflow

**BVH Importer** reads the BVH file, parses it, and sends the information to *After Effects* timeline with the following algorithm:

1. Parse BVH Header data and obtain the joints information,
2. Parse BVH Motion data and obtain the animation data,
3. Create Composition,
4. Build Skeleton. For each Joint in Header:
  - 4.1. Create a layer,
  - 4.2. Give it a name,
  - 4.3. Offset layer in 3D space,
  - 4.4. Adjust Anchor Point,
  - 4.5. Move it to the end of composition,
  - 4.6. Parent it if necessary ,
5. Animate Skeleton. For each layer in composition:
  - 5.1. Create initial pose at time 00:00 without any motion data deformations,
  - 5.2. Position property:
    - 5.2.1. Push all position keyframes data to an array,
    - 5.2.2. Apply Position keyframes to the layer at once,
  - 5.3. Rotation property:
    - 5.3.1. Convert Euler Angles to Rotations so AE can understand,
    - 5.3.2. Push all rotation keyframe data to an array,
    - 5.3.3. Apply Rotation keyframes to the layer at once,
6. Create Controller Null and parent Root Joint to it,
7. Add Beam Effect.

*Script does not support multiple hierarchies, only one ROOT object is allowed.*

# What is BVH file

Basically, it has two parts **HIERARCHY** and **MOTION**. Like the names suggest those two parts contain just that: *hierarchies* of skeletons and *motion data*. Inside the hierarchy part we have a description of skeletons. Even if the format permits having multiple skeleton definitions, rarely it will contain more than one. Skeletons are defined by defining bones which themselves are defined with joints; meaning we define a skeleton by defining joints. But if an elbow joint is the child of a shoulder joint how do we know the length of the upper arm? By defining an offset.

Lets look at an example:

```
HIERARCHY
ROOT Hips
{
  OFFSET 0.00 0.00 0.00
  CHANNELS 6 Xposition Yposition Zposition Zrotation Xrotation Yrotation
  JOINT Chest
  {
    OFFSET 5.00 0.00 0.00
    CHANNELS 3 Zrotation Xrotation Yrotation
    End Site
    {
      OFFSET 0.00 5.00 0.00
    }
  }
  JOINT Leg
  {
    OFFSET -5.0 0.0 0.0
    CHANNELS 3 Zrotation Xrotation Yrotation
    End Site
    {
      OFFSET 0.0 5.0 0.0
    }
  }
}
MOTION
Frames:      2
Frame Time: 0.033333
0.00 0.00 0.00 0.00 0.00 0.00  0.00 0.00 0.00  0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00  0.00 45.00 0.00  0.00 0.00 0.00
```

First joint of the hierarchy is a root joint so it is defined by using the keyword *ROOT*. Every other joint that is a descendant is defined using the *JOINT* keyword followed by the joint name. Special joints are *End Site* joints which are joints without any children or name.

Contents of a joint are *OFFSET* and *CHANNELS*. We use an offset to know the length (or offset from) of bones between joints of a joint's parent and itself. Most commonly, a *ROOT* joint will have an offset of (0, 0, 0) (note these are, of course: x, y, z components). *CHANNELS* line defines the number of channels following which channels that *MOTION* parts contain animation data for. Again, the most common use is a *ROOT* joint that has 6 channels (xyz position and zxy rotation) while other joints will have 3. *End Site* joints don't have animation data so they do not need to have *CHANNELS* data. They only have an *OFFSET* so we know it's length.

The *MOTION* part contains two lines (frames defining number of frames and frame time which is frame rate ( $bvh\ motion\ FPS = 1 / frame\_time$ ) followed by lines for each frame that has float data of each joint/channel (specified) combination beginning from parent to children nodes, just in same order they were specified in hierarchy part, from top to bottom. The example is dull and has all zeroes but you get the point.

Applying *MOTION* data to skeleton is straight forward. What we do (for each joint, starting from root) is take the value from the motion data and apply it in the order it was loaded / defined in the file.



## Where to get BVH files

There are several different formats that mocap files can be stored in. [BVH Importer](#) can only deal with files in Biovision BVH format. BVH files can be bought from many commercial sources, but a large range of mocap files are also available for free download. Here are some sites I found useful.

**CMU Graphics Lab Motion Capture Database:** Hosted at Carnegie-Mellon University, this is a huge library of mocap files which can be downloaded for free.

<http://mocap.cs.cmu.edu>. CMU hosts mocap files in three formats: tvd, c3d and amc. However, the script can only read BVH files, so none of these files can be used directly. Fortunately, *B. Hahne* at [www.cgsped.com](http://www.cgsped.com) has converted the CMU files to BVH. The converted files are located at <http://sites.google.com/a/cgsped.com/cgsped/motion-capture>

**Advanced Computing Center for the Arts and Design (ACCAD):** Hosted at the Ohio State University, this is another great source of free mocap files. BVH files can be downloaded from [http://accad.osu.edu/research/mocap/mocap\\_data.htm](http://accad.osu.edu/research/mocap/mocap_data.htm)

**Eyes Japan (mocapdata.com):** This is a Japanese company that sells mocap data commercially, but they also offer a huge number of motions for free. <http://www.mocapdata.com/>

**The Trailer's Park:** Free mocap data can also be found at the Trailer's Park, <http://www.thetrailerspark.com>. This site does not offer original data, but offer repacks of mocap data from other free sites for download.

**Hochschule der Medien, Universität Bonn (HDM):** <http://www.mpi-inf.mpg.de/resources/HDM05>

Commercial online Motion Capture Rig/Animate tool with Motion request option: <http://www.mixamo.com>



# ***BVH Importer*** *for After Effects*

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