Blender addon

Simplify Multiple F-Curves

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Reference Page: http://slsi.dfki.de/software-and-resources/keyframe-reduction/

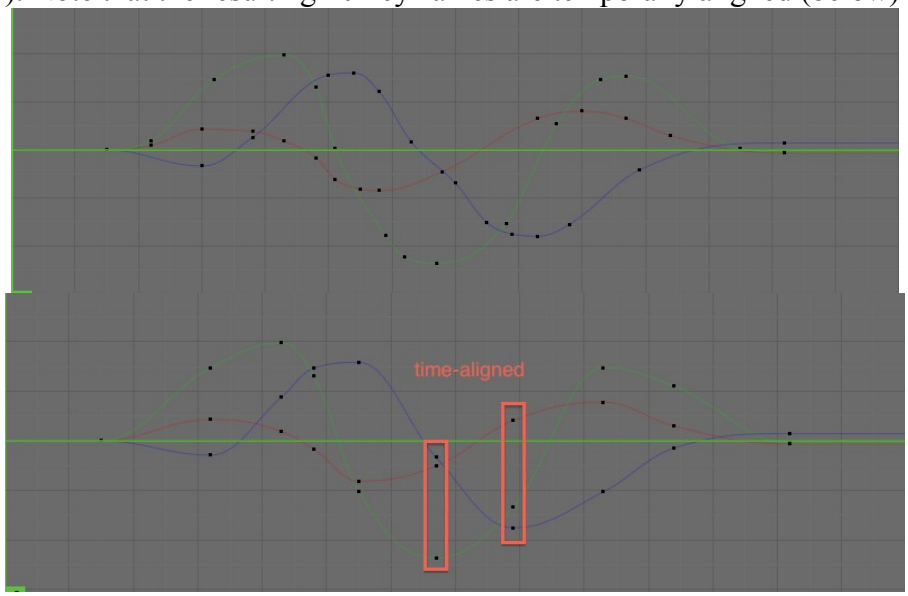
Introduction

Simplify Multiple F-Curves is a Blender addon that performs keyframe decimation over a selection of F-Curves over the time-window of your choice: it reduces the number of keyframes and ensures that their remaining control points are temporally aligned. Having the control points aligned on a few time values simplifies the later manual edit of simplified animation.

This addon lets you:

- Set the number of desired keyframes after simplification
- Set the acceptable error between the original curves and the simplified curves
- Computed keyframes are ALL temporally aligned across the curves
- Curve selection
- Time-window selection

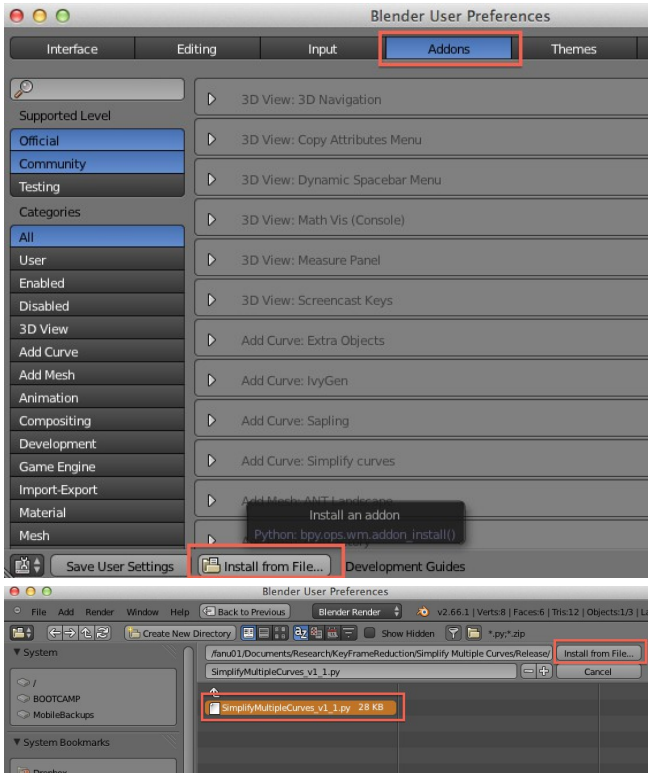
The following pictures show the result of simplifying three curves, each one composed of 15 keyframes (top). Note that the resulting 10 keyframes are temporally aligned (below) .



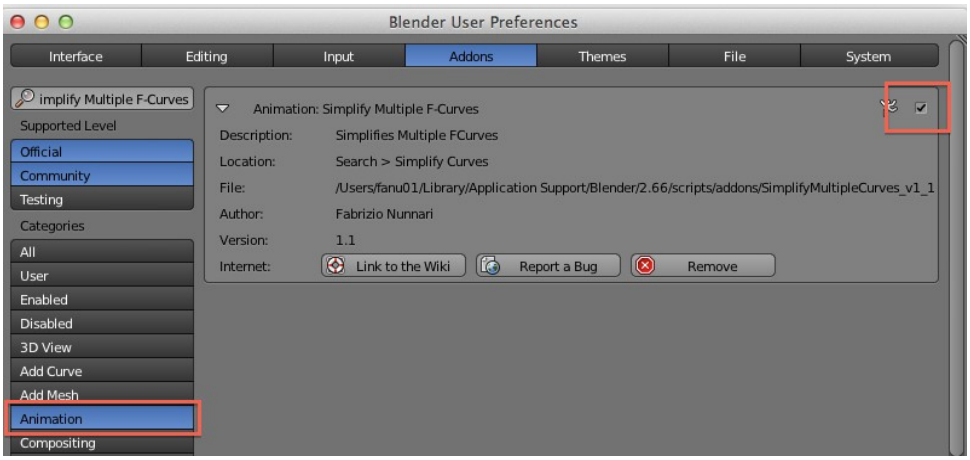
Installation

Install the addon script and enable it.

Open the user preferences window (menu File / User Preferences), go into the “Addons” tab, select “Install from file...” and select the *SimplifyMultipleFCurves.py* file on your hard drive.



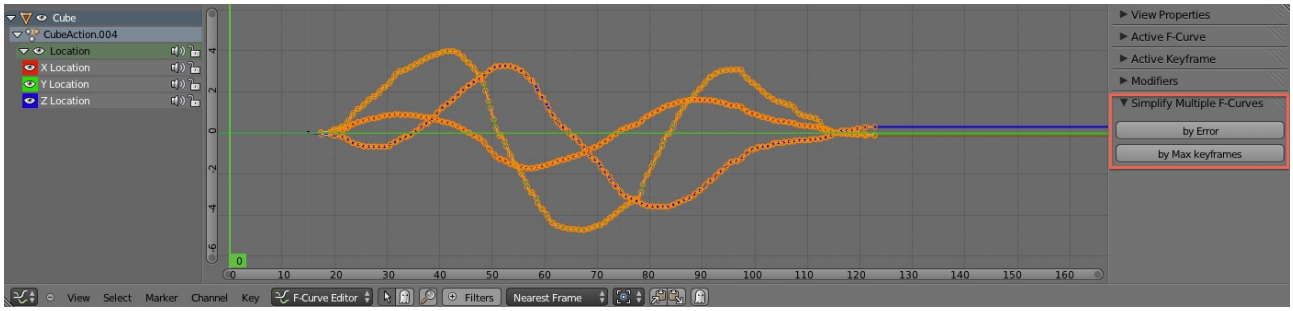
Enable the addon in the Animation section by checking the box on the right side of the description dialog



For more details, check the official documentation for more details on addons installation: http://wiki.blender.org/index.php/Doc:2.6/Manual/Extensions/Python/Add-Ons

Usage

Open the Graph Editor / F-Curves Editor, select the curves you want to simplify and click on one of the two buttons shown in the Simplify Multiple F-Curves panel.

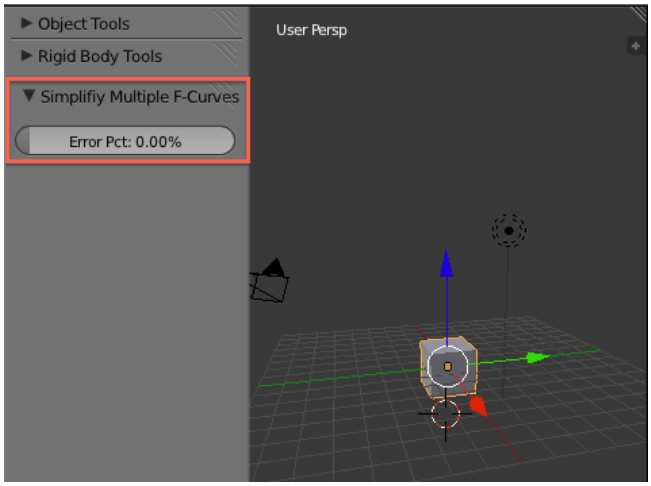


Depending on you choice you will have a new control panel in the 3D window to interactively control the simplification.

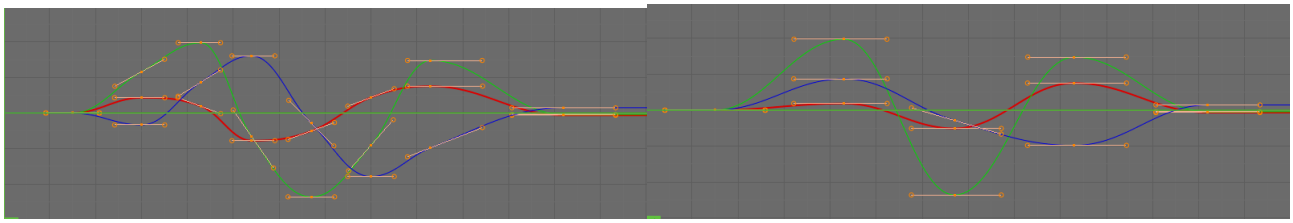
In order for the script to run, the selection must include at least 1 curve. The curve must contain at least 2 keyframes.

Simplify by Error

Once selected the simplification “by Error”, you will see a control panel appearing on the 3D View / Tool panel. Interactively move the percentage slider or input the desired value to see the result in the graph editor.



The following pictures show simplification of 25% (left) and 80% (right).



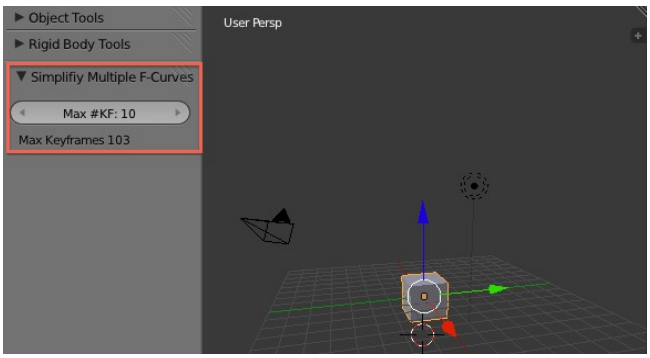
The simplification value is related to the error computed by comparing the original curves and the simplified curve. An error of 0% means that no keyframes will be removed, a value of 100% means that only two keyframes will be kept: the first and the last one.

There is no correlation between the simplification percentage and the number of keyframes discarded or retained. Such case is properly treated by the following operator.

Simplify by Max Keyframes

This control panel allow you to specify the maximum number of keyframes that should be kept in the simplified curves. This includes borders, so the minimum number of keyframes to retain is 2.

When invoked, the 3D view shows a panel containing the controller together with an indicator of the number of keyframe actually in the curve.



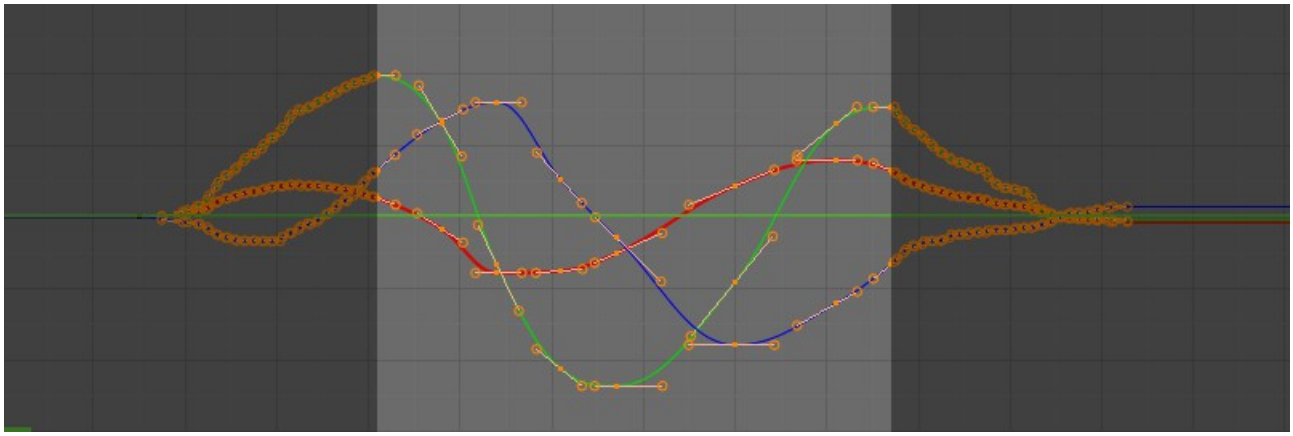
This operator is computationally more intensive than direct percentage selection because the algorithm will perform iteratively until reaching the desired number of remaining keyframes.

Normalization

The normalization option is useful when not all the curves share the same “amplitude scale”. For example, in general, when you simplify together two curves, one operating on translation, with an extension from -100 to 100, and the other one operating on a scale element, with an extension from 0 to 1, the translation curve will “dominate” the error calculation and the scaling curve will always be oversimplified. When the normalization option is active, all curves will be normalized in a range [0,1] before simplification, thus treated with the same “priority”.

Range selection

It is possible to operate only on a restricted time window. The addon performs curve simplification over the range that is specified as a scene-preview range (use the P key to select a preview range in the F-Curves Editor).



The time range selection must include at least 2 keyframes. The leftmost and rightmost keyframes within the selected range will be retained and used as first and last keyframes. No new keyframes will be created at range selection borders!

How it works

The algorithm is essentially based on the following strategy.

- First the selected curves are analyzed and information about their keyframes stored.
  - All the curves are analyzed in parallel, starting from their first keyframe. Each time a keyframe is encountered on a curve:
    - if the curve already has a keyframe at that frame position its value is stored,
    - otherwise a new keyframe is evaluated by interpolation.
- Then, given a simplification percentage, the curves information are analyzed to retrieve a

list of keyframes to retain.
    - The simplification percentage is converted into an “error” with respect to the maximum extension among all curves.
    - This error is used to apply a Ramer–Douglas–Peucker algorithm, with a little variant:
        - the error comparison is performed among all curves in parallel;
        - if at least one curve has a keyframe to retain, the same frame position is retained for all curves in the selection.
- Finally, the selected curves in the graph editor are reconstructed:
    - the keyframes (within the selected range) are completely deleted;
    - new keyframes are re-built according to the original stored information and the list of keyframes to retain.

Limitations

- When executed on a selection on non-aligned curves, at simplification 0% (retain all keyframes) the resulting number of keyframes might be greater than the number of original keyframes. That's because when at least a curve has a keyframe at a certain frame, new keyframes are created for the curves not having one at the same frame. This might be a bit misleading for the user. This issue doesn't emerge when working on full-frame-rate motion capture recordings.
- No tangent information is retained from the original curves.

Known Issues

- When performing massive simplification, the graph editor curves are not immediately updated. You have to click on the editor to force an update, or move the slider to force additional updates.
- The simplification sliders appear on the 3D View. I would be happy to see them on the same Graph Editor / Properties panel, but the Operator's *bl_space_type* and *bl_region_type* attributes are not working as I expect. Suggestions are more than welcome.

Credits

Simplify Multiple F-Curves has been developed by Fabrizio Nunnari, in collaboration with Alexis Heloir for the Sign Language Synthesis and Interaction research group at DFKI / MMCI, Saarbrücken, Germany.

The addon implementation has been inspired and contains some code from two existing addons:

- The Simplify curves addon: http://wiki.blender.org/index.php/Extensions:2.6/Py/Scripts/Curve/Curve_Simplify
- The “Samples to Bezier” tool of the Motion Capture addon: http://wiki.blender.org/index.php/Extensions:2.6/Py/Scripts/Animation/Motion_Capture_Tools