

MATLAB®



python

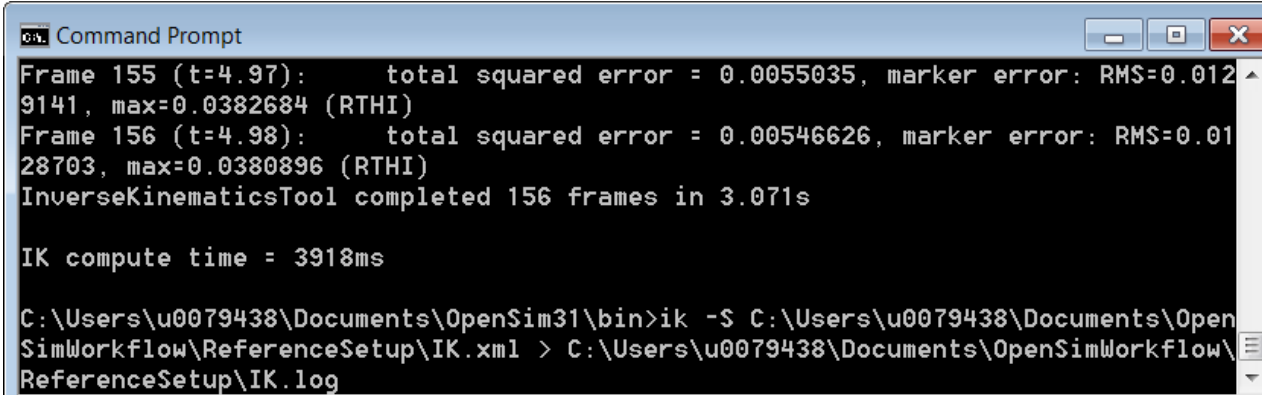
## **Automating OpenSim Processing**

# Automated processing

- Command line
- API

## Command line

- Execute OpenSim tools from command line
  - All executables that are available in <OpenSim\_Install\_Dir>/bin
    - ik, id, rra, cmc, analyze...
  - Open command window
  - Go to <OpenSim\_Install\_Dir>/bin
  - Run setup file
    - executable -S setup.xml
      - e.g. **ik -S** setup\_ik.xml
    - Output in command window
      - Add log file
        - » e.g. ik -S setup\_ik.xml > setup\_ik.log
  - Use full paths in setup .xml file



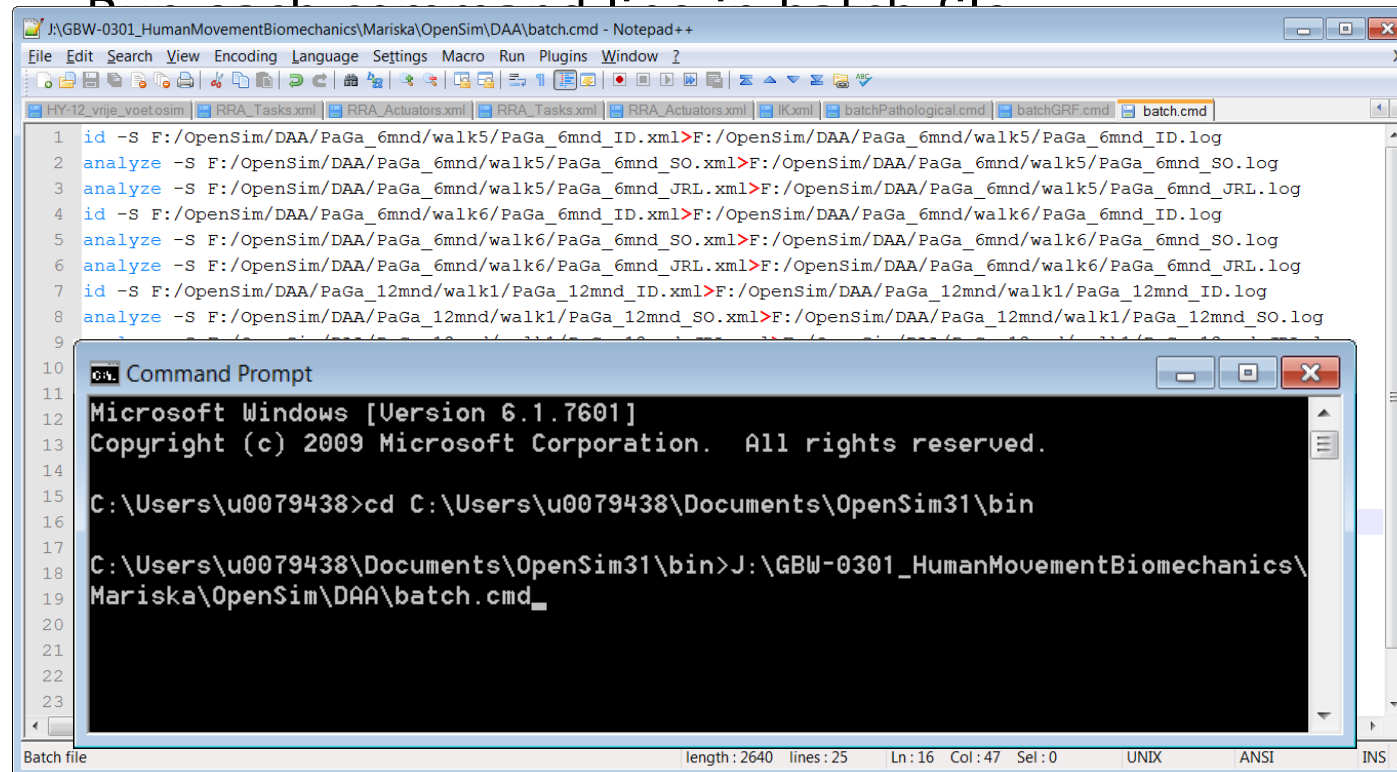
```
Command Prompt
Frame 155 (t=4.97):      total squared error = 0.0055035, marker error: RMS=0.012
9141, max=0.0382684 (RTHI)
Frame 156 (t=4.98):      total squared error = 0.00546626, marker error: RMS=0.01
28703, max=0.0380896 (RTHI)
InverseKinematicsTool completed 156 frames in 3.071s

IK compute time = 3918ms

C:\Users\u0079438\Documents\OpenSim31\bin>ik -S C:\Users\u0079438\Documents\Open
SimWorkflow\ReferenceSetup\IK.xml > C:\Users\u0079438\Documents\OpenSimWorkflow\
ReferenceSetup\IK.log
```

# Batch processing

- Command lines in .cmd file
  - e.g. `ik -S setup_ik.xml > setup_ik.log`
    - Write output to log file
  - Combine different analysis
- Run .cmd file from command line



The screenshot shows a Notepad++ window with a batch file named 'batch.cmd' open. The batch file contains the following commands:

```
1 id -S F:/OpenSim/DAA/PaGa_6mnd/walk5/PaGa_6mnd_ID.xml>F:/OpenSim/DAA/PaGa_6mnd/walk5/PaGa_6mnd_ID.log
2 analyze -S F:/OpenSim/DAA/PaGa_6mnd/walk5/PaGa_6mnd_SO.xml>F:/OpenSim/DAA/PaGa_6mnd/walk5/PaGa_6mnd_SO.log
3 analyze -S F:/OpenSim/DAA/PaGa_6mnd/walk5/PaGa_6mnd_JRL.xml>F:/OpenSim/DAA/PaGa_6mnd/walk5/PaGa_6mnd_JRL.log
4 id -S F:/OpenSim/DAA/PaGa_6mnd/walk6/PaGa_6mnd_ID.xml>F:/OpenSim/DAA/PaGa_6mnd/walk6/PaGa_6mnd_ID.log
5 analyze -S F:/OpenSim/DAA/PaGa_6mnd/walk6/PaGa_6mnd_SO.xml>F:/OpenSim/DAA/PaGa_6mnd/walk6/PaGa_6mnd_SO.log
6 analyze -S F:/OpenSim/DAA/PaGa_6mnd/walk6/PaGa_6mnd_JRL.xml>F:/OpenSim/DAA/PaGa_6mnd/walk6/PaGa_6mnd_JRL.log
7 id -S F:/OpenSim/DAA/PaGa_12mnd/walk1/PaGa_12mnd_ID.xml>F:/OpenSim/DAA/PaGa_12mnd/walk1/PaGa_12mnd_ID.log
8 analyze -S F:/OpenSim/DAA/PaGa_12mnd/walk1/PaGa_12mnd_SO.xml>F:/OpenSim/DAA/PaGa_12mnd/walk1/PaGa_12mnd_SO.log
```

Below the Notepad++ window, a Command Prompt window is open, showing the execution of the batch file:

```
C:\Users\u0079438>cd C:\Users\u0079438\Documents\OpenSim31\bin
C:\Users\u0079438\Documents\OpenSim31\bin>J:\GBW-0301_HumanMovementBiomechanics\
Mariska\OpenSim\DAA\batch.cmd_
```

The Command Prompt window also displays the Microsoft Windows version information and copyright notice.

## OpenSim API

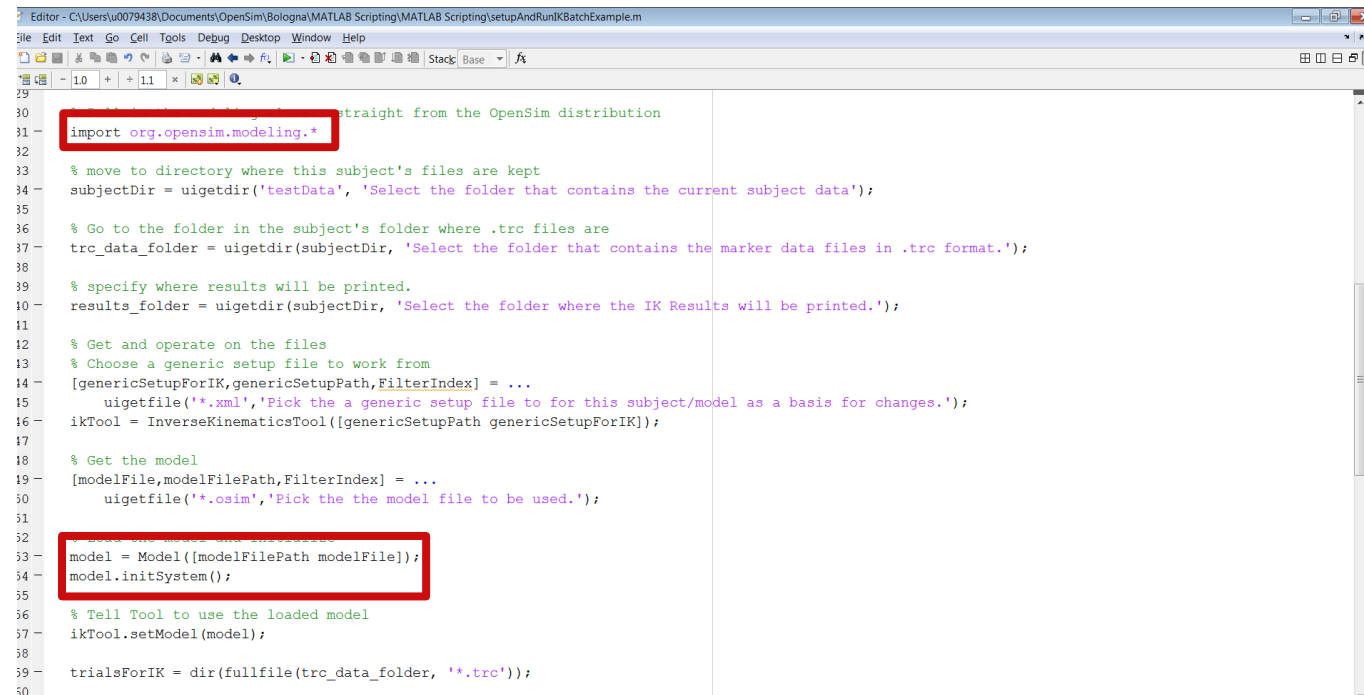
- Application programming interface
  - Interface between software programs
    - Matlab
    - Python
- Build/adapt models
- Create setup files
- Run analyses
- ...

## Scripting

- OpenSim GUI scripting shell
- Matlab
- Python

# Scripting

- Matlab
  - Setup Matlab Scripting environment
    - Automated setup from OpenSim 3.2 onward
  - Load OpenSim libraries
  - Import model



```
Editor - C:\Users\u0079438\Documents\OpenSim\Bologna\MATLAB Scripting\MATLAB Scripting\setupAndRunIKBatchExample.m
File Edit Text Go Cell Tools Debug Desktop Window Help
Stack: Base
29
30 % Get the model straight from the OpenSim distribution
31 import org.opensim.modeling.*
32
33 % move to directory where this subject's files are kept
34 subjectDir = uigetdir('testData', 'Select the folder that contains the current subject data');
35
36 % Go to the folder in the subject's folder where .trc files are
37 trc_data_folder = uigetdir(subjectDir, 'Select the folder that contains the marker data files in .trc format.');
```

```
38
39 % specify where results will be printed.
40 results_folder = uigetdir(subjectDir, 'Select the folder where the IK Results will be printed.');
```

```
41
42 % Get and operate on the files
43 % Choose a generic setup file to work from
44 [genericSetupForIK, genericSetupPath, FilterIndex] = ...
45     uigetfile('*.xml', 'Pick the a generic setup file to for this subject/model as a basis for changes.');
```

```
46 ikTool = InverseKinematicsTool([genericSetupPath genericSetupForIK]);
47
48 % Get the model
49 [modelFile, modelFilePath, FilterIndex] = ...
50     uigetfile('*.osim', 'Pick the the model file to be used.');
```

```
51
52 model = Model([modelFilePath modelFile]);
53 model.initSystem();
54
55 % Tell Tool to use the loaded model
56 ikTool.setModel(model);
57
58 trialsForIK = dir(fullfile(trc_data_folder, '*.trc'));
59
60
```

## Useful recourses

- Command line
  - <http://simtk-confluence.stanford.edu:8080/display/OpenSim/Command+Line+Utilities>
- API
  - <http://simtk-confluence.stanford.edu:8080/display/OpenSim/Introduction+to+the+OpenSim+API>
- Scripting
  - <http://simtk-confluence.stanford.edu:8080/display/OpenSim/Scripting>
  - <http://simtk-confluence.stanford.edu:8080/display/OpenSim/Common+Scripting+Commands>
- Doxygen (documentation of classes and methods)
  - [https://simtk.org/api\\_docs/opensim/api\\_docs32/](https://simtk.org/api_docs/opensim/api_docs32/)
- Example scripts
  - Installed with OpenSim
    - <OpenSim\_Install\_Dir>/Scripts