

FreeCAD FEM Workbench Documentation

FreeCAD Community

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1 Introduction

This document provides an overview of the FreeCAD FEM Workbench, focusing on the integration between the Keyword Editor, Nodeset Extractor, and Solver components.

2 System Architecture

3 Key Components

3.1 Keyword Editor

The Keyword Editor allows users to:

- Edit solver-specific keywords and parameters

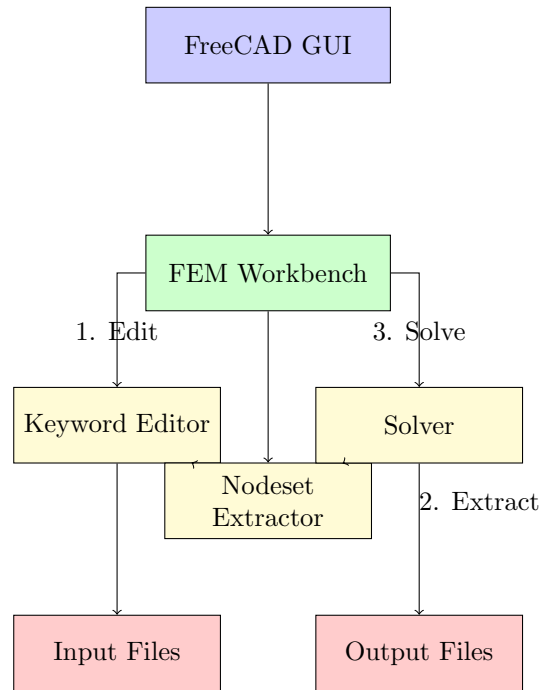


Figure 1: Top-down flow of the FEM Workbench

- Validate input files before execution
- Save and load solver configurations
- Support for multiple solvers (CalculiX, OpenRadioss, etc.)

3.2 Nodeset Extractor

The Nodeset Extractor provides:

- Automatic node set creation from geometry
- Support for various constraint types (force, displacement, etc.)
- Visualization of node sets
- Export/import capabilities

3.3 Solver Integration

The Solver component handles:

- Execution of analysis

- Input file processing
- Output directory management
- Progress monitoring
- Error handling and logging

4 Workflow

4.1 1. Model Setup

1. Create or import geometry
2. Define material properties
3. Apply boundary conditions

4.2 2. Nodeset Extraction

1. Select geometry for node sets
2. Extract nodes using the Nodeset Extractor
3. Verify node sets in the 3D view

4.3 3. Solver Configuration

1. Open the Keyword Editor
2. Configure solver parameters
3. Save the input file

4.4 4. Execution

1. Run the solver
2. Monitor progress
3. View results

5 Example

```
# Example Python API usage
import FreeCAD
from femutils.nodeset_extractor import extract_nodesets

# Get the active document
```

```
doc = FreeCAD.ActiveDocument

# Extract nodesets from analysis
analysis = doc.Analysis
mesh_obj = doc.Mesh
nodesets = extract_nodesets(analysis, mesh_obj)

# Print extracted nodesets
for name, nodes in nodesets.items():
    print(f"{name}: {nodes}")
```