

Nidhoggr Technical Reference Manual

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1 Introduction

- Purpose and Scope
- History and Development Goals
- Overview of Physical Models

2 Software Architecture

- High-Level Code Organization
- Major Modules and Dependencies
- Build System (CMake, etc.)

3 Data Structures

- Mesh and Grid Classes
- Field Representations
- Boundary Condition Structures
- Material and Equation-of-State (EOS) Models

4 Numerical Methods

- Finite Element Methods (FEM) Implementation
- Smoothed Particle Hydrodynamics (SPH) Implementation
- Solvers (e.g., linear, nonlinear, iterative methods)
- Time Integration Schemes

5 Physics Models

- Hydrodynamics
- Solid Mechanics
- Damage and Fracture Modeling
- Radiation Transport (if applicable)

6 I/O and Post-Processing

- Input File Formats
- Output File Formats (VTK, Silo, etc.)
- Restart and Checkpointing
- Visualization Recommendations

7 Extending Nidhoggr

- Adding New Material Models
- Adding New Boundary Conditions
- Implementing New Solvers
- Adding New Output Types

8 Coding Standards and Guidelines

- Naming Conventions
- Best Practices for Contributions
- Testing and Validation Procedures

9 Known Limitations and Future Work

- Current Limitations
- Planned Features

A Appendix A: Class Hierarchies

- UML-style Diagrams (optional)

B Appendix B: Developer Tools

- Debugging Tools
- Profiling and Performance Analysis