OpenGR is an open framework, developed here at the University of Texas at Austin, for relativistic simulations. OpenGR utilizes the SAMRAI (Structured Adaptive Mesh Refinement Application Infrastructure) libraries developed at Lawrence Livermore National Labratory to manage our MPI (Massively Parallel Instruction set) calls, nonlinear solver, and ODE solver.

We are currently finishing stability testing of our feature set for the first release of OpenGR and the output looks promising. The current features which are not outlined to the right and proposed future development are highlighted below.

Current Features

- **Scalability** The OpenGR framework has been tested on up to 256 processors, and seems to be scaling well.
- Flexability We have implemented, and are currently testing, several differing formulations of Einstein's equations, as well as constrained evolution of both ADM and NOR formulations. OpenGR provides flexability in implementing evolution equations, setting boundary data, visualization, and choosing initial data.
- **Data Management** OpenGR and supporting analysis tools provide restart capabilities, a well documented HDF5 interface provided by SAMRAI, and batch output analysis through the VisIt visualization application.

Future Improvements

- **AMR** Once we are evolving matter fields, adaptive mesh refinement (AMR) will provide increased stability. This is a planned improvement.
- **Development API** To improve the reusability of our own code, and to encourage others to use our framework as a basis for their simulations, a defined application programming interface (API) is a must. This will ease the burden on developers and allow them to focus more on the physics.

An Introduction to OpenGR)

OPENGR An Open Framework for Relativistic Simulations

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