Poster at Splinter Meeting

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Smoothed particle hydrodynamics on dynamical spacetime background near black holes

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Smoothed particle hydrodynamics (SPH) is a well established technique to analyze the merging between black holes and stellar objects. However, influence of a dynamical spacetime background on these systems is not well studied.

In order to analyze the differences between fixed and dynamical systems, we develop a combination of hydrodynamic and spacetime evolution based on SPH and the Baumgarte-Shapiro-Shibata-Nakamura (BSSN) formalism.

To this purpose we deduce SPH evolution equations from hyperbolic Euler equations in {3+1}-framework. To integrate these in an existing BSSN-evolution code we also need a transformation for hydrodynamic variables from the particle- to a grid-based form. We show that a clouds-in-cells model working with a Monte-Carlo method will conserve the hydrodynamic states after mapping on the grid and is useful for our purposes.