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# New Hyperboloidal Discontinuous Numerical Algorithm in the time domain for self-force applications

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In 2034 LISA is due to be launched, which will provide the opportunity to extract physics from stellar objects and systems that would not otherwise be possible, among which are EMRIs. Unlike previous sources detected at LIGO, these sources can be simulated using an accurate computation of the gravitational self-force. Whereas the field has seen outstanding progress in the frequency domain, metric reconstruction and self-force calculations are still an open challenge in the time domain. Such computations would not only further corroborate frequency domain calculations/models but also allow for full self-consistent evolution of the orbit under the effect of the self-force . Given we have a priori information about the local structure of the discontinuity at the particle, we will show how we can construct discontinuous spatial and temporal discretizations by operating on discontinuous Lagrange and Hermite interpolation formulae and hence recover higher order accuracy. We will show how this technique in conjunction with well-suited conformal (hyperboloidal slicing) and numerical (discontinuous time symmetric ) methods can provide a relatively simple method of lines numerical recipe approach to the problem. We will focus on updating on our progress providing a full generic solution and sharing our results for both the scalar and gravitational self-force cases for a particle in a circular orbit on a Schwarzschild background, (spoiler alert for those who attended last year's Capra: fluxes finally fixed!).

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