1035-65-622 **M. Ziaul Haque*** (mhaque@smu.edu), 5555 Amesbury Drive, Apt 702, Dallas, TX 75206. *An Adaptive Finite Element Method with Lumped Masses for Second Order Hyperbolic Partial Differential Equations in One Space Dimension.* Preliminary report.

We implement the finite element method with lumped masses to discretize the wave equation in one dimension. The diagonal mass matrix resulting from lumping leads to a special system of second-order ordinary differential equations. Instead of transforming this system to an equivalent first-order system, we solve this directly by using explicit Runge-Kutta-Nystrom method that offers appropriate efficiency and less memory. Two interpolation-error based a posteriori error estimates obtained from elliptic and parabolic problems have been used to estimate the spatial discretization error of the wave equation. One involves high-order derivatives of the computed solution and the other uses the first (second) derivative jumps of the computed solution at the element boundaries for odd (even) order bases. Both estimates are seen to be asymptotically exact for the method of lumped masses for second-order hyperbolic problems. These estimators drive as hp-adaptive strategy. Computational results demonstrate the effectiveness of the approach. (Received September 12, 2007)