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\begin{flushleft}

\Huge {\bf Abstract}

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This work presents an auditory-emulation program that simulates the auditory neural response and determines hearing level based on a parallel time-domain nonlinear solution of the cochlea. Previous such simulations used a parallel calculation of the basilar membrane velocity and then calculated the serial neural response in the temporal and longitudinal dimensions. However, this approach suffers from limited efficiency because it requires copying large arrays and performing serial computation. In contrast, the proposed approach uses the graphics processing unit to do massively parallel computing, which accelerates the just-noticeable-difference (JND) calculation by a factor of 80 to 400. This is valuable both to calculate the hearing level for single-pitch signals and spoken words (with various types of noise or in silence) and to determine how various types of hearing aids affect the JND.

%a one dimensional cochlear model, using a graphics processor unit (GPU). The cochlear model as introduced in TBD - [1] is described by a set of non-linear partially differential equations. The output of the algorithm is the basilar membrane (BM) speed along the cochlea as a function of time, given an input signal to the middle ear .One dimensional grid is used for this problem, x-dimension represents the location on the basilar membrane (distance from stapes). An iterative method is used by the algorithm, challenging parallelization in time domain. This paper presents an overlapped block partitioning method, to cope with this constrain. (TBD - shared memory/ automatic variables tradeoff, Jacobi relaxation, optimization of order of computations, more ...)

%TBD - present results (compared to PC)

%The method presented in this paper can be found useful for accelerating computation of other fields of physics that involves non-linear equations.