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Practical Implementation of Prestack Kirchhoff Time Migration on a General Purpose Graphics Processing Unit

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Abstract

In this study, we present a practical implementation of prestack Kirchhoff time migration (PSTM) on a general purpose graphic processing unit. First, we consider the three main optimizations of the PSTM GPU code, *i.e.*, designing a configuration based on a reasonable execution, using the texture memory for velocity interpolation, and the application of an intrinsic function in device code. This approach can achieve a speedup of nearly 45 times on a NVIDIA GTX 680 GPU compared with CPU code when a larger imaging space is used, where the PSTM output is a common reflection point that is gathered as $I[nx][ny][nh][nt]$ in matrix format. However, this method requires more memory space so the limited imaging space cannot fully exploit the GPU sources. To overcome this problem, we designed a PSTM scheme with multi-GPUs for imaging different seismic data on different GPUs using an offset value. This process can achieve the peak speedup of GPU PSTM code and it greatly increases the efficiency of the calculations, but without changing the imaging result.

Key words: GPGPU, offset splitting, parallelization, PSTM, texture memory.