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Optimizing Radeon VRAM behavior

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Abstract

The possibility of applying neural networks for optimizing VRAM behavior was researched in the thesis, and a set of software including a memory simulator was created for the task. Data was gathered from a wide variety of games and applications, producing memory traces suitable for the simulator. Using the simulator to play back memory traces, the efficiency of various approaches could be measured. The simulator was first used in minimizing fragmentation, and later on in training the AI.

The current state of the art of neural networks is shortly reviewed, as well as the common applications for each method. The methods chosen for this study are covered in more detail. The main training methods used were genetic/evolutionary training for the initial solution, and then fine-tuning with a Monte-Carlo solution.

As a result, fragmentation was changed in such a way that eviction was reduced by up to 20%. The change was accepted into future Linux kernels, starting with version 3.15.

The AI achieved acceptable results in optimizing the placement of buffers, improving the performance of most tested applications by 1-2% under memory pressure. The smoothness of each application improved as well, resulting in a more pleasant user experience.

Keywords
Radeon, graphics adapters, artificial intelligence, neural network

Miscellaneous