Exploiting Stability to Reduce Time-Space Cost for Memory Tracing

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Abstract: Memory traces record the addresses touched by a program during its execution, enabling many useful investigations for understanding and predicting program performance. But complete address traces are time- consuming to acquire and too large to practically store except in the case of short-running programs. Also, memory traces have to be re-acquired each time the input data (and thus the dynamic behavior of the program) changes. We observe that individual load and store instructions typically have stable memory access patterns. Changes in dynamic control-flow of programs, rather than variation in memory access patterns of individual instructions, appear to be the primary cause of overall memory behavior varying both during one execution of a program and during re-execution of the same program on different input data. We are leveraging this observation to enable approximate memory traces that are smaller than full traces, faster to acquire via sampling, much faster to re-acquire for new input data, and have a high degree of verisimilitude relative to full traces. This paper presents an update on our progress.

Reference:
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