Data-Oriented Design: From Theory to Implementation

Degree programme: Master of Science in Engineering | Specialisation: Information and Communications Technologies
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Complex, interconnected programs are ubiquitous in today's societies, as drivers and enablers of many recent technological advancements. To mitigate the difficulty of writing and maintaining such programs, paradigms of how to best develop software have emerged. This thesis investigates the data-oriented design (DOD) paradigm as an alternative to object-oriented design (OOD), which is the dominant paradigm taught and used in the software industry today.

Outset

DOD advocates principles that favor clear data paths over abstraction and taking into account target hardware platforms when implementing software. This is in stark contrast to OOD, which promotes layers of abstraction and many small functions and classes that hide underlying soft- and hardware system implementations.

Method

Principles of DOD were researched and a software package, a game engine, was implemented (see fig. 1). A set of solutions to problems encountered during the project were thoroughly documented to serve as a baseline and inspiration for future work, highlighting where DOD principles guided the design.

Results and Conclusions

A series of tests was run on the DOD implementation as well as OOD comparison programs. The DOD programs consistently outperformed their OOD counterparts with considerable speedups (see fig. 2). The conclusion is drawn that DOD principles should be taught as a viable paradigm in informatics curricula and programmers should consider a more data-oriented approach when developing software.

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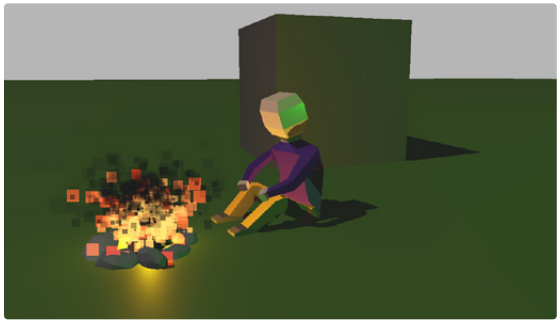

Fig. 1: A scene rendered in the custom game engine created for the thesis.

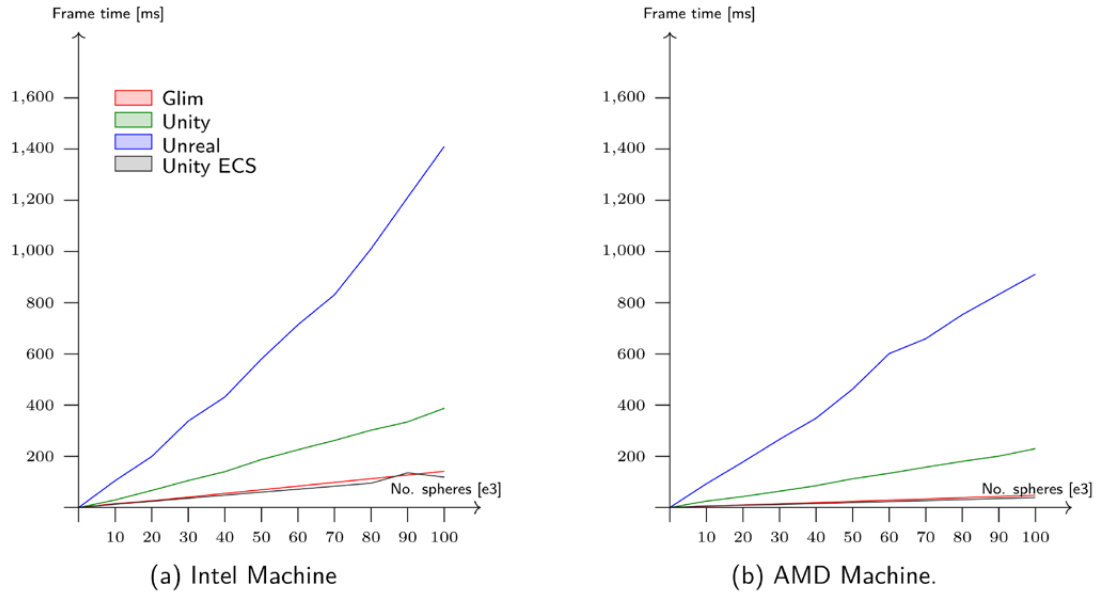

Fig. 2: Performance measurements of a test program implemented in the custom game engine (in red) and industry standard solutions. The test was run on two different machines.