Simulating the GPU-based shaders in the graphics pipeline on a CPU-based language to allow code inspection at runtime

Masterthesis

at the University of applied science Ravensburg-Weingarten

by

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Author's declaration

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Matthias Mettenleiter

Abstract

An abstract is a brief summary of a research article, thesis, review, conference proceeding or any in-depth analysis of a particular subject or discipline, and is often used to help the reader quickly ascertain the paper's purpose. When used, an abstract always appears at the beginning of a manuscript, acting as the point-of-entry for any given scientific paper or patent application. Abstracting and indexing services for various academic disciplines are aimed at compiling a body of literature for that particular subject.

The terms précis or synopsis are used in some publications to refer to the same thing that other publications might call an "abstract". In "management" reports, an executive summary usually contains more information (and often more sensitive information) than the abstract does.

Quelle: http://en.wikipedia.org/wiki/Abstract_(summary)

Contents

1 Introduction

Explanation of debugging   "Debuging is the process of locating and removing faults in computer programs" accorrding to [Collins 2014] . In the following only ways of debugging software problems are considered.Excluding specialized debugging hardware. The steps that are part of the debugging process are reproducing the problem, identifying the source of the problem and fixing the problem. All of these steps can be done manually but there are ways to improve and accelerate this process.

To find a way to reproduce the problem there is the option of writing tests with aberations, inserting debug outputs on the console into the source code or writing states into log files. This enables the programmer to find anomalys before, while and after running the program.

After being able to reproduce a problem to find the source of the problem there is the option of increasing the amount of debug outputs to confine the point in the code at which the error occurs.

For most programming languages there are tools to assist the programmer to narrow down the source of the bug with multiple methos.

One method is to enable the user to set breakpoints at which the programm pauses and he can inspect the values of the variables directly within the code and restart the programm to move to the next breakpoint or go through the single steps of the programm. By stepping through the code this way the point where the error occurs can be found.

Another way to simplify the task is to have the code throw an exception when unwanted behavior occurs and stop at this exception. By saving a stack of the calls which occured before the exception was trown the programmer can retrace in which lines of coude the error may be found.

//TODO ReverseDebugging

Problem with debugging of shaders in the graphics pipeline

Existing approach for compute shaders

Objective of creating a general solution for debuging shaders in the graphics pipeline

2 Related Work

Existing methods for debugging shaders in the graphics pipeline

Approaches for translating and simulating compute shaders

3 Contribution

Steps for simulating the graphics pipeline

Steps for translating the shader code

4 Implementation

5 Conclusion

Fazit ziehen über das Projekt und die Arbeit. Welche Erkenntnisse wurden gewonnen? Was hat gut/schlecht funktioniert? Wurden die eigenen Erwartungen erfüllt oder nicht? War das Projekt erfolgreich?

Acronyms

API	Application Programming Interface
BDSG	Bundesdatenschutzgesetz
CEP	Complex Event Processing
DEA	Deterministischer endlicher Automat
EDA	Event Driven Architecture
GB	Gigabyte
GFS	Google File System
HDFS	Hadoop Distributed File System
HTTP	Hypertext Transfer Protocol
IDE	Integrated Development Environment
IP	Internetprotokoll
KB	Kilobyte
LTS	Long Term Support
MB	Megabyte
MPI	Message Passing Interface
MRC	Map Reduce Class
NAS	Network Attached Storage
NEA	Nichtdeterministischer endlicher Automat
NFS	Network File System
OS	Operating System
OSDI	Operating Systems Design and Implementations
PAP	Programmablaufplan
PDF	Portable Document Format
POM	Project Object Model
RFC	Request for Comments
RSA	Rivest, Shamir und Adleman
SAN	Storage Attached Network
SPOF	Single Point of Failure
SSH	Secure Shell
TMG	Telemediengesetz
VM	Virtuelle Maschine

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Bibliography

Collins, Harper (2014). *Collins English Dictionary – Complete and Unabridged, 12th Edition*. URL: https://www.thefreedictionary.com/debugging (visited on 08/20/2019).

Appendix

A. Screenshot NameNode Web-Interface

B. DVD Inhalt

C. DVD

A. Screenshot NameNode Web-Interface

Hadoop   Overview   Datanodes   Datanode Volume Failures   Snapshot   Startup Progress   Utilities

Overview 'localhost:9000' (active)

Started:	Fri Jul 10 00:23:31 CEST 2015
Version:	2.7.0, rd4c8d4d4d203c934e8074b31289a28724c0842cf
Compiled:	2015-04-10T18:40Z by jenkins from (detached from d4c8d4d)
Cluster ID:	CID-322169a1-9f18-4284-9cfa-490bd79c1dd4
Block Pool ID:	BP-1249407956-127.0.1.1-1436480592942

Summary

Security is off.

Safemode is off.

1 files and directories, 0 blocks = 1 total filesystem object(s).

Heap Memory used 26.65 MB of 50.49 MB Heap Memory. Max Heap Memory is 966.69 MB.

Non Heap Memory used 30.99 MB of 32.25 MB Commited Non Heap Memory. Max Non Heap Memory is 214 MB.

Configured Capacity:	18.58 GB
DFS Used:	24 KB (0%)
Non DFS Used:	2.85 GB
DFS Remaining:	15.73 GB (84.67%)
Block Pool Used:	24 KB (0%)
DataNodes usages% (Min/Median/Max/stdDev):	0.00% / 0.00% / 0.00% / 0.00%
Live Nodes	1 (Decommissioned: 0)
Dead Nodes	0 (Decommissioned: 0)
Decommissioning Nodes	0
Total Datanode Volume Failures	0 (0 B)
Number of Under-Replicated Blocks	0
Number of Blocks Pending Deletion	0
Block Deletion Start Time	10.7.2015, 00:23:31

NameNode Journal Status

Current transaction ID: 1

Journal Manager	State
FileJournalManager(root=/tmp/hadoop-root/dfs/name)	EditLogFileOutputStream(/tmp/hadoop-root/dfs/name/current/edits_inprogress_0000000000000000001)

NameNode Storage

Storage Directory	Type	State
/tmp/hadoop-root/dfs/name	IMAGE_AND_EDITS	Active

Hadoop, 2014.

C. DVD Inhalt

⊢ **Anwendung/**
| – pom-xml   ⇒ *Maven POM Datei*
| ⊢ **conf/**   ⇒ **.properties Dateien für Konfiguration*
| ⊢ **src/**   ⇒ *Quellcode Dateien*
| ⊢ **target/**
| | – Logfileanalyzer-1.0-SNAPSHOT.jar   ⇒ *Ausführtbare JAR-Datei*
| | ⊢ **site/apidocs/**   ⇒ *JavaDoc für Browser*
|
⊢ **Literatur/**   ⇒ *PDF Literatur & E-Books*
⊢ **Praesentationen/**
| – Abschlusspraesentation.pptx   ⇒ *Präsentation vom 21. August 2015*
| – Abschlusspraesentation.pdf
| – Kickoffpraesentation.pptx   ⇒ *Präsentation vom 03. Juni 2015*
| – Kickoffpraesentation.pdf
|
⊢ **Sonstiges/**
| – LineareRegression.xlsx   ⇒ *Berechnung der linearen Regression*
|
⊢ **Latex-Files/**   ⇒ *Editierbare LaTeX Dateien der Arbeit*
| – bibliographie.bib   ⇒ *Literaturverzeichnis*
| – dokumentation.pdf   ⇒ *Bachelorarbeit als PDF*
| – dokumentation.tex   ⇒ *Hauptdokument*
| – einstellungen.tex   ⇒ *Einstellungen*
| ⊢ **ads/**   ⇒ *Header, Glosar, Abkürzungen, etc.*
| ⊢ **content/**   ⇒ *Kapitel*
| ⊢ **images/**   ⇒ *Bilder*
| ⊢ **lang/**   ⇒ *Sprachdateien für LaTeX Template*