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RAVENSBURG-WEINGARTEN
UNIVERSITY
OF APPLIED SCIENCES

Meins titel

Masterthesis

at the University of applied science Ravensburg-Weingarten

by

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Author's declaration

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ORT, Monat Jahr

_____

NAME

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)

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1 Introduction

My:

Fast and realistic hair rendering

- Why render hair?
  - Why not.
- What is to be expected in this work.
  - New approach for simulation (Tractrix)
  - New approach for rendering as B-Splines as particle basis.
  - Try to get it to 60 fps without to much optimization (as I dont have the expertise especially in Compute)

2 Related Work

Approaches:

- Hair structure/attributes:
  - Huge amount of geometry / Hair (100k strands)
  - Semi transparent
    - Stacked cones
    - Mostly opaque wall, but transparent core
  - Anti aliasing, because one hair is scudding thin
  - Flexible in rotation, but not stretchable
    - Can rotate really weirdly (See super helix paper)

    Fixed at one end (scalp)
- Mesh rendering
  - Only simple mesh as hair
  - Simple and basically no performance impact
  - Useful for simple/small avatars (MOBAs, RTS, ...)
  - Not useful for realistic hair (What I want)
- Realistic/Physical rendering
  - TressFx, HairWorks, NumaDemo, Frostbyte engine...
  - What they do generally, with some optimizations here and there
  - Overview: Simulation, Interpolation, Rendering
  - Simulation
    - Mass Spring systems:

- Particle systems connected by springs
- Needs multiple springs to make it realistic (curly etc.)
- Good: Performance is ok
- Bad: Hard to find spring constants / Hard to control
- Is used

* Super Helix simulation:
  - Very realistic
  - Performance not really good
  - Not used often because of performance
* Collision:
  - Hair2Hair and Hair2Body Collision
  - Is possible with particles
  - Different approaches
  - Sphere collisions at particles
  - Penalty forces or just raw displacements

– Interpolation:
  * Single strand Interpolation
  * Multi strand interpolation

– Rendering:
  * Geometry:
    - Lines:
    - Simple and efficient
    - Only one width per render call
    - Hair gets thinner from base to leading end
    - Does not look to realistic
    - Triangles:

- Have to be generated:
- In Vertex shader with dummy verticies.
- In Geometry shader with line strips.
- In Tesselation shader with line strips or triangles from geometry shader.
- If generated allow fine adjustments.

* Shading:
  - Realistic light models exist (I have the paper, but can´t remember right now)
  - Deep opacity maps

3 Contribution

Simulation:

- Tractrix simulation:
  - Explanation what it is
  - Benefits
    - Only math and little physics -> No search for spring constants
    - Rather straight forward O(n)
    - Possible to simulate B-Splines
      - Fewer points to simulate
  - My approaches:
    - Simple tractrix
    - Double tractrix (Forward + Backward)
    - Coupled with simple mass spring system
  - Evaluation

B-Spline structure:

- Fewer points for simulation
- How to manage collisions?
- How to render?
  - If no particles use ray tracing?
- Evaluation

4 Implementation

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```
# Create usergroup and user
sudo addgroup hadoop
sudo adduser -ingroup hadoop hduser

# login as hadoop user and create rsa key
su - hduser
ssh-keygen -t rsa -P ""

# add to authorized keys
cat $HOME/.ssh/id_rsa.pub >> $HOME/.ssh/authorized_keys

# Initial login on host via ssh
ssh localhost
```

Listing 4.1: Konfiguration des Hadoop Users

```
$ cd /usr/local
$ sudo wget http://apache.openmirror.de/hadoop/common/current
            /hadoop-2.7.1.tar.gz
$ sudo tar xfz hadoop-2.7.1.tar.gz
$ sudo mv hadoop-2.7.1 hadoop
$ sudo chown -R hduser:hadoop hadoop
```

Listing 4.2: Herunterladen und entpacke von Hadoop

```
# Java
export JAVA_HOME=/usr/lib/jvm/java-7-openjdk-amd64

# Hadoop
export HADOOP_INSTALL=/usr/local/hadoop
export PATH=$PATH:$HADOOP_INSTALL/bin
export PATH=$PATH:$HADOOP_INSTALL/sbin
export HADOOP_MAPRED_HOME=HADOOP_INSTALL
export HADOOP_COMMON_HOME=HADOOP_INSTALL
export HADOOP_HDFS_HOME=HADOOP_INSTALL
export HADOOP_YARN_HOME=HADOOP_INSTALL
```

Listing 4.3: Umgebungsvariablen für Hadoop

```
hduser@ubuntu-hadoop-vm:~$ hadoop version
Hadoop 2.7.0
Subversion https://git-wip-us.apache.org/repos/asf/hadoop.git -r d4c8d4d4d203c934e807
4b31289a28724c0842cf
Compiled by jenkins on 2015-04-10T18:40Z
Compiled with protoc 2.5.0
From source with checksum a9e90912c37a35c3195d23951fd18f
This command was run using /share/hadoop/common/hadoop-common-2.7.0.jar
hduser@ubuntu-hadoop-vm:~$
```

Figure 4.1: Ergebnis für die Kommandozeileneingabe *hadoop version*

```
<configuration>
  <property>
    <name>fs.defaultFS</name>
    <value>hdfs://localhost:9000</value>
  </property>
</configuration>
```

Listing 4.4: Konfiguration in der core-site.xml

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

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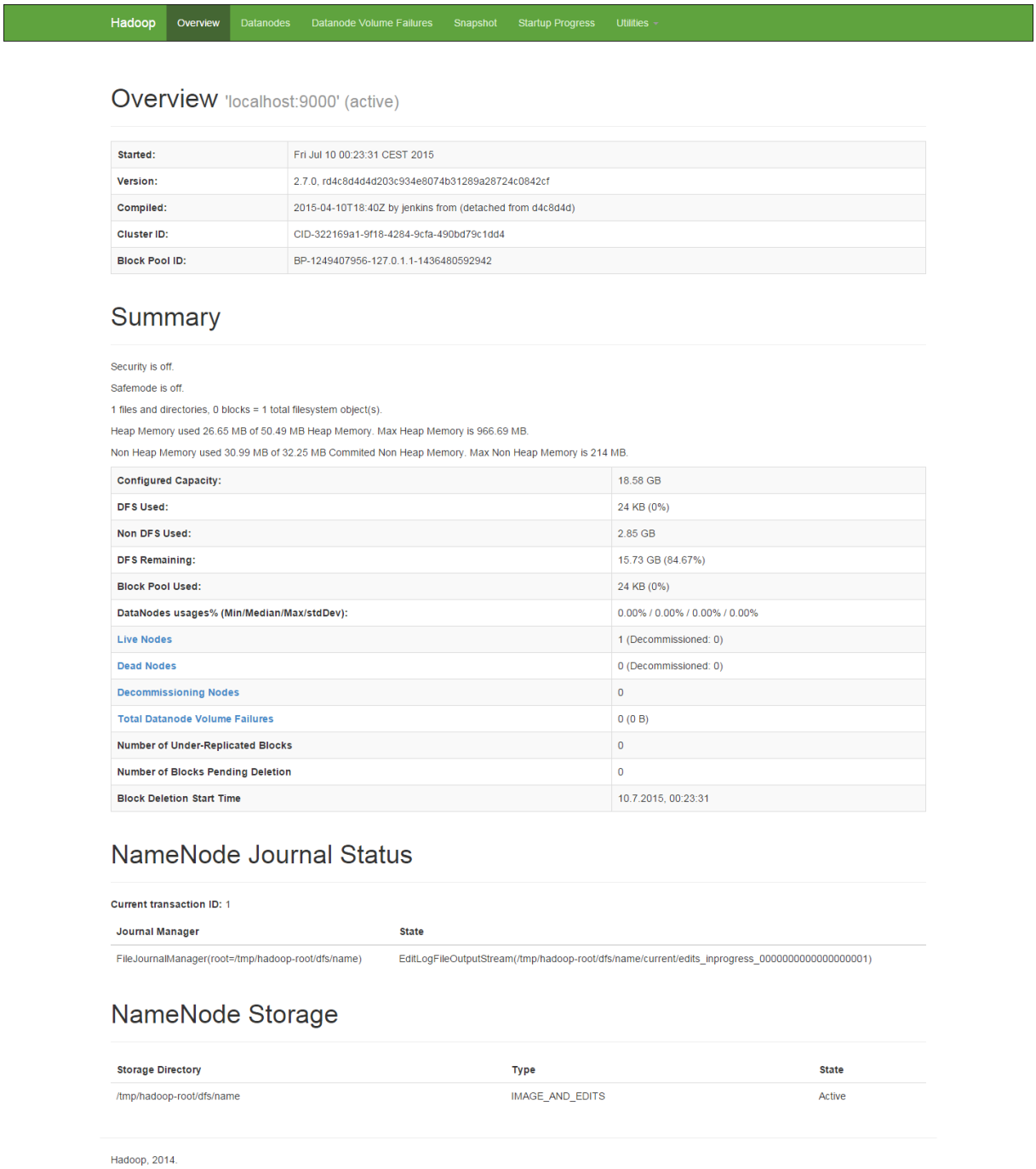
A. Screenshot NameNode Web-Interface



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
```