DEPARTMENT OF INFORMATICS

TECHNISCHE UNIVERSITÄT MÜNCHEN

Thesis type (Bachelor's Thesis in Informatics...)

Evaluation of Scene Representation Networks for Streamline Integration

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Evaluierung von Scene Representation Networks für Streamline Integration

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I confirm that this thesis type (bachelor's thesis in informatics...) is my own work and I have documented all sources and material used.

Munich, 15.02.2022 Alexander Fuchs

Acknowledgments

Abstract

Contents

1 Introduction

General Usage of SRNs reduce data, slightly decrease performance interpolation between frames (superresolution) => useful for vector fields requirements of flow fields: preserve not just individual points but the main defining stream features *cit Streamlines encapsulate the information to reconstruct a flow field Specific goal of the thesis: prior implementation of SRN exists: => good results already (lower data usage, decent quality) evaluate prior results on streamlines using l2, bof train a network on streamlines and see how it goes

2 Related Work

About related works on: SRNs in general: where have they been used? different approaches? vector fields: what are they generally used for Streamline Similarity: different options for streamline similarity (used for culling as well)

3 Streamline Integration

streamline vs streakline vs pathline what is used in the following (eval vs network)

3.1 General Methodology

Seed initial points: Generate next set of points repeat result is Tensor of Shape x

3.2 Seeding Strategy

different strategies to capture more "interesting" parts of the field good coverage

3.2.1 Uniform Random

even coverage can have many points in less "interesting" regions

3.2.2 Uniform Deterministic

guaranteed very even coverage even with few points good for testing

3.2.3 Importance Sampling using local Entropy

How is Entropy calculated here?: Sphere of equal regions neighborhood size Use vector length or not? Rejection Sampling intensity min probability uneven coverage, focus on "important" regions

3.2.4 Comparison

On Speed and Accuracy

3.3 Integration Methods

3.3.1 Euler-Integration

procedure no additional samples needed

3.3.2 Runge-Kutta

some additional samples error is O()

3.3.3 Runge-Kutta-Fehlberg

adaptive stepsize more accurate requires higher number of samples individual? similarity might suffer under adaptive stepsize

4 Streamline Similarity

4.1 Prior Considerations

Masking, Time-relation (streamline vs pathline), adaptive stepsize

4.2 L2-Distance

Procedure, Limitations (stepsize, length, mask) decent since comparing streamlines with same start location

4.3 Bag-Of-Features

instead of distance generate a set of features for each point on the streamline compare these using clustered representative feature vectors

4.3.1 Choice of Features

4.3.2 Spatially Sensitive Bag-of-Features

4.4 Comparison

On Speed and Accuracy (Look up Error estimation)

5 Evaluation of the existing SRN

typically psnr or ssim we use streamline similarity show difference between the methods

5.1 Comparison of Network against

6 Results

6.1 Section

Citation test [Lam94].

6.1.1 Subsection

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Bibliography

[Lam94] L. Lamport. *LaTeX : A Documentation Preparation System User's Guide and Reference Manual*. Addison-Wesley Professional, 1994.