Poster checklist

This checklist shall help you to create the poster for the summer school of the graduate program Explorative Analysis and Visualization of Large Information Spaces.

Each invited master student is asked to prepare a poster and a short presentation (2-3 minutes) about his final thesis.

Basics

- The poster must be formatted in A0
- Accepted file formats: PDF (strongly recommend), PNG and JPG
- Final submission deadline 9. September 2010
- Please send your poster per Email to iris.adae@uni-konstanz.de (We will print and bring it to the summer school.)
- We are going to have a small pre poster introduction round. In this, each student has 2-3 Minutes to give a hint about his posters. You can use a maximum of two slides for this mini presentation. Don't forget to introduce yourself (name, origin, university)
- Send the slides before the summer school to iris.adae@uni-konstanz.de

Content

- Describe the idea (and results) of your master thesis
- Your name and the names of all others who worked together with you on your thesis
- Optional: Acknowledgements, the institution (e.g. the university)

- Your poster has two main tasks
  01 Give people who walk by your poster a basic impression what your work is about
  02 Help you explain people your work in detail
- It should contain as little text as possible to explain your idea.
- Use pictures (overviews, workflows, examples,...) to underline your idea. Pictures don't need to be described in full detail, it can be more briefly explained during the session

Tools

- Latex (e.g. the beamer package)
- Inkscape (Free tool for generating vector graphics)

Examples

Attached you find the posters of the last year winners of our Best-Poster-Contest. Many thanks to Joselene Marques , Britta Weber and Denise Hippler for creating such good posters and allowing us to publish them as examples.

If you have any further questions, don't hesitate to contact me(Iris).

Dimensionality Reduction and Relevance Feedback: Powerful Techniques on CBIR Systems

Joselene Marques
University of Sao Paulo - Brazil

CBIR (Contend-based Image Retrieval)

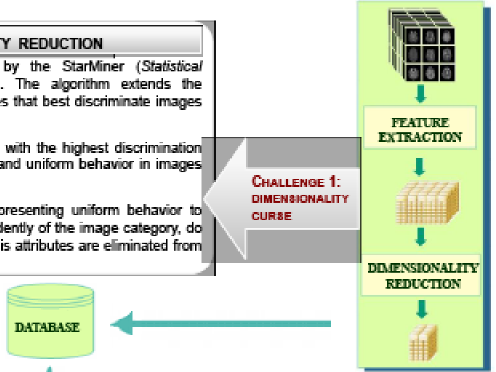
CBIR techniques work on the whole information embodied into an image. **Feature Extraction** techniques (image processing algorithms) are used to extract relevant characteristics (such as color, shape and texture) from the images, organizing them in feature vectors. These vectors are employed in place of the images allowing fast and efficient indexing and retrieval. The approach presented here attack two challenges in CBIR systems: the high dimensionality of feature vectors and the semantic gap.

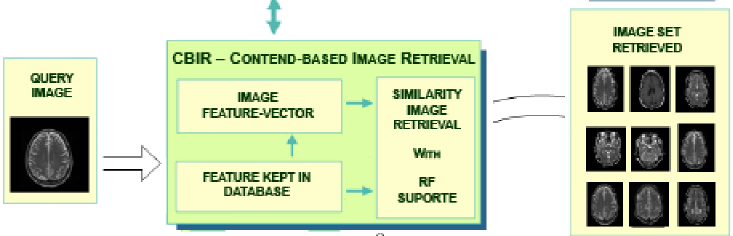
1 Dimensionality Reduction

The first challenge was tackled by the StarMiner (*Statistical Association Rule Miner*) algorithm. The algorithm extends the statistical rule mining to find attributes that best discriminate images into categorical classes.

The algorithm identifies the features with the highest discrimination power, since they have a particular and uniform behavior in images of a given category.

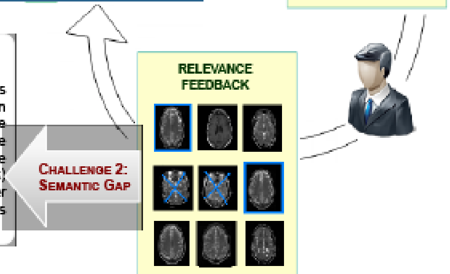
On the other hand, the attributes presenting uniform behavior to every image in the dataset, independently of the image category, do not contribute to categorize them. This attributes are eliminated from the vector feature.





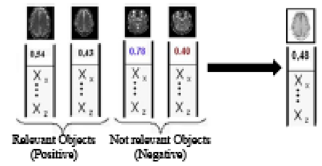
2 Relevance Feedback

The inconsistence between low level features and the high level user interpretation generates different perceptions of image similarity, which is called *semantic gap*. The second challenge was dealt with using the proposed RF (Relevance Feedback) techniques. The RF approach asks the user to quantify the relevance of the images retrieved by a query.



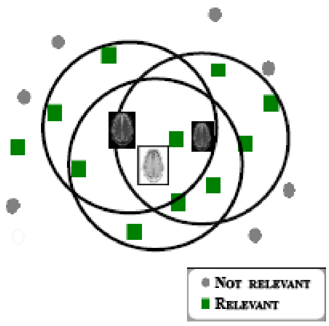
RF Projection

The algorithm analyzes each attribute from the feature vector separately, classifying them into a "relevance rule". This process generate an additional image (phantom), which is used in the new query process.



RF Multiple Point Projection

The algorithm process a new query centered at each image selected as relevant (Ri) and the phantom generated employing the RF Projection. Thus, if there were r objects selected as relevant, we will have r+1 query centers.



To arrange the results, the distance between the resulting object set *Oi to the* corresponding query center (*Ri or the phantom*) is computed. The objects with the smaller combined distance are returned as the result of the query.

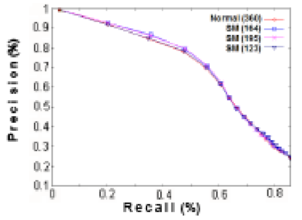
$O_1 = \{O_{11}, O_{12} \dots O_{1(K+S)}\}$

$O_2 = \{O_{21}, O_{22} \dots O_{2(K+S)}\}$

$O_{r+1} = \{O_{(r+1)1}, O_{(r+1)2} \dots O_{(r+1)(K+S)}\}$

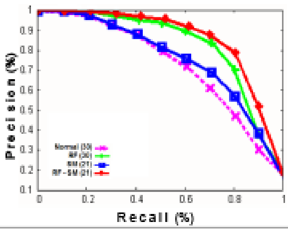
Experiment 1 – Dimensionality Reduction using StarMiner

For this experiment, we used a database of 704 medical images. The StarMiner algorithm was applied to the original vector "Normal (360)". Note that the reduced vectors establish better results than the original vector.



Experiment 2 – Dimensionality Reduction with RF Multiple Point Projection

For this experiment, it was used an image dataset consists of 210 medical images. The StarMiner algorithm, applied to the original vector, reduced the vector in 30%. Three RF iterations were executed.



Conclusion

The results presented here show that the combination of dimensionality reduction and relevance feedback can bring significant improvements in the effectiveness of CBIR systems.

Gaschurn, Austria
September/2009

CNPq

Britta Weber

Segmentation of Microtubules from Electron Tomograms

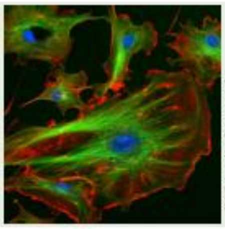
B. Weber, V. J. Dercksen, D. Günther, S. Prohaska, H.-C. Hege

Cooperation: Anthony Hyman, Quentin de Robillard (MPI-CBG)
Funding: Max Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG), Dresden

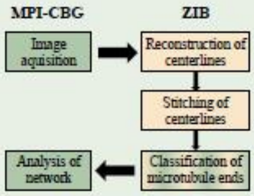
Understanding Microtubules In-Vivo

The project goal is to analyze microtubules in cells. Microtubules are tubular macro-molecules that play an important role in cell division and vesicle transport in the cell. Our next aim is to automate the extraction of centerlines from multiple electron tomograms.

Cytoskeleton of cells with nuclei (blue), actin filaments (red) and microtubules (green).



[Wikimedia Commons]

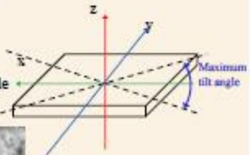


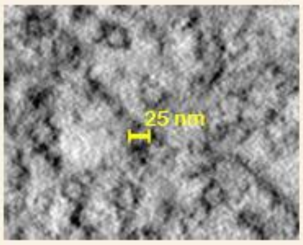
Electron Tomography

Electron tomograms of cells are acquired at a voxel size of 1.2 nm and an extension of 0.2µm x 2.1µm x 2.1µm.

Image characteristics

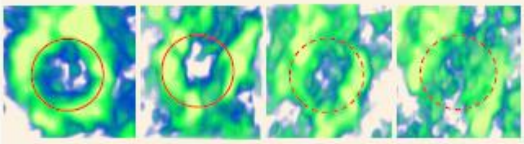
- Low signal-to-noise ratio
- *Missing wedge*, due to limited tilt angle
- Mixed structures in images





Above: Specimen cannot be rotated fully around the x- or y-axis. The limited tilt angle results in a reconstruction artifact called the *missing wedge*.

Above: Electron tomogram with microtubules. Yellow label indicates the cross section of one microtubule.



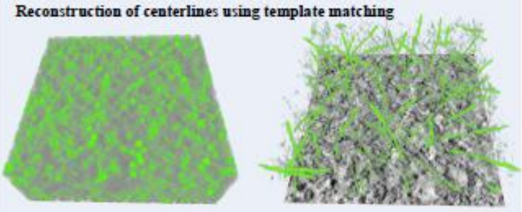
Volume rendering of cross sections through microtubules. While the leftmost microtubule appears as a tube in the tomogram, the other images illustrate the effect of the *missing wedge* artifact. Parts of the tubes are *missing*.

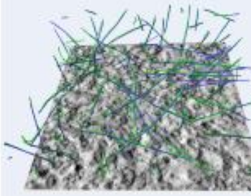
Future work

- **Improve template matching**
- **Semi automatic tracing**

Reconstruction and Stitching

Reconstruction of centerlines using template matching





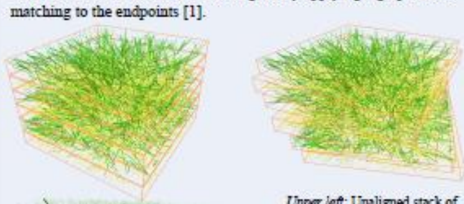
Upper left: Volume rendering of original volume

Upper right: Volume rendering of correlation function

Left: Comparison of manually segmented centerlines (blue) and automatically traced centerlines (green)

Alignment of microtubule stacks

Stacks of traced microtubules are aligned by applying a graph based matching to the endpoints [1].



Upper left: Unaligned stack of microtubules (manually segmented)

Upper right: Aligned stack

Left: aligned stack with microtubules (green) and borderlines of the centrosome (blue)

Publications

[1] V.J. Dercksen, B. Weber, D. Günther, M. Oberlaender, S. Prohaska, H.-C. Hege: Automatic alignment of stacks of filament data, *Proc. IEEE International Symposium on Biomedical Imageprocessing, 2009.*

Denise Hippler

Virtual News Presenter

D. Hippler, J. M. De Martino

UNICAMP

Introduction

Virtual agents that reproduce the mechanisms of human face-to-face communication are a promising option for human-computer interface development.

The present research aims to develop a virtual presenter able to present information orally.

Possible roles of a virtual presenter are, among others, guide, tutor, instructor, spokeperson, news presenter and announcer.

Our virtual presenter is an anthropomorfic 3D graphics character that presents information in an emotionless way using verbal and non-verbal communication channels.

Verbal :
* Speech
* Speech-synchronized visible articulatory movements

Non-verbal:
* Blink * Squint * Eye movements
* Head movements * Eyebrow movements

Proposed Method

Virtual character animation control:
* Script: full control of the character, but can be cumbersome.
* Behavior model: reduces the burden of script specification.

Script

Timed phonetic transcription

Non-verbal movements defined by tags

Example:

```
/ 21375
<RotNeck neckAngX="15" neckAngY="0.0" neckAngZ="0.0" sinc="9">
<Squint sinc ="9">
p 1011 a 1809 i 1932 e 3433 S 7281 t 936 i 1962 n 1962 U 3403 S 3618
i 3005 S 3649 r 1686 a 3219 e 2085 I 3556 eN 5672 s 4506 I 1110 S 3587
</Squint>
</RotNeck>
<Brows intensity="1.0" sinc="2">
eN 9780 t 1778 R 1318 AN 3342 U 1932
</Brows>
<RotNeck neckAngX="-10" neckAngY="0.0" neckAngZ="10" sinc="8">
n 1349 u 3280 o 2115 I 5917 t 1840 a 6009 v 3955 U 4108 d 3434 i 2882 A 2759
d 1533 i 2303 o 3127 f 3740 eN 4691 s 6254 i 7849 v 3617 A 4354
</RotNeck>
/ 6101
```

Behavior model

Implemented behavior of a real news presenter so far:

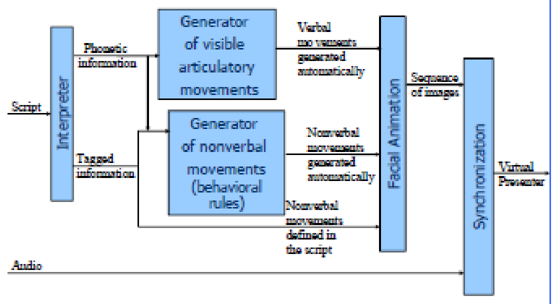
Blink rate: One blink every 46 frames (average rate).

Head movement:

- Eyes move to keep the gaze at the same point when the head moves.
- End of a presentation is reinforced with a head nod.
- In order to increase the amount of head movement during presentation, head nods are randomly triggered.

The current system can be easily extended by adding new facial movements to the repertoire, allowing emotional expression for the definition of different behaviors.

System Overview



Evaluation

5 Situations (10 different news each)

-Real Presenter
-Virtual Presenter
-Virtual Presenter uncoordinated movements
-Virtual Presenter no movements
-Audio only

3 Tests

How natural ?
Memory: 5 keywords
Comprehension: 3 questions

(40 Subjects)

Results

How natural ?

Real Presenter (best)
Virtual Presenter
Virtual Presenter no movements
Virtual Presenter uncoordinated movements (worse)

Memory: 5 keywords — No difference

Comprehension: 3 questions — No difference

Conclusions and Perspectives

Measured behavior patterns are an interesting way to complement scripted movements. That way the presenter is also driven by posture rules when following a script.

The evaluation results indicate that visualization of the speaker does not affect (does not help, but also does not harm) memorization.

The results also indicate that badly placed non-verbal movements are perceived as more unnatural than no movements at all.

Acknowledgments