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Usage of Voxels in Imagery Methods

Proseminar

Roboter & Aktivmedien

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Introduction

Usage of Voxels in Imagery Methods

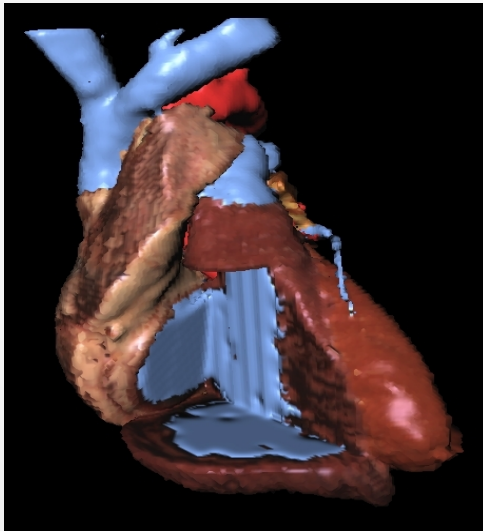Capturing an object and visually represent it in smallest parts

Voxel and images

- We see voxels all the time

- Everybody knows and uses Imagery Methods in everyday situations

Magnetic resonance spectroscopy

- Usage of voxels in MRS

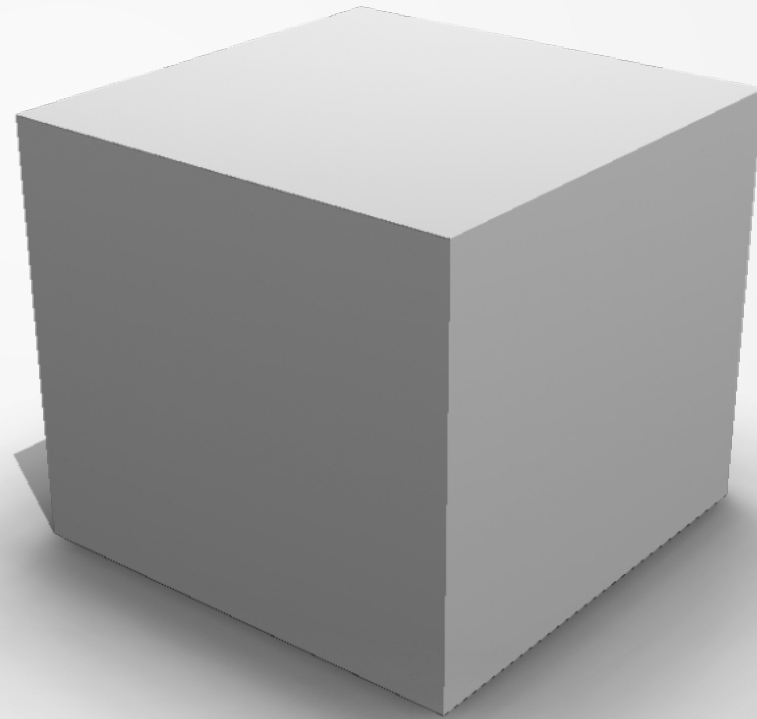- MRS works with RF- Pulses (Radio Frequency- Pulses)

Definition Imagery Methods

- Generates an image of metrics from a real object

- Used in medical fields, entertainment, military, science...
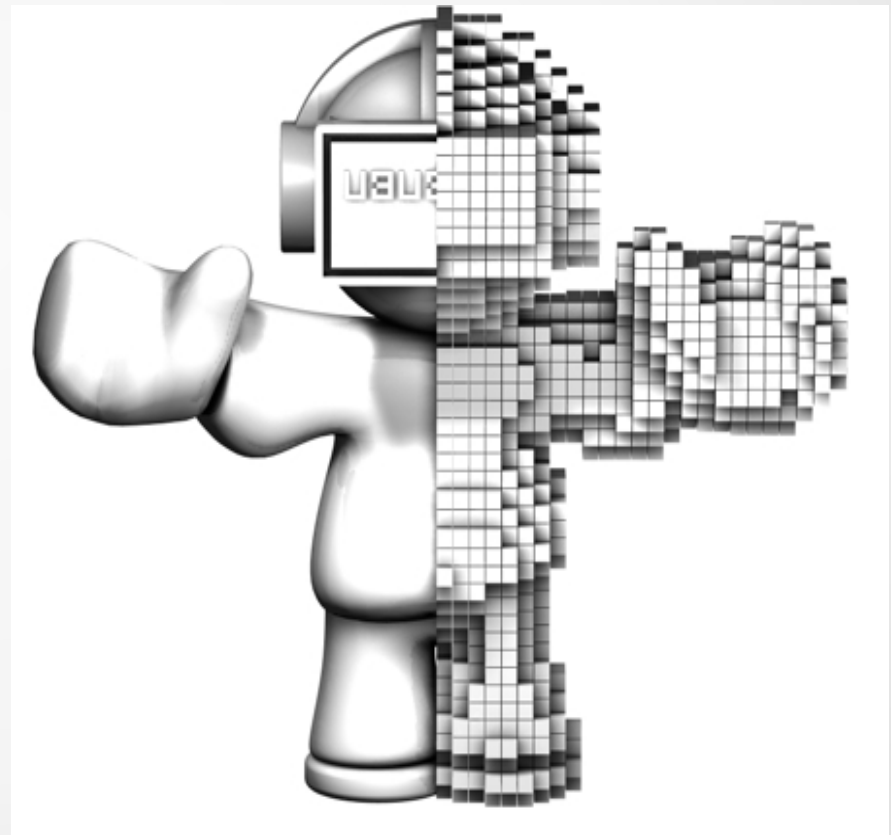
Definition Voxel

- A Voxel is a 3D **Vo**lumetric pi**xel**

- Used in animated movies and computergames
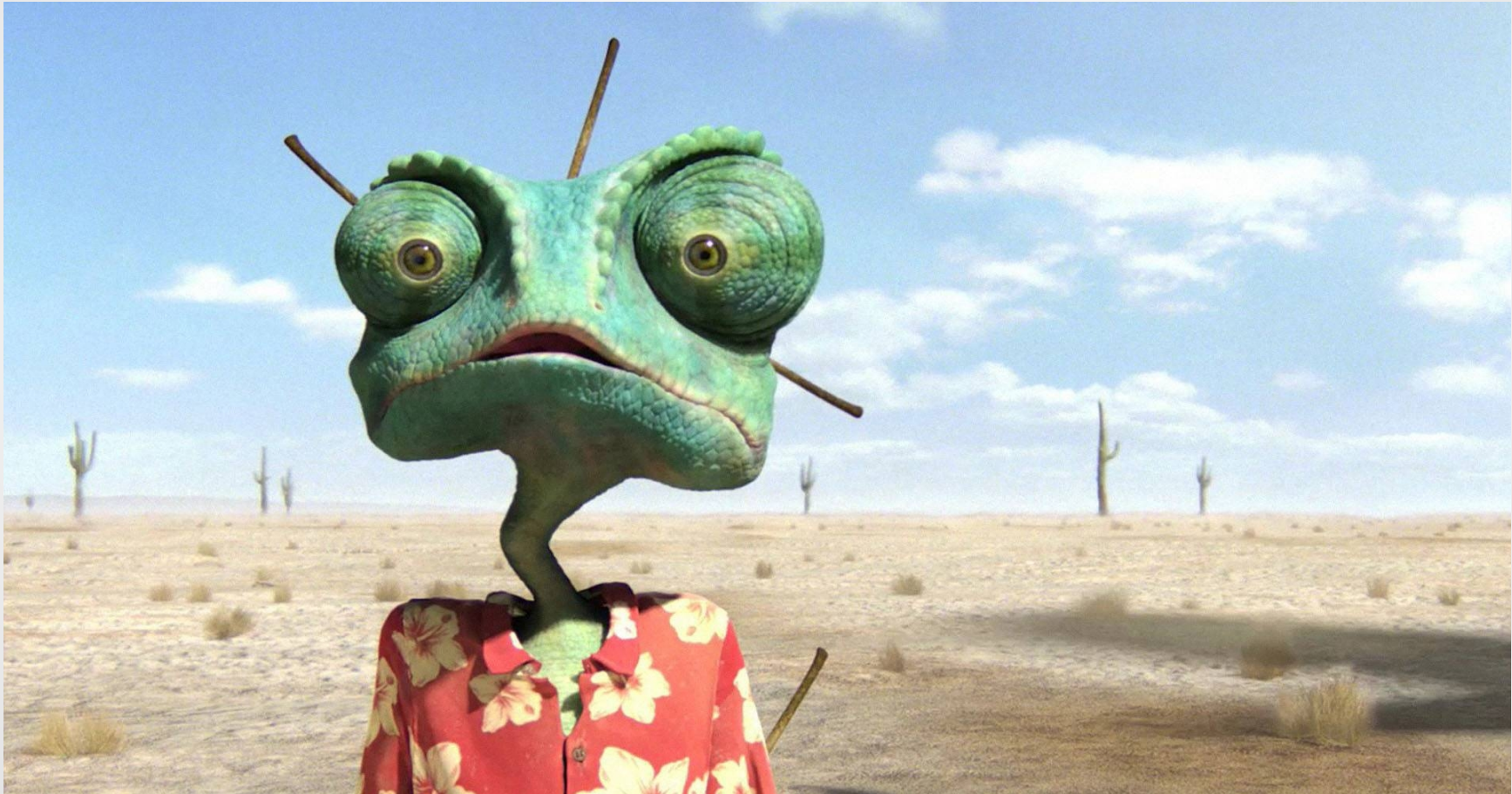
- **Not** based on polygons

Definition Voxel

„A voxel is the three-dimensional equivalent of a pixel - A box, rather than a point, in space that has a volume. Imagine taking an object and then decomposing into cubes, all of the same size. Or, if you'd prefer, building an object out of LEGOs or in Minecraft, much like a cubist painting."

From „Hacking the Kinect"

Definition Voxel

Paper

Localized Single-Voxel Magnetic Resonance
Spectroscopy, Water Suppression, and Novel Approaches for
Ultrashort Echo-Time Measurements

- Release: 2014

- Autors: Hongxia Lei, Lijing Xin, Rolf Gruetter and Vladimir Mlynarik

- Instituts: University of Geneva
  Center for Biomedical Imaging (CIBM)

  University of Lausanne
  Laboratory of Functional and Metabolic Imaging (LIFMET)

Statement of the problems

- How to get the Volume Of Interest (VOD) of an organ inside a body?

- How to handle water, lipids, bones etc.?

- Pros and cons of different localization schemes
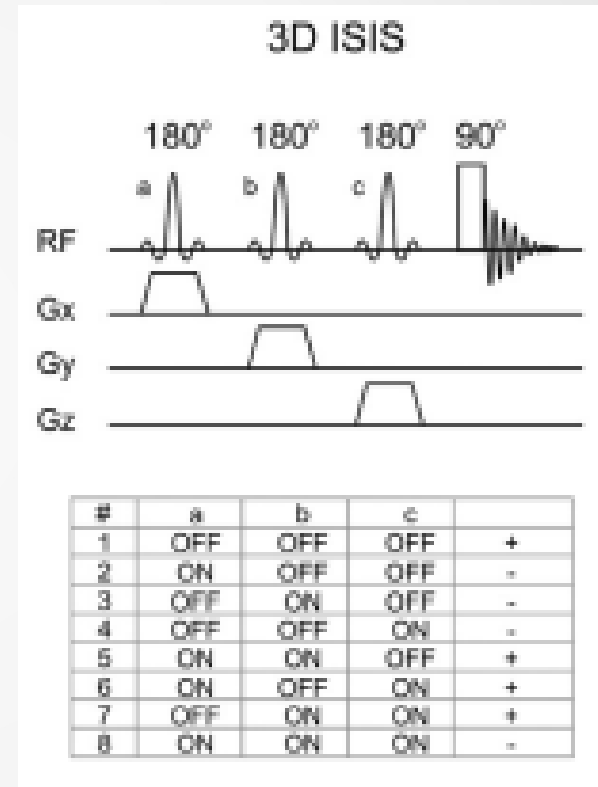
Solution approaches

Solution approaches

- Different procedures with the same hardware

- Slice-Selective 90° / 180° Pulses

- Methods to minimize confounding factors:

    - CHESS, STEAM, WEFT, MEGA, WATERGATE, SPECIAL

- OVS elimininates signals outside the VOI with RF-suppression

ISIS localisation

For locating a VOI **two** scans are **required**:

1. The free induction decay (FID) is obtained with all the spins in the volume having the same phase

2. The FID is acquired in the same way except that spins in the target slice are first inverted using a slice- selective 180° pulse

- When the two FIDs are subtracted, only signals from the target slice remains

- ISIS localisation requires a minimum number of eight scans for the volume localization

3D ISIS

#	a	b	c	
1	OFF	OFF	OFF	+
2	ON	OFF	OFF	-
3	OFF	ON	OFF	-
4	OFF	OFF	ON	-
5	ON	ON	OFF	+
6	ON	OFF	ON	+
7	OFF	ON	ON	+
8	ON	ON	ON	-

Compared Solutions

- Localization schemes have different demands to work best

- It is possibel to get 3D images with MRS

- Higher levels of RF- Pulses give better images

Round of questions

Discussion

The Kinect can handle voxel – Can robots use voxel for visual perception in a real environment?