MaZda

- WHERE WE ARE - WHERE WE ARE GOING

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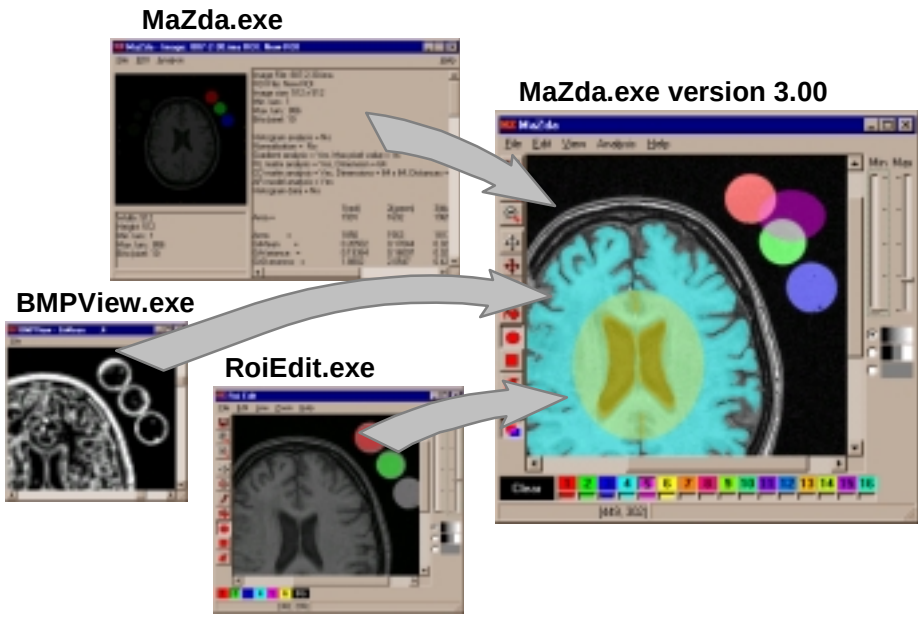
What is MaZda

- Software for computation of textural features within grey-scale images (mostly biomedical images, runs under 32-bit Windows systems, written in C++)
- Why MaZda? - MaZda stands for *Ma*cierz *Zda*rzeń, what means Cooccurrence Matrix (first implemented method of texture computation) in Polish
- Implemented methods:
  - histogram statistics
  - cooccurrence matrix features
  - runlength matrix features
  - gradient analysis
  - autoregression model parameters
- Analysis pathways:
  - computation of features within regions of interest (ROI)
  - filtration-like image processing (sliding mask)

History

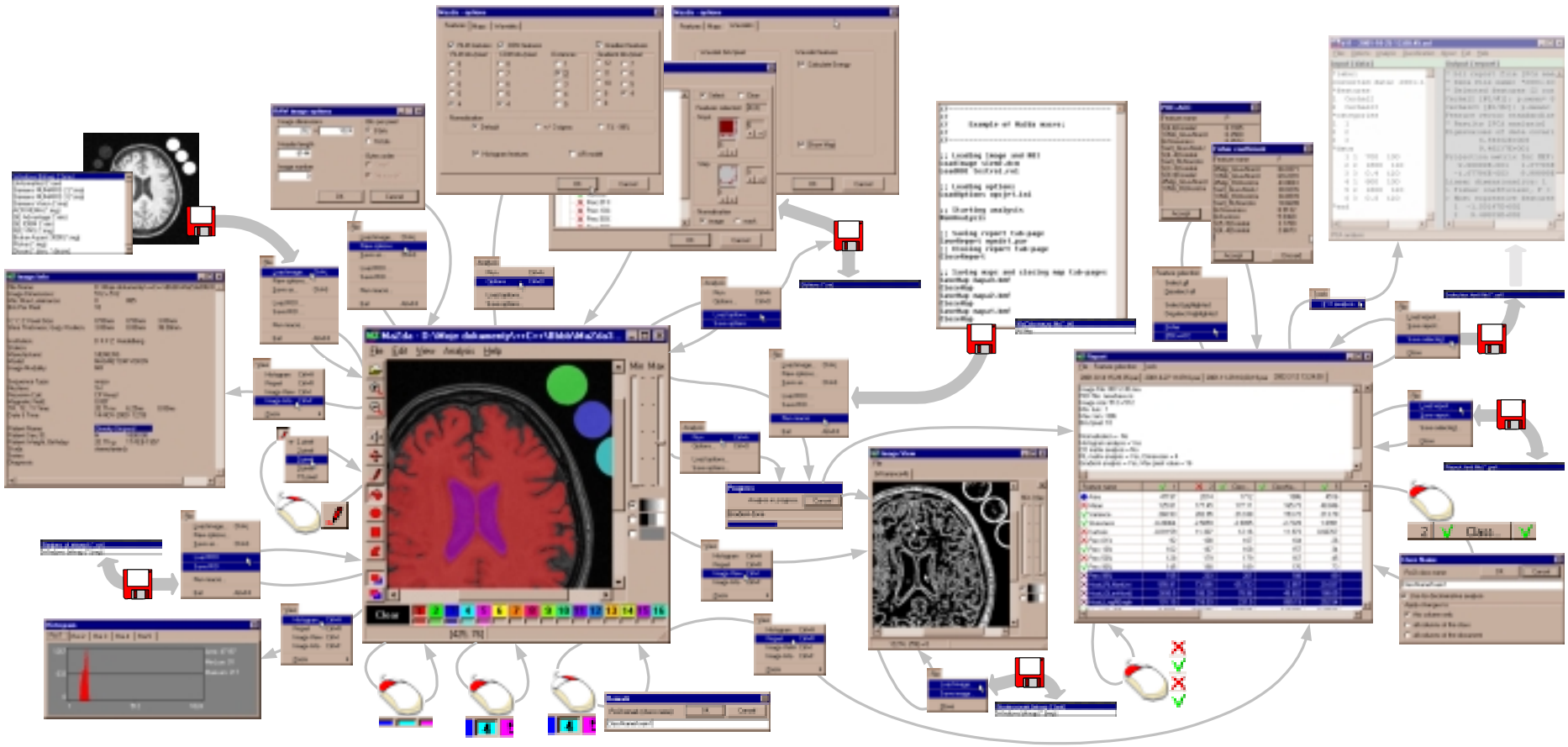
- Mammogram analysis software (1996-1997)
- Implementation of computational methods existing in *MRI-Win* and implementation of various formats image loader from *MRI-Win* (Heidelberg 1998)
- Addition of autoregression model and image normalization procedure (1999, so called version 2.xx)



- Merging MaZda, Convert (preselection of meaningful features) filtered maps viewer and ROI editor + user interface facelifting (2000-2001, version 3.xx)
- Analysis automation (2001-2002)
- Wavelet analysis (by Marcin Kociołek 2000-2002)

Where we are now

MaZda - version 3+



Where we are going

MaZda is very good program...
but:

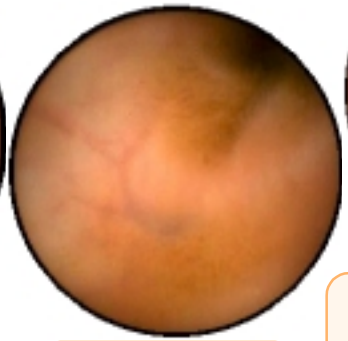
- Grey-scale is not enough
- Texture analysis is not enough
- 2D image analysis is not enough
- Static image analysis is not enough
- Loaded image formats - not enough
- Selection and classification methods - not enough
- Windows version - not enough

Grey-scale is not enough

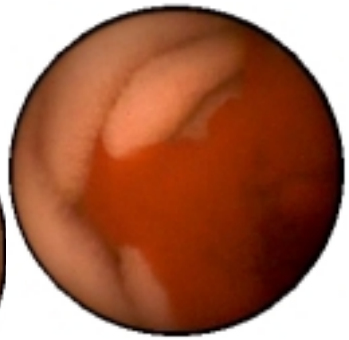
COLOR IMAGE ANALYSIS

Distal body-antral region of stomach

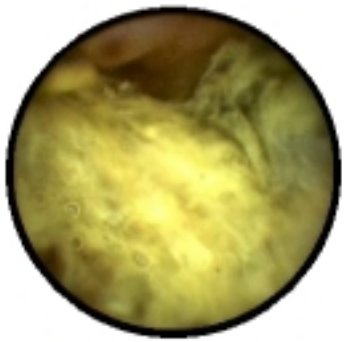
Jejunum



Ileum



Area of active bleeding

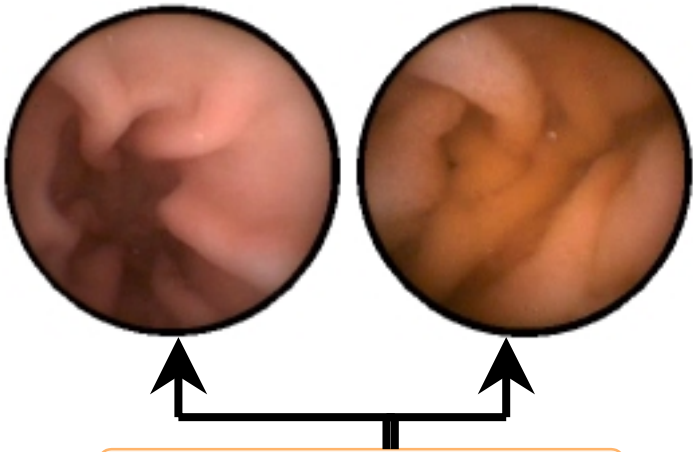


Partially digested intestinal content

RGB is not enough:

- **Registration of (MRI) scans taken with various procedures**
- **Image analysis with n “color” components (every pixel is defined by n-dimensional vector of components)**

Texture analysis is not enough



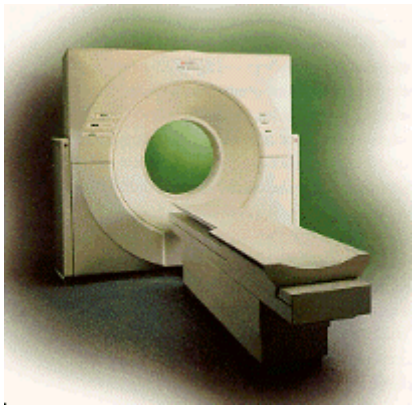
Need for analysis of:

- **Structure**
- **Shape**
- **Resemblance**

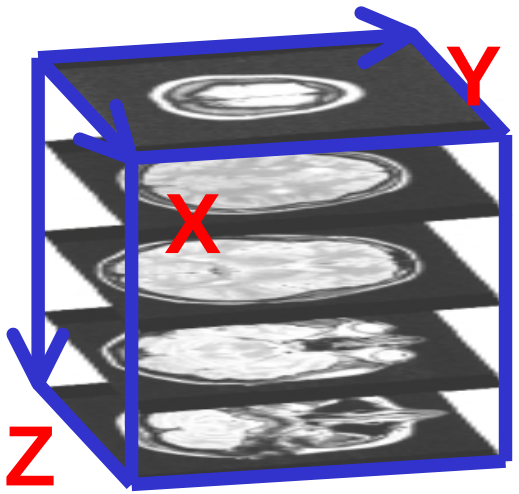
- **Template matching?**

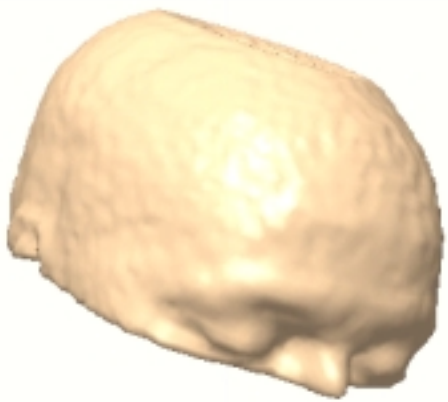
2D image analysis is not enough

3D space



3D imaging or scanning





3D segmentation
& volume of interest (VOI)
editing

- To compute 3D texture
- To make some volumetric measurements

Static image analysis is not enough

Video analysis

- Interpretation of video (e.g.WCE) is a tedious process of viewing and searching for abnormalities
- It requires a high level of concentration, so as not to miss lesions that might be present in only few frames

- Analysis of video frames as separate images (possible with MaZda) can cause missing of information that may be found only by comparison of consecutive frames
- Need for a motion analysis

New selection and classification methods

- Selection:
  - mutual information procedure
- Classification:
- supplement vector matching (clusterization)

Windows is not enough

- Version for Unix systems
  - MaZda can be used under Linux with WINE (WIne is Not an Emulator)
  - Our group cannot focus on the “MaZda for Unix” job
  - We can offer limited help to some other group wishing to proceed with “MaZda for Unix” project
- Java implementation
  - Some analysis with MaZda takes hours (textural analysis with sliding mask or processing a set of images)
  - Since Java language is interpreted (Java binaries is not a machine code), the Java program may be 10x - 20x slower than similar written in C/C++
- Shareware, freeware, open project?

MaZda - modular approach & plugins

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