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Vision and Robot Projects at Óbuda University

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Introduction - Program Goals

- Practical areas of AI (image processing, computer vision, robotics) are been teaching & research curricula since 1989 in our institute

- The goal of our program:
to teach the theoretical knowledge needed to design and develop applications with special emphasis on improving the skills needed to conduct independent development work

Lecture Courses

- Specialization in Information technology, Automation and Robotics (IAR)
  - Compulsory courses:
    image processing, machine vision, 3D modeling, …, robotics, programming, …
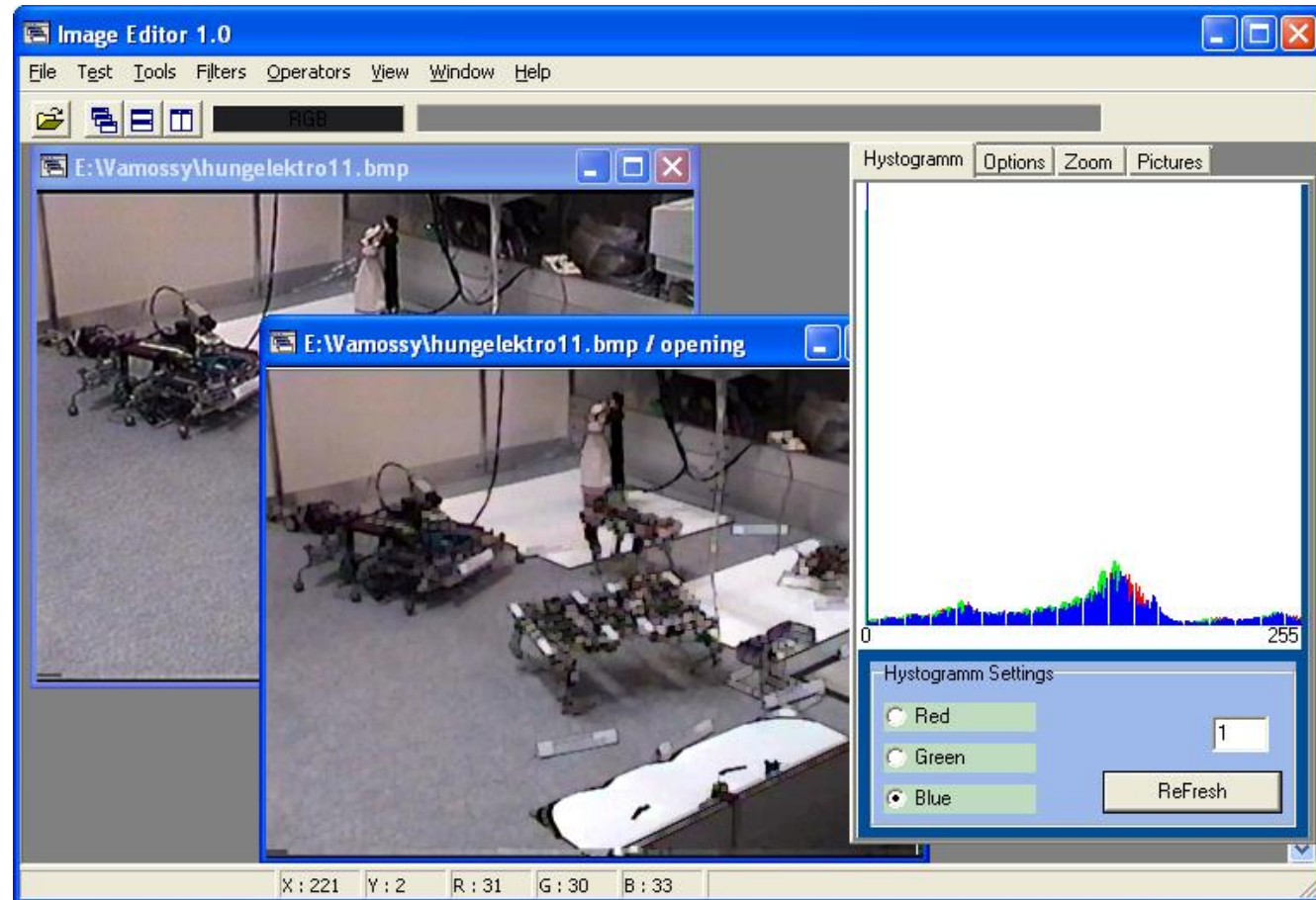 - R&D lab:

    team based projects during three semesters

IAR		semester			
	Topic	5.	6.	7.	hours
1.	Fundamental of computer vision and 3D modeling	301 f			60
2.	Developer environments (MATLAB, LABVIEW)	002 f			30
3.	Machine Vision		202 v		60
4.	R&D lab. I		001 f		15
5.	Mobile robotics and robot vision			200 v	30
6.	R&D lab. II			001 f	15

Lot of programming tasks

Image processing task

- Functionality

- Speed

Organization of the Lab "R&D"

- First semester
  - Acquainting with the basic tools that are at disposal
  - Study the literature, detailed system design
- Second semester
  - Implementation of the ß version
  - Conference paper, internet home page
  - "Miniconference "
- Third semester
  - Test and final version
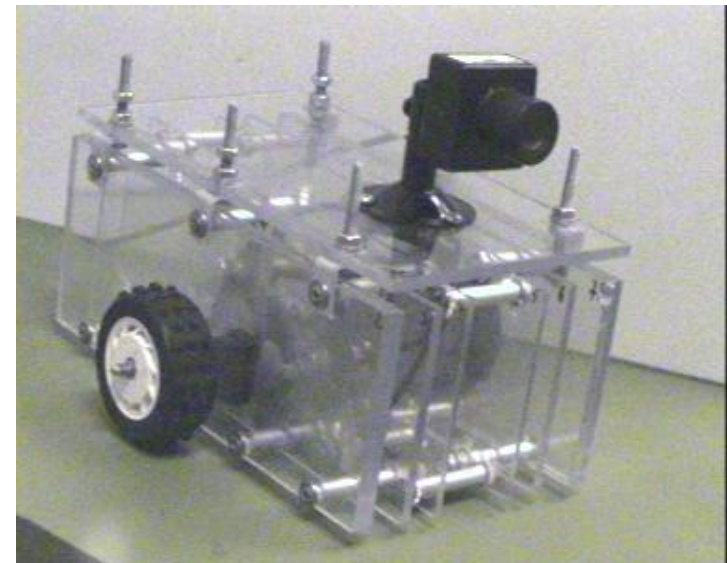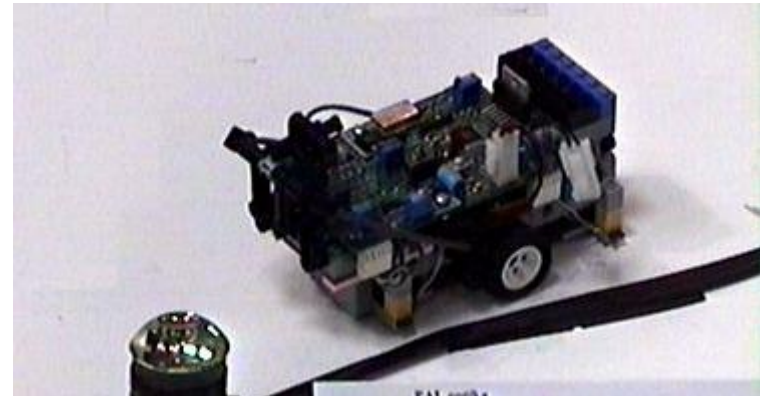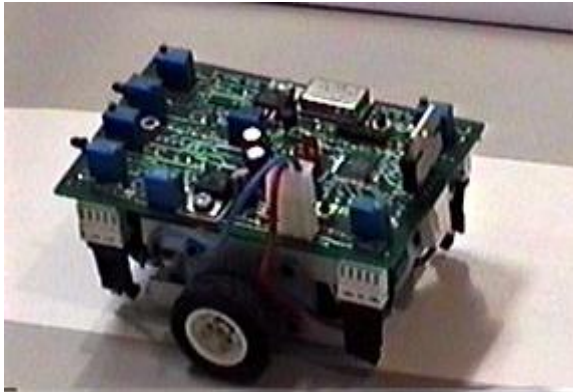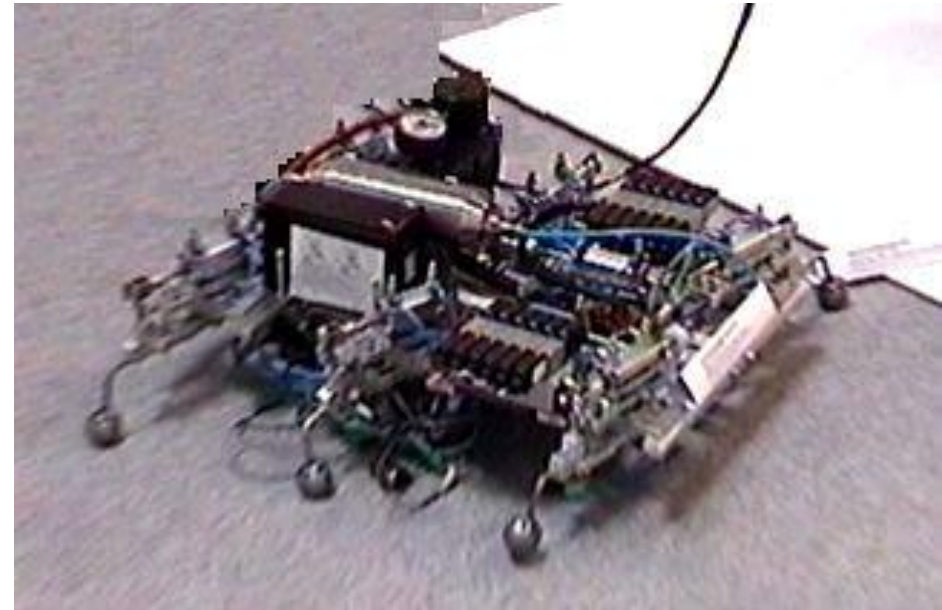 - "Miniconference "
  - Dissertation

Robotised system
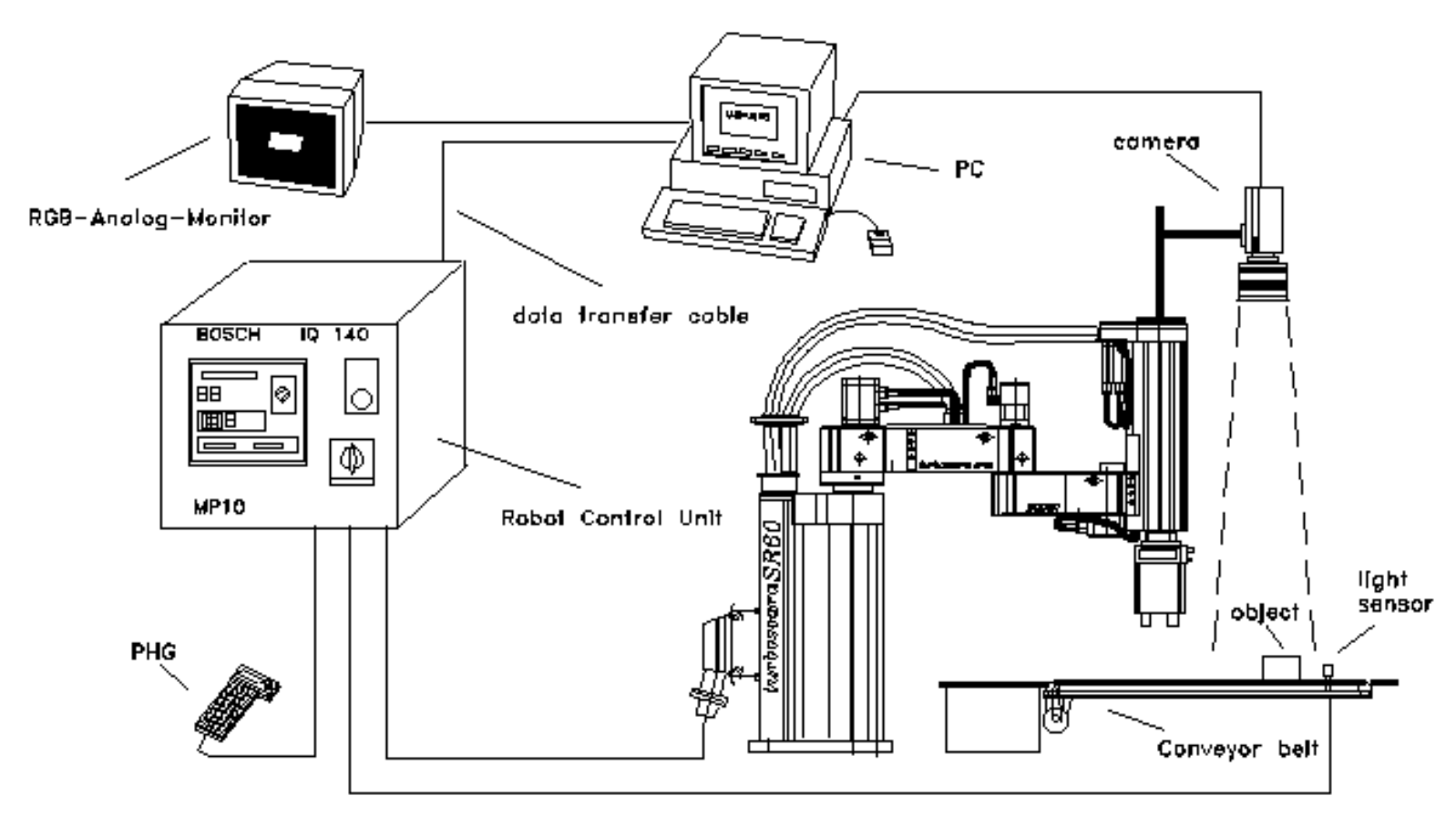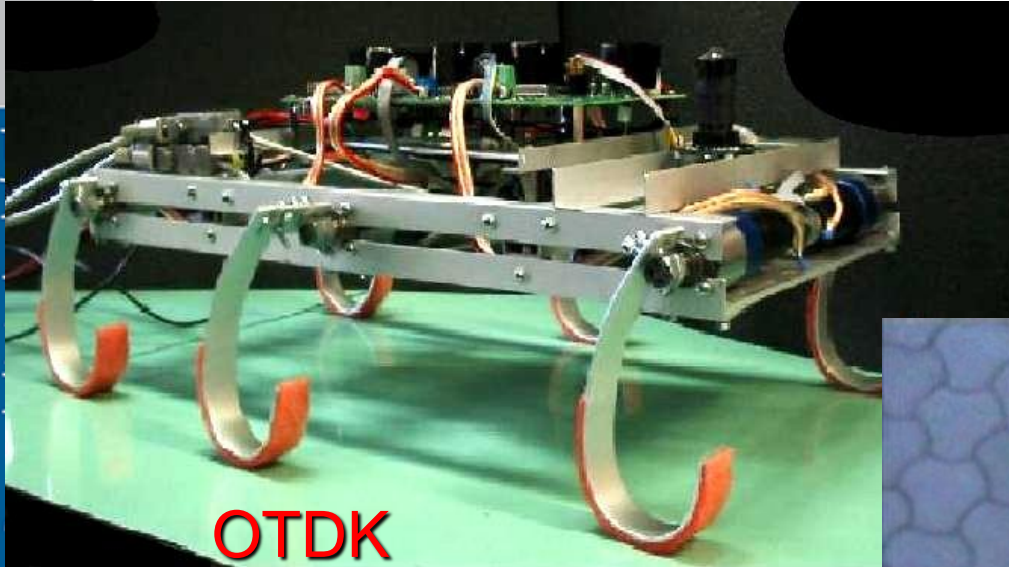
Wheeled mobile robots

Walking robots

OTDK I. 1999
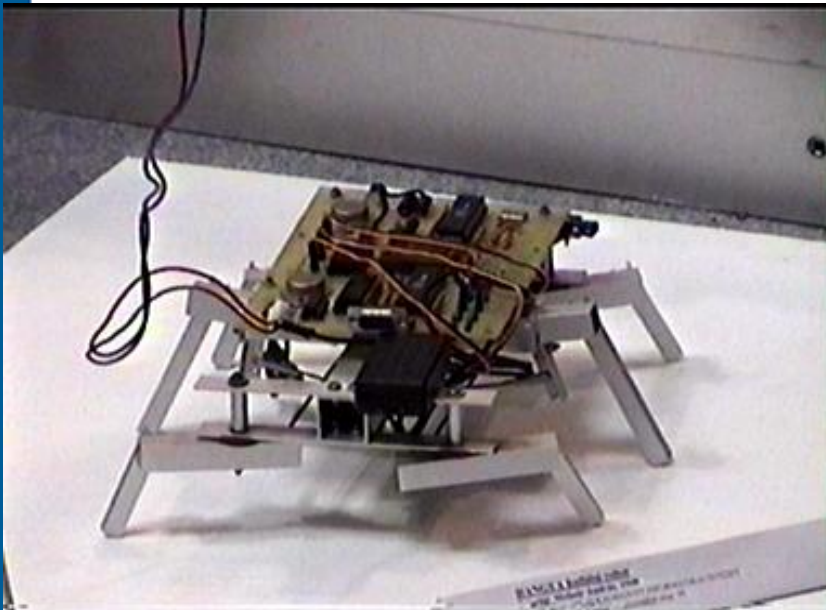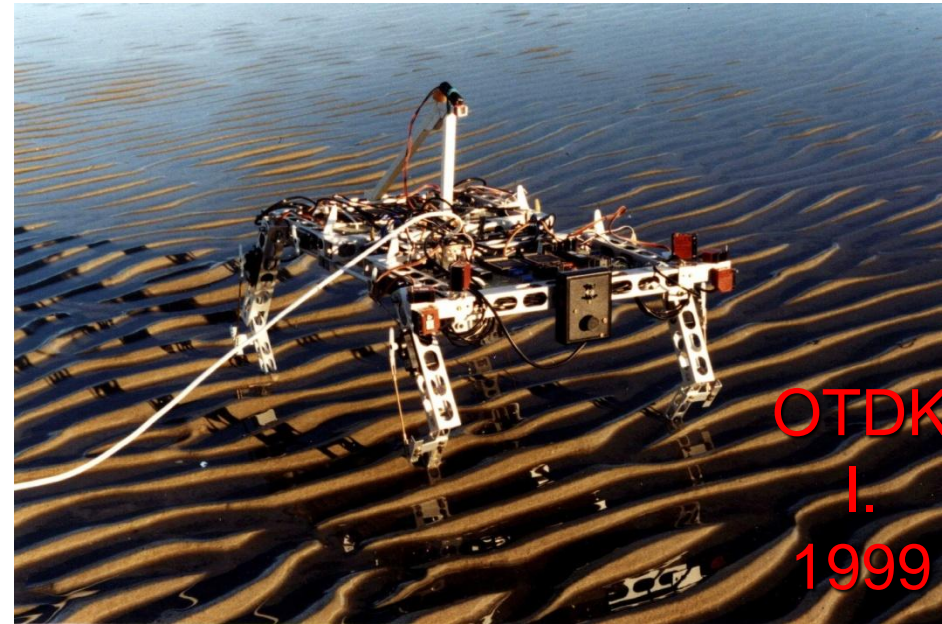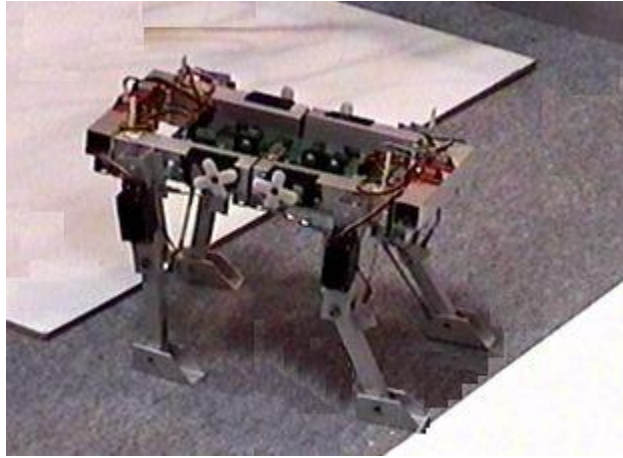
Fobot, CCExplorer: mobile robots

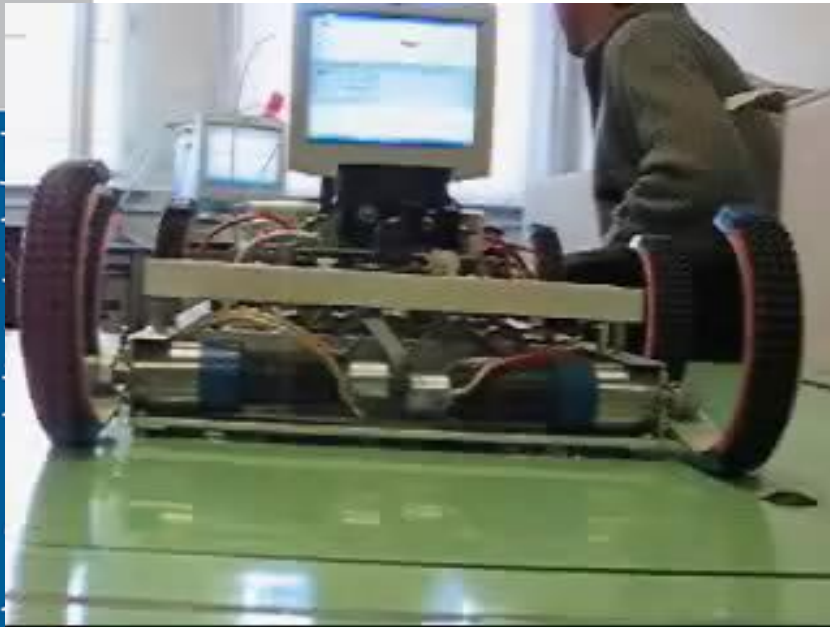

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2005

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2003

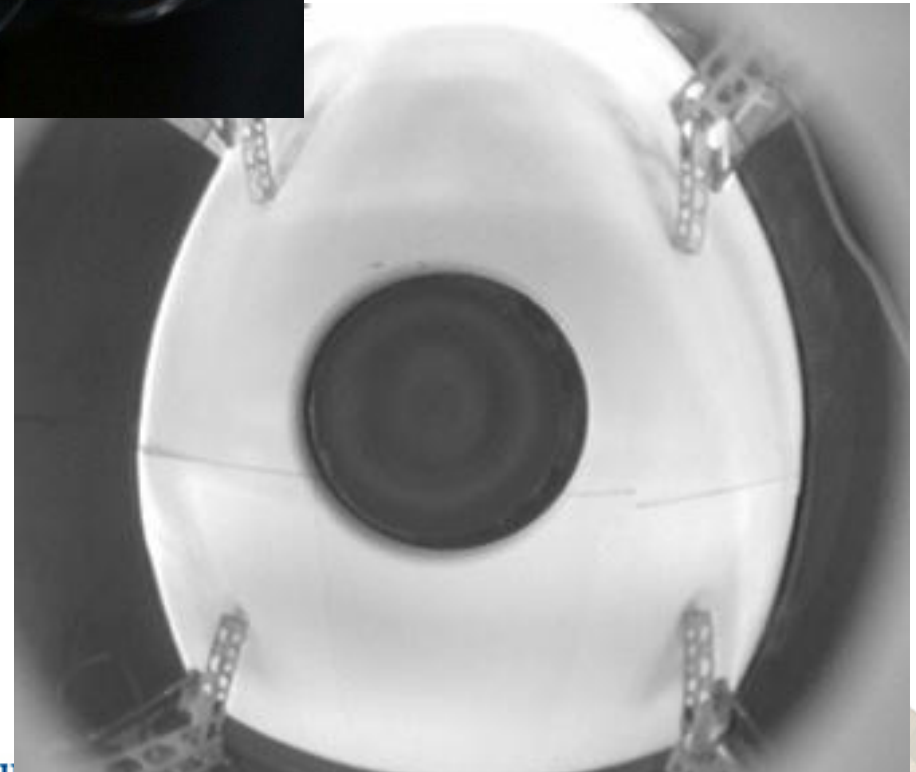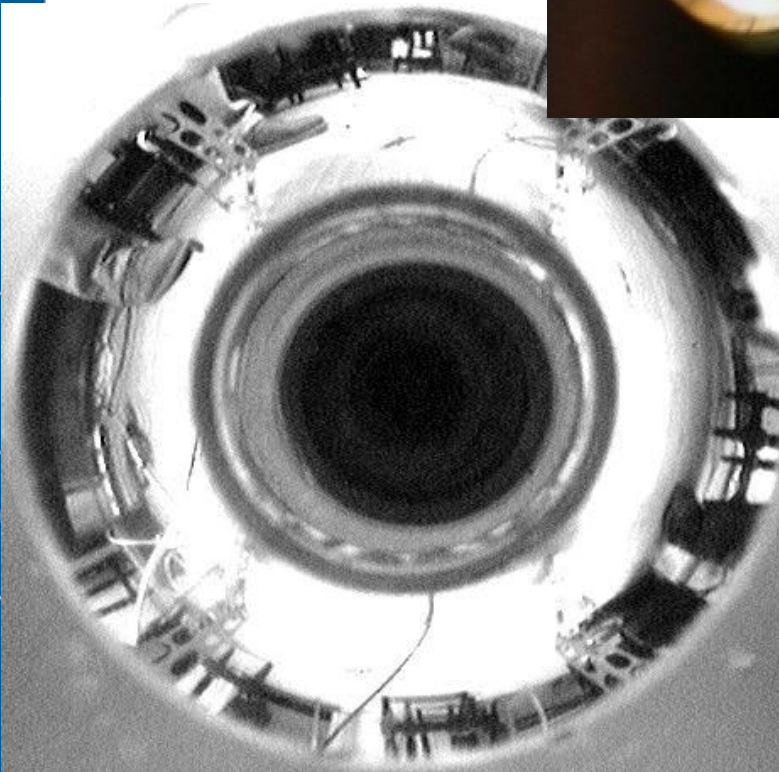18.MAY.2004

Gait / obstacle avoidance
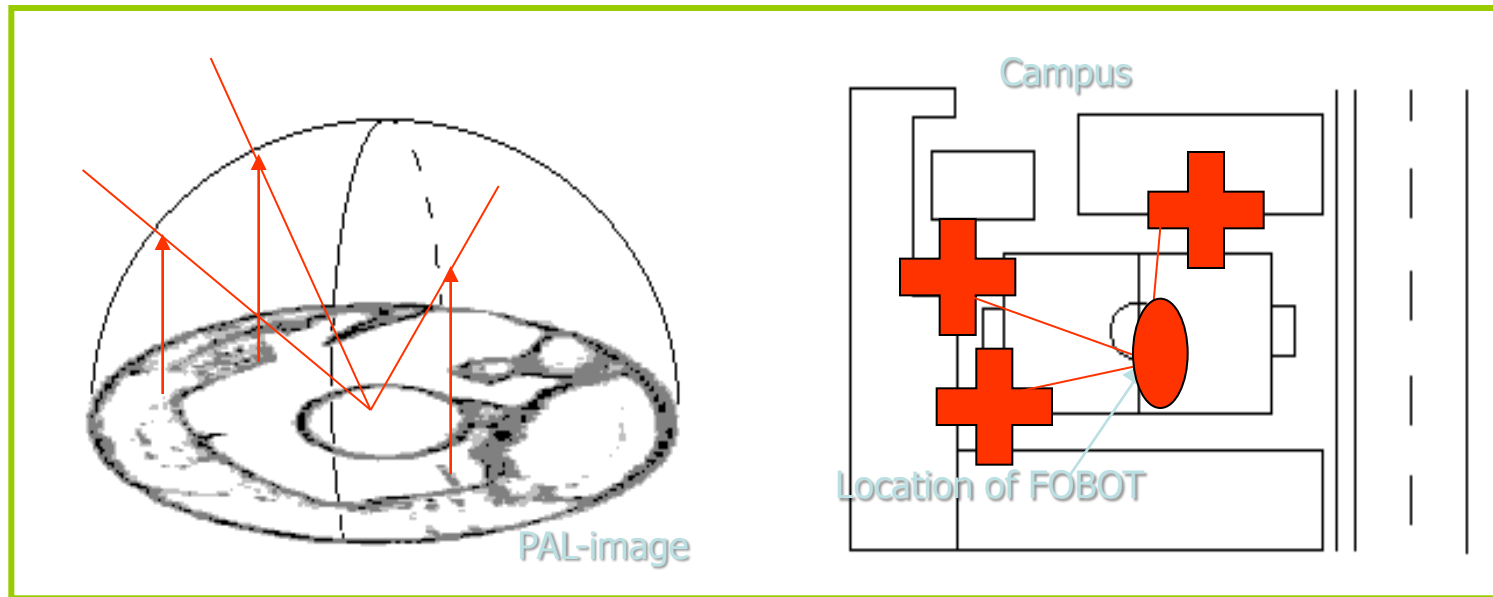

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2003

Obstacle avoidance based on PAL

Localization by PAL

Add filters → Selection of the tracked points manually → Unwrapping the PAL-image → Edge, corner detection

Campus

PAL-image

Location of FOBOT

3D transformation, mapping the points ← Determination of the spatial vectors from the PAL-image ← Determination of the "good features to track" on the image

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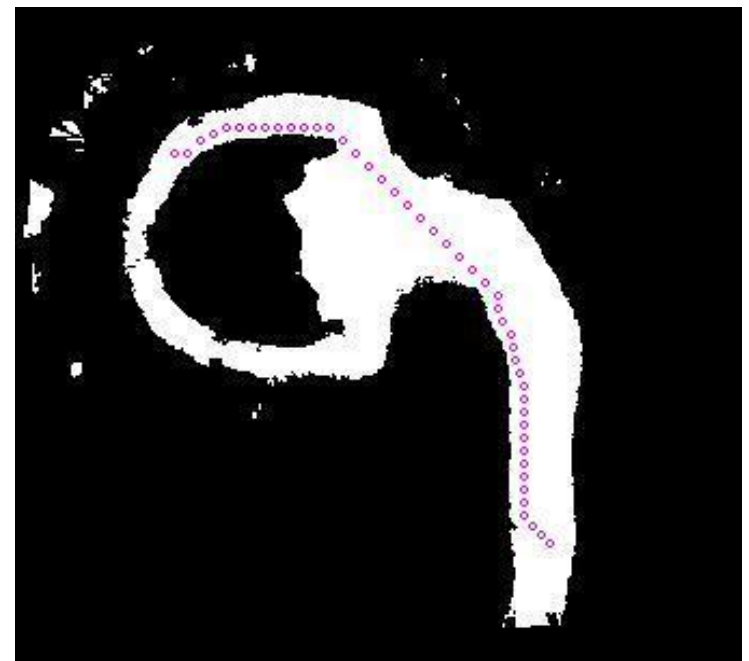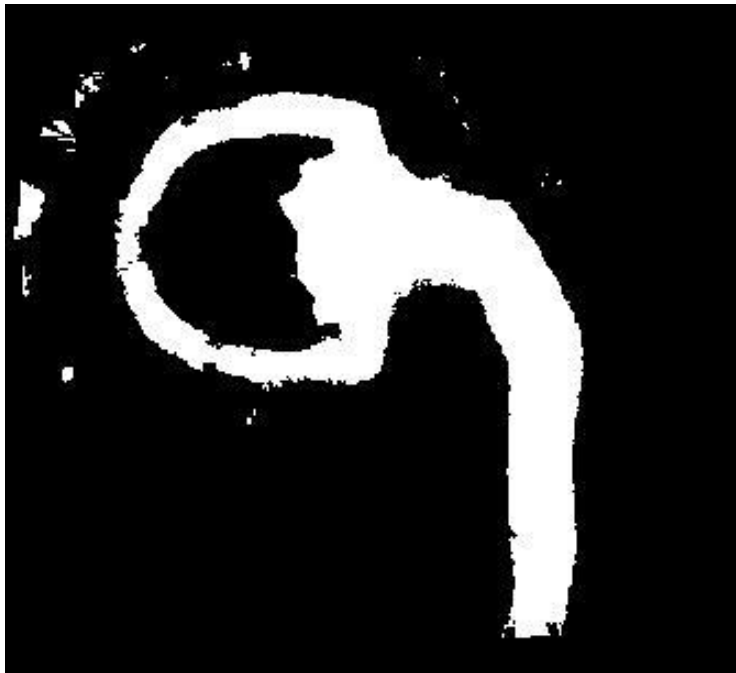# Map building with PAL

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Mapping process

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Path planning

Binarization => Wave propagation – based path planning

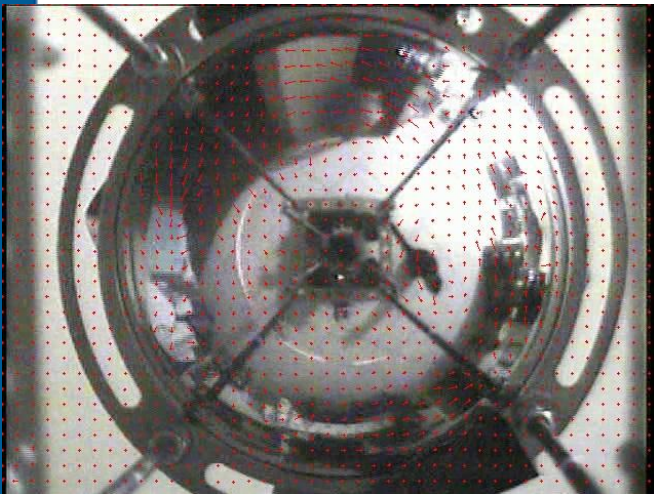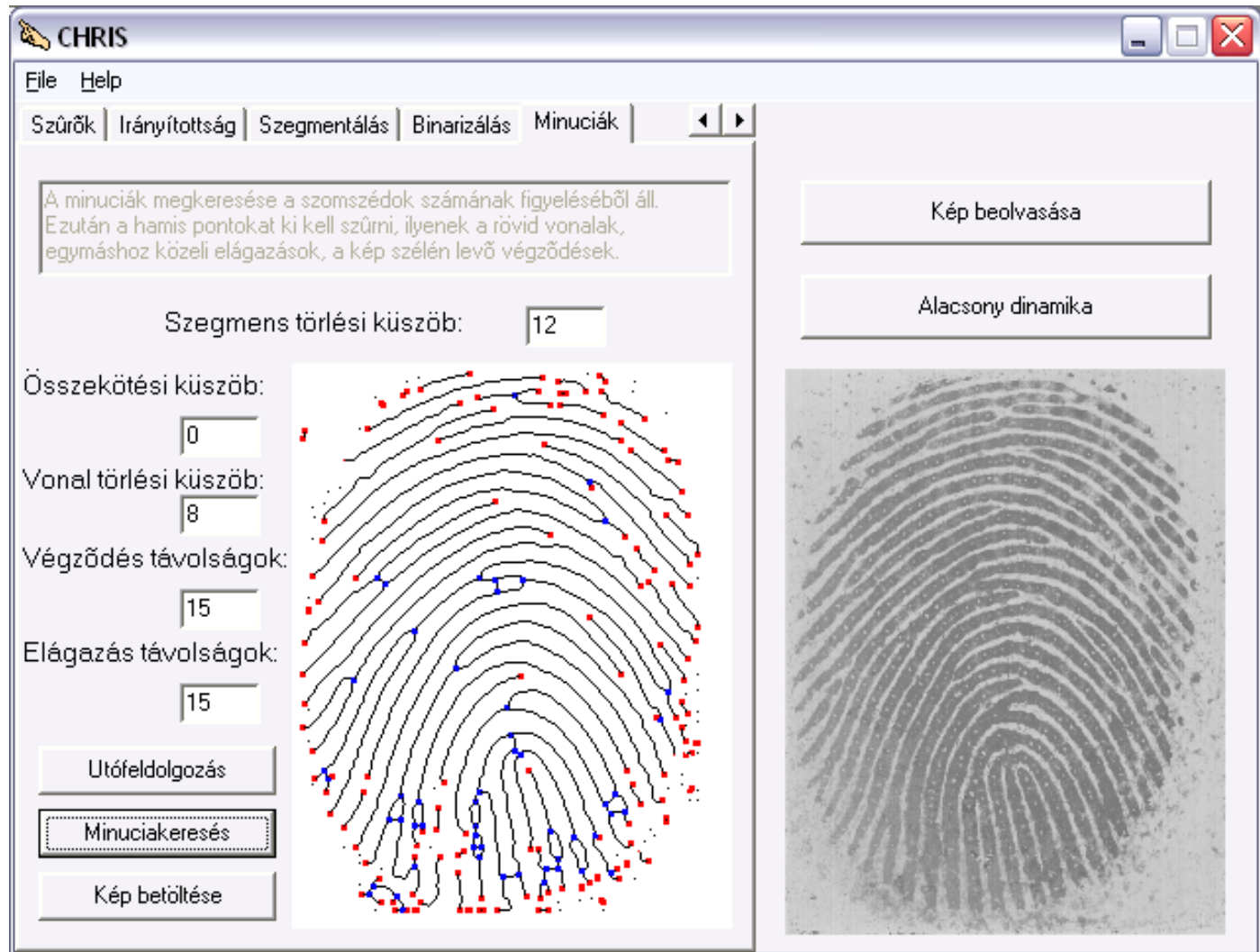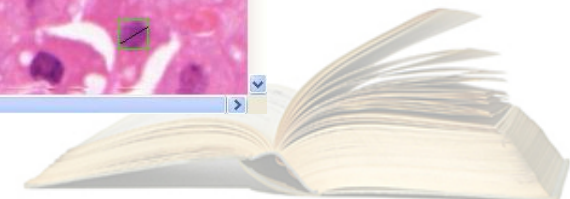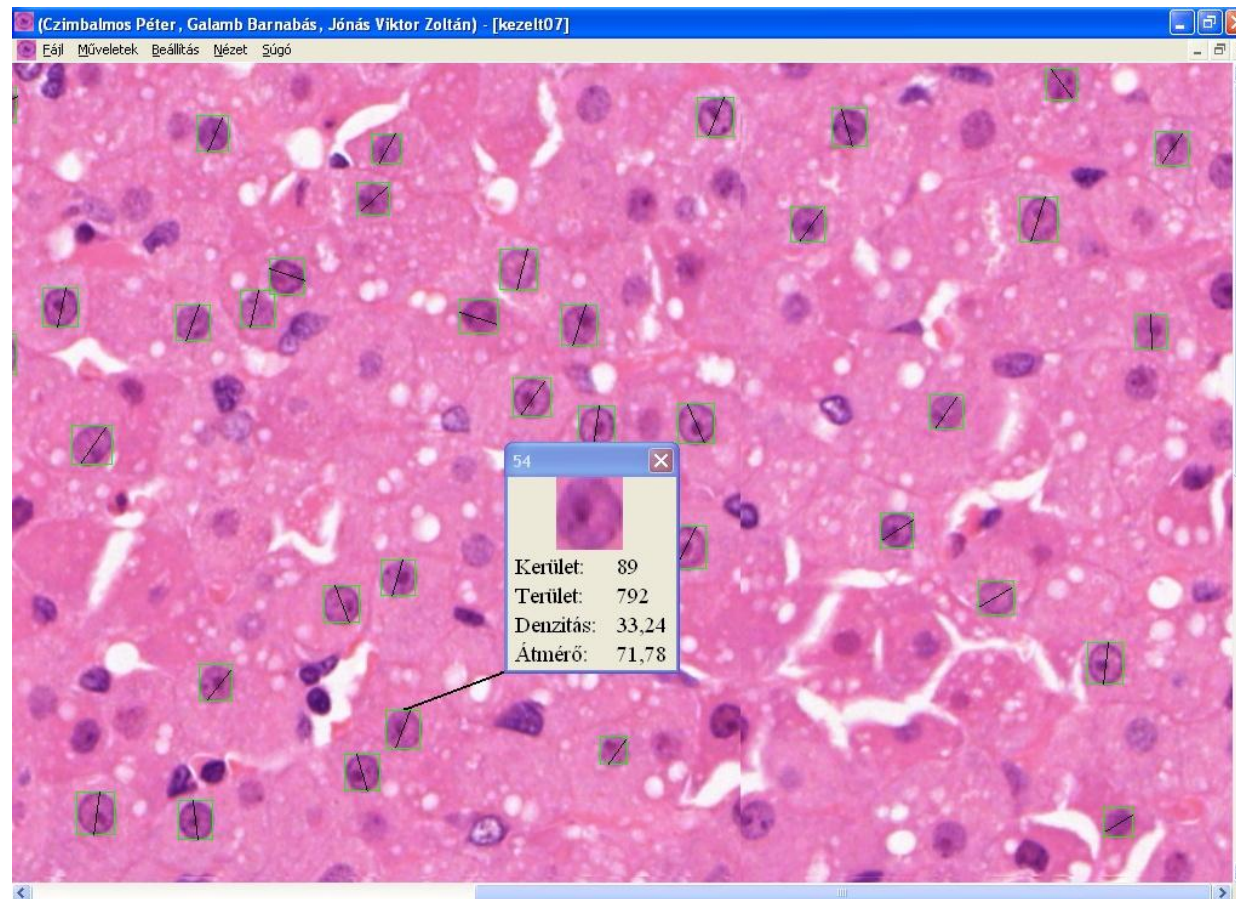# Super-resolution for Omnidirectional Vision

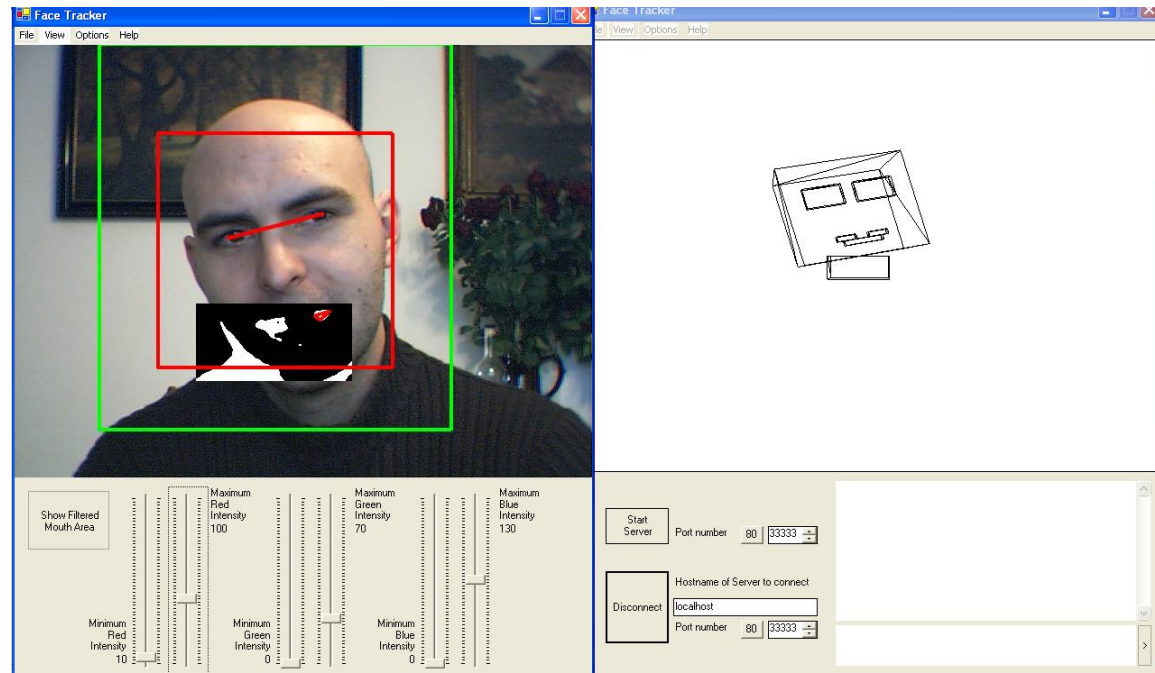# Fingerprint recognition
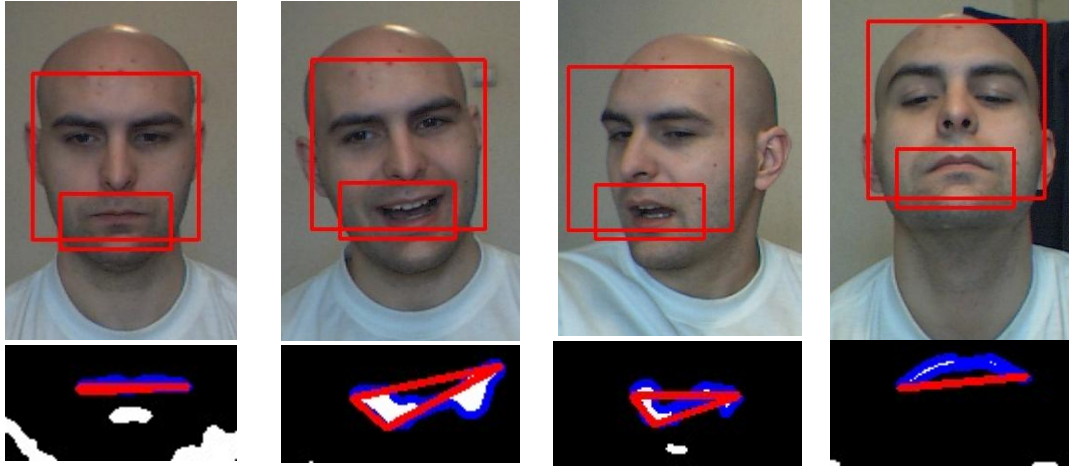
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Cell parameter detection
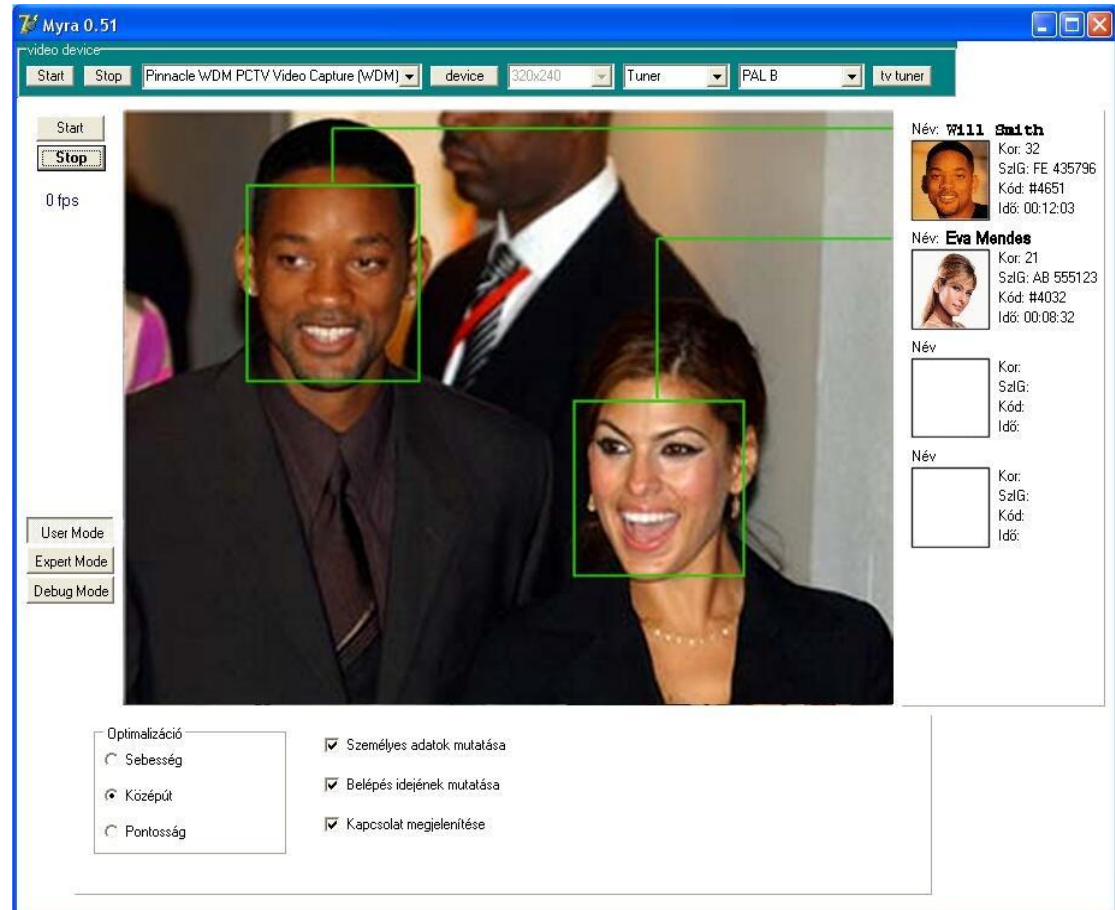# 3D virtual microscope

Facial Expressions

Face detection and recognition

Detection

- Skin tone detection: (18fps)
- AdaBoost: (3-15 fps)

Recognition

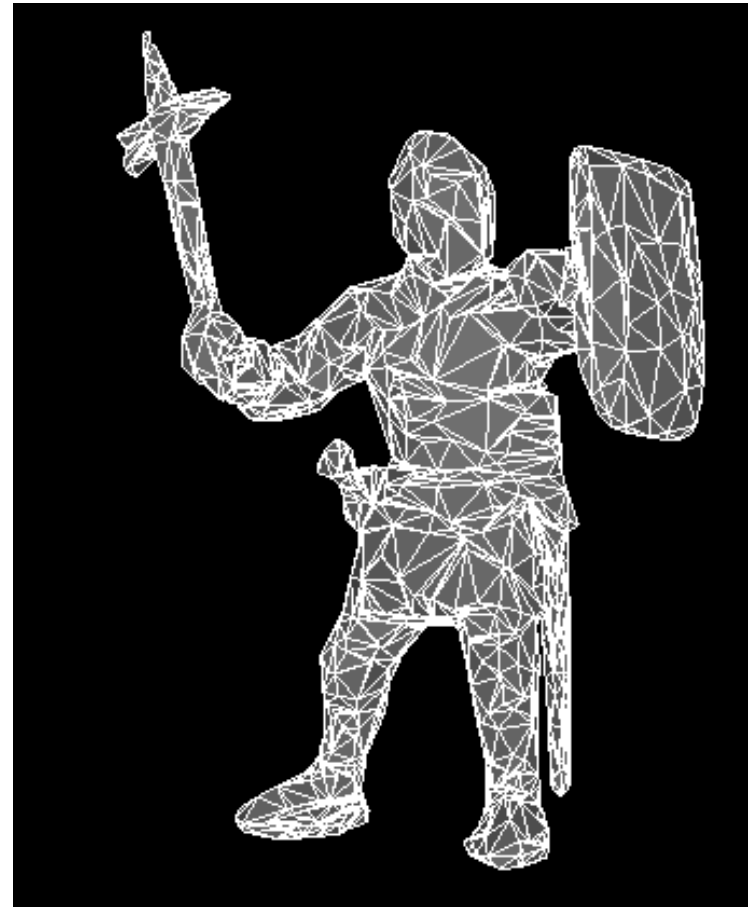- Eigenface method
- Gabor wavelets based method

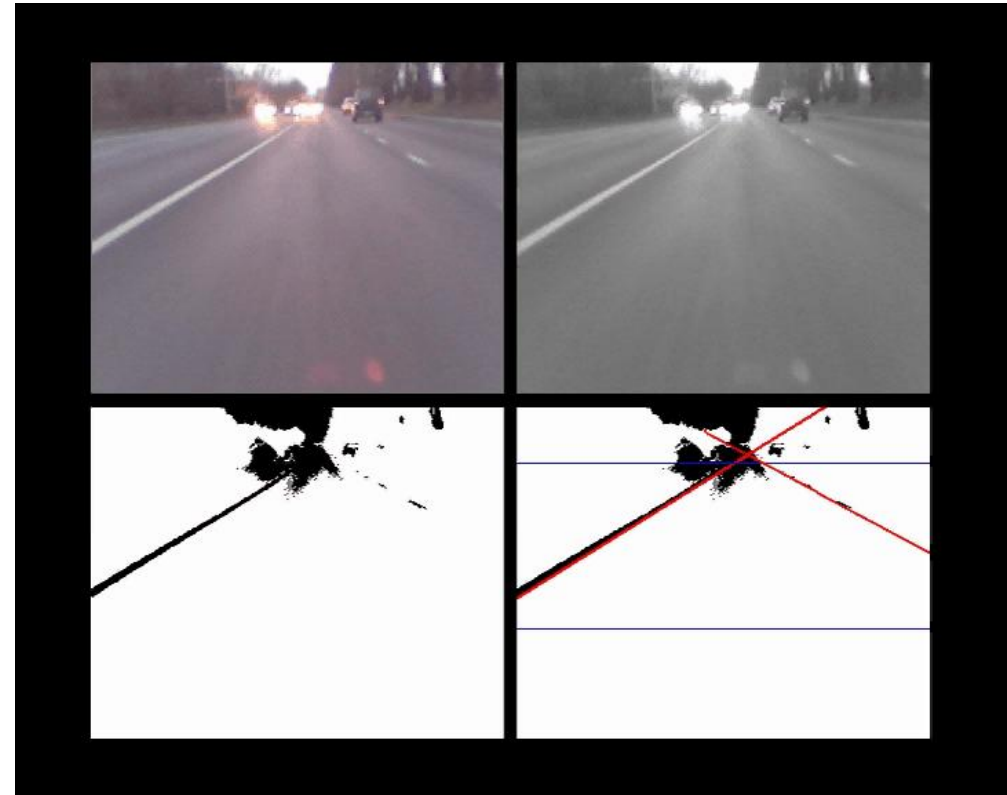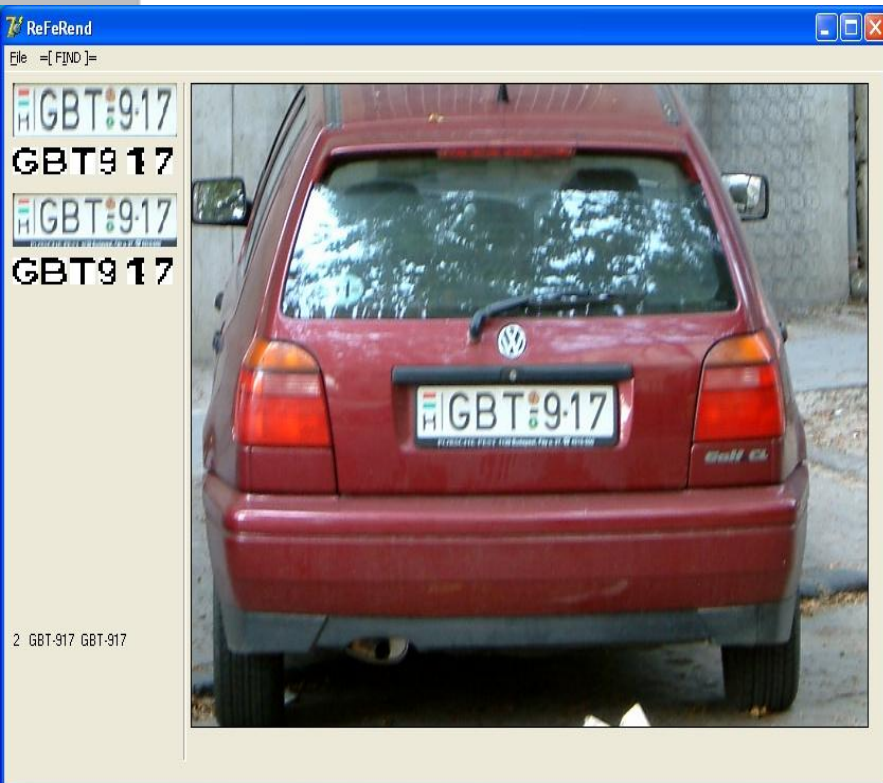# Morphing with automatic feature detection

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2005

3D reconstruction

License plate and lane recognition

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Conclusions

- Team based project work
- Hardware and software development

- (More than 25) first, second and third places on national scientific student competitions
- Exhibitions at fairs (Hannover, Grenoble, Leipzig, Budapest), more than 30 international conferences with students
- Summer School on Image Processing, Intensive Program on Computer Vision

Thank you very much your attention!

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