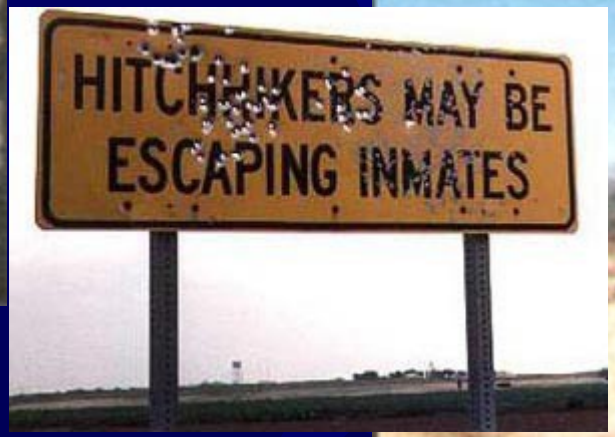
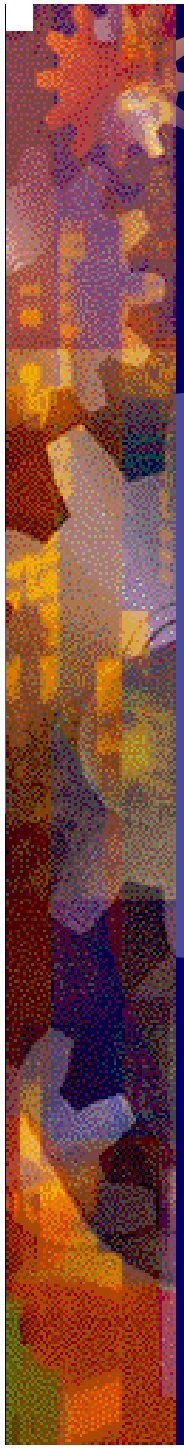

SSIP 2008
Project suggestions
7-16/7/8

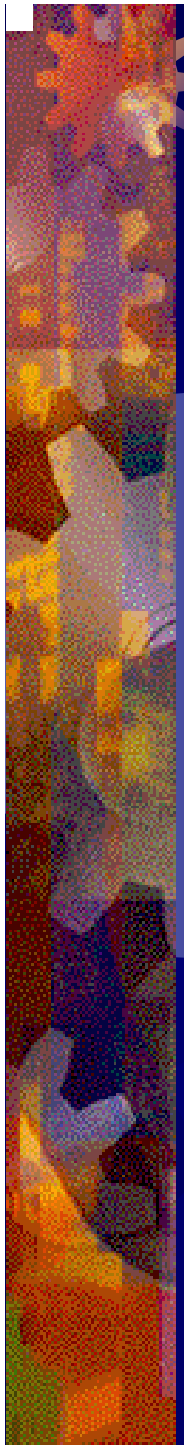
Guidelines -> Roadmap





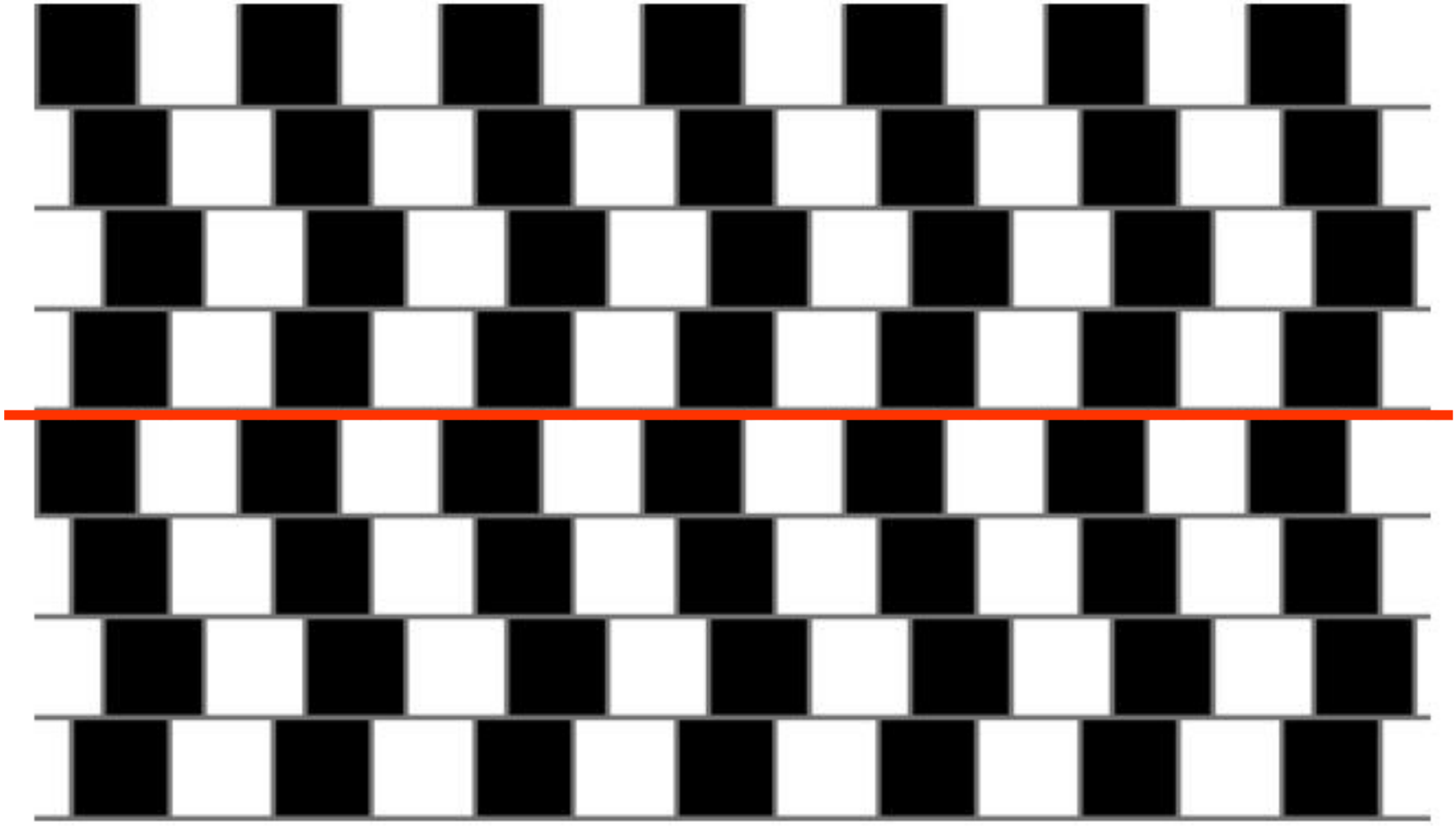
Team work

- Gopher
- Scientist/ researcher
- Programmer/ coder
- Documenter/ publicist
- Manager



You will be assessed in terms of:

- Ability to function as a team
- Scientific originality
- Use of resources
- Demonstration of function
- Quality of coding
- Quality of documentation
- Interest and imagination of Web pages



Are the horizontal lines parallel or do they slope?

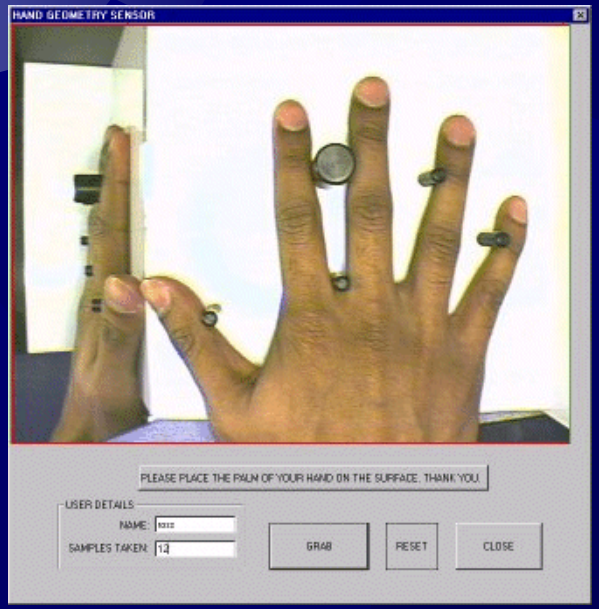
Project 1 What monument am I looking at?

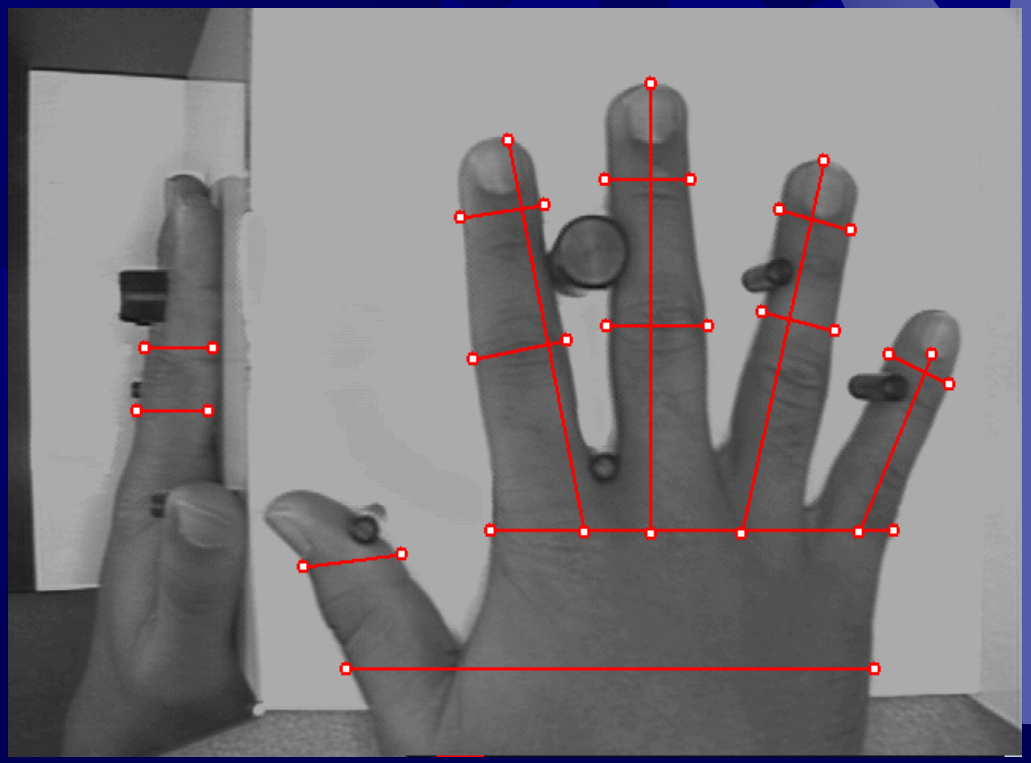
- Take photos of landmarks in Vienna.
- Find images of the same landmark in the Internet and use associated text to find out the name of the landmark.
- Difficulty: Hard

Reinhold Stansich / Flickr

Project 2: Identification by Hand Geometry

- Build a simple system identifying enrolled individuals based on hand geometry.
- Use a webcam and feel free to design your setup (keep it simple, e.g. hand on black paper viewed from above).
- Difficulty: Medium





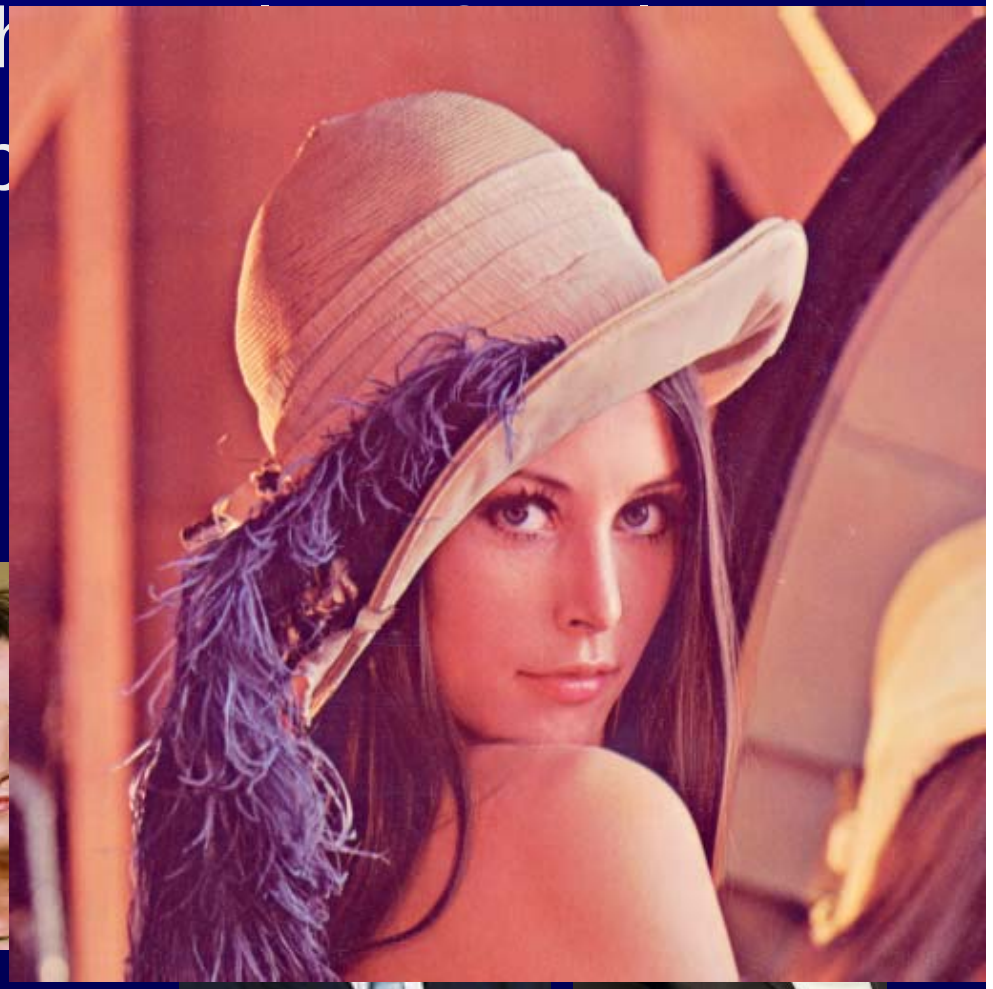
Project 3: Ear Biometry

- How well can you recognise somebody by measurements of their ears?
- Create a database of the ears of all the class participants.
- Write a program incorporating an ear-recognition algorithm developed by your group which will output the name of the person based on the ear image.
- Also output the recognition statistics.

- Difficulty: Medium

Project 4: Male or Female?

- Find faces in images.



Project 5:Football

- Given an image of a football pitch, find
  - Players of the two teams
  - The ball
- Your algorithm should work on a wide variety of images.
- Difficulty: Fairly hard

Varient: Tracking of moving person against background

- Input: video sequence of for example of part of football match
- Aim to detect key events such as goals, fouls (or diving)
- Output: statistics of match
- Remarks: Difficulty medium to hard.
- Note ‘Use of camera tracking to observe if balls crosses line’

Football matches in history

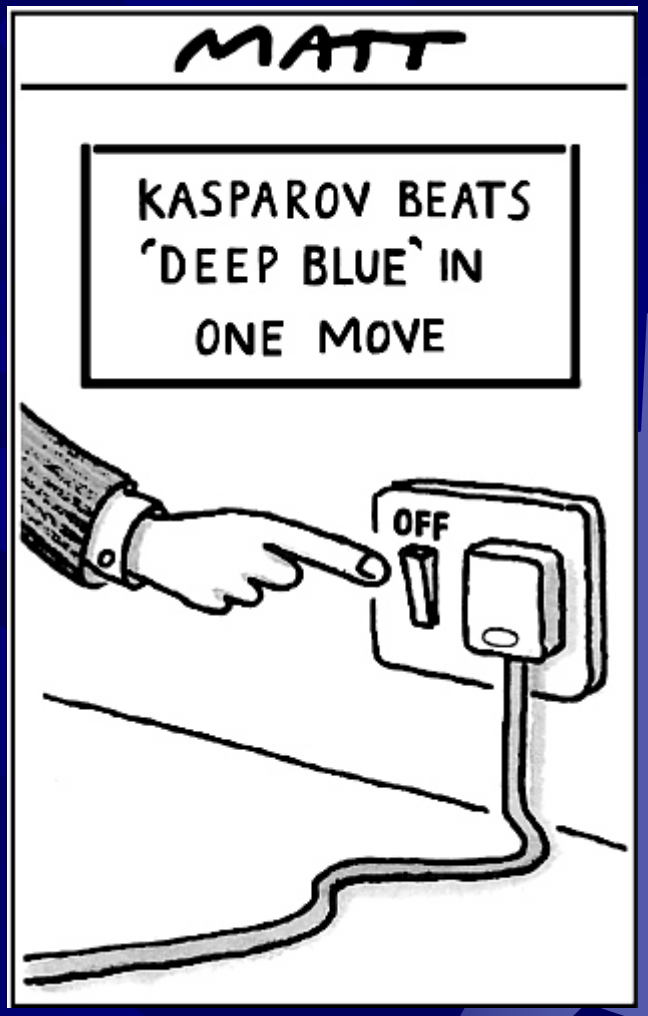

TV

Project 6: Game partner

- Choose a board game such as Draughts, Backgammon, Chess.

- Point a webcam at the board.
- The computer should follow your moves in real time and play against you (suggest moves from its side).

- Discuss the game that you choose with us.
- The emphasis should be on the visual processing – interface your program with an existing game strategy engine.
- Difficulty: rather difficult (for chess or Go, extremely difficult!)



Project 7: Vision-based badge detection

- Detection of a visual pattern in form of a badge encoding some useful information like a personal ID. The task could consist of two subtasks:
  - the design of a pattern which is easy to detect and reliable to readout at various scales, poses, illumination (for feasibility within the short time span, you are allowed to introduce some constraints). Possibilities: multiple colors, binary patterns, etc.
  - building a computationally-efficient detection (readout) algorithm, which copes with the above variations in viewing conditions.
- Difficulty: Medium

Crystal Ginn / Flickr

Project 8: Automatic CAPTCHA Decoding

- Captchas are online tests to detect if a human is using the computer.
  - Yahoo

  - Gmail

  - Paypal

  - Slashdot

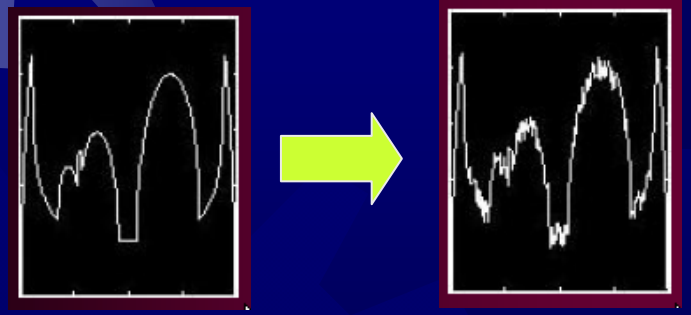
- Task: See how many CAPTCHAs you can crack

- How?
  - It is impossible to write a CAPTCHA cracker that works on all CAPTCHCAs.
  - A crack for a CAPTCHA is a sequence of image processing operators to apply to it so that it can be read by a standard OCR program
  - Use a freeware OCR program, don't write one yourself!
- Measure what percentage of each type of CAPTCHA can be cracked by your program.
- Difficulty: Depends on the CAPTCHAs chosen

Project 9: Binary/ discrete Tomography

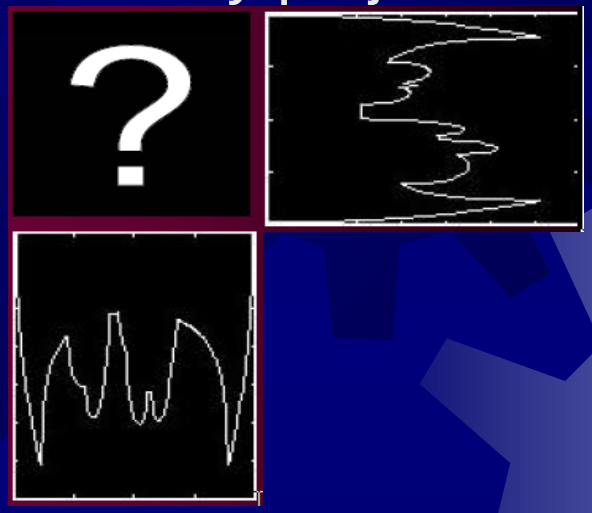
- Calculate projections of binary images

- Add noise to the projections



Test also in 3D

- Reconstruct the image from noisy projections



- Test accuracy and speed depending on
  - size of the image
  - number of projections
  - characteristics of noise

Project 10: Facial emotion recognition based on mouth analysis

- Input: videos or static color images of a persons' face, under natural conditions; good lighting, but, no makeup!
- Objective: recognize emotional state using mouth information; useful for computer tutoring systems. Mouth must be located first
- Tasks to do:
  - find the mouth region in a facial image (relatively of known position and size, assume you're in front of a computer and you have a webcam)
  - analyze the mouth shape and state – find suitable descriptors for it, in order to accurately classify different emotions
  - at least basic emotions should be identified (i.e. neutral, happy, sad, surprised) but also some spontaneous emotion would be nice
- Output: the mouth identified and the emotion recognized
- Remarks:
  - difficulty – high;
  - Any suggestions as of how could one distinguish from video only between mouth change during speech and emotion?

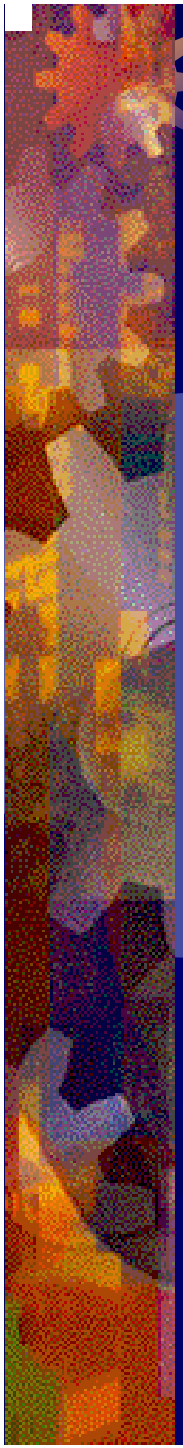
Some example images:

Happy

"Screaming…."

Angry

Neutral



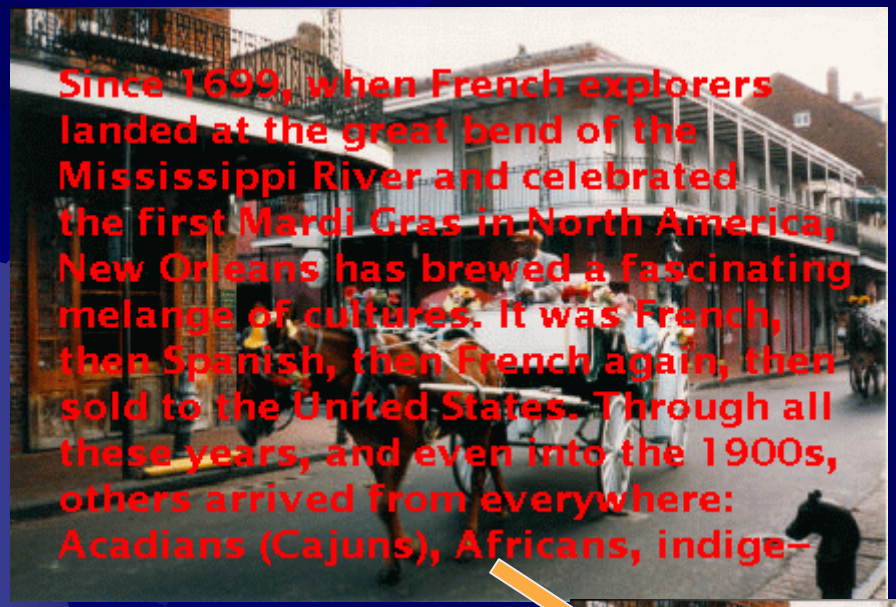
Project 11: Photographs restoration for scratch removal and date superposition removal

- Input: printed and scanned photographs affected by scratches or printed text, as date – time imposed
- Objective: removal of such unwanted ⇔ filling in the missing part with information that looks as natural as possible; can be done with image in-painting techniques.
- Tasks to do:
  - develop an application implementing such an algorithm, for photographs restoration
  - no constraints on the implementation environment
  - user interaction should be implemented to select the part to be restored
  - the application should preserve both color and texture – the not deteriorated part of the image should not be affected in any noticeable way by the algorithm
- Output: the restored image in digital format
- Remarks:
  - difficulty – medium to high;
  - extra-work: can you design/implement a version which does not require user interaction, i.e. the deterioration automatically assessed based on the analysis of the photograph? (scratch detection, text detection)

Example photographs to be restored (1):

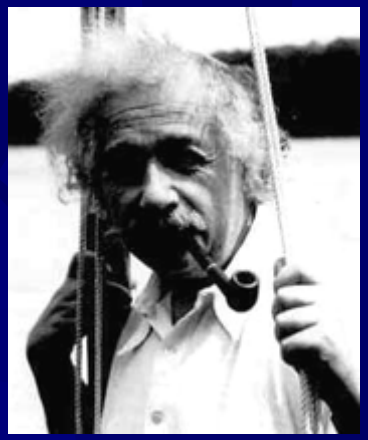
After restoration

Example photographs to be restored (2):



After restoration

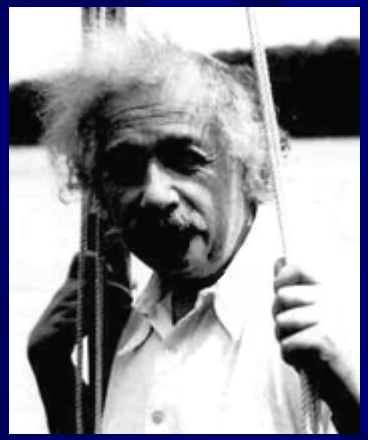
Example object removal from a photograph:



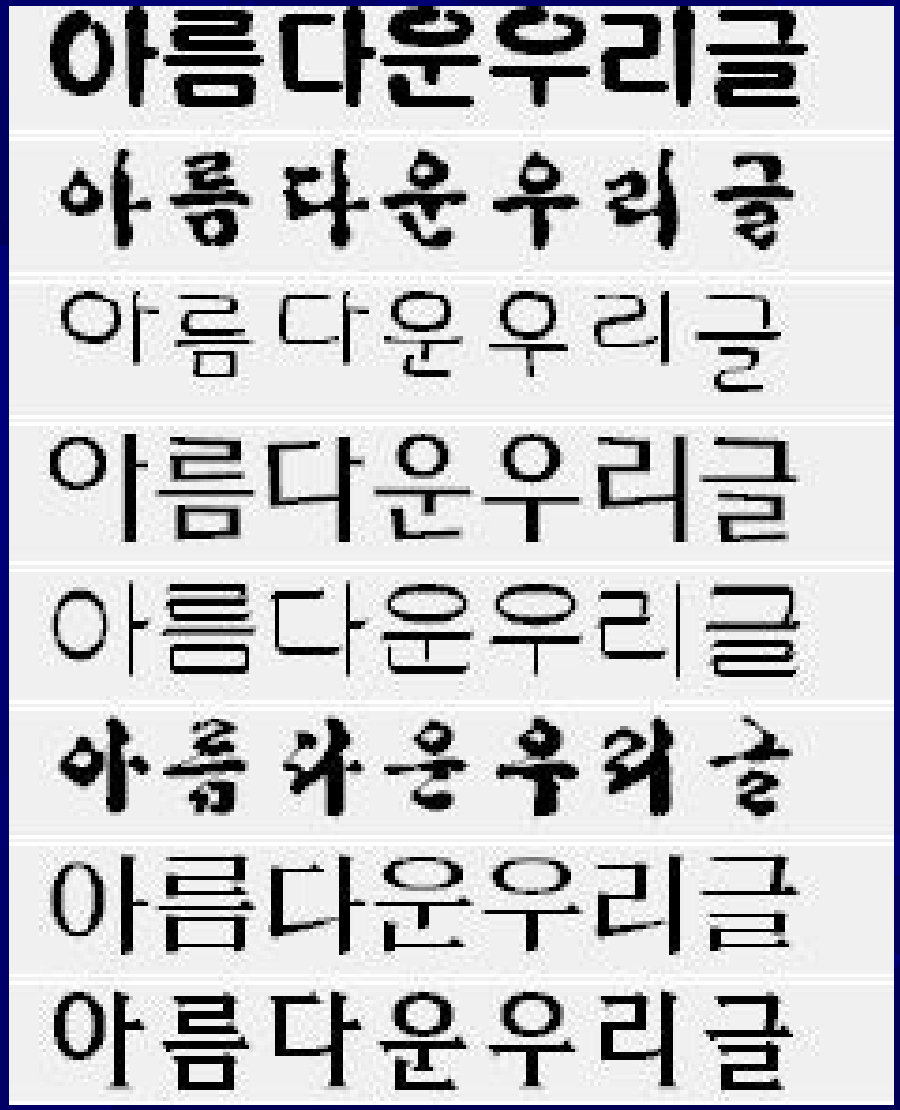
Original image

Object to remove

Result after removal



Project 12 OCR with a difference



Project 13: Modelling of traffic flow.

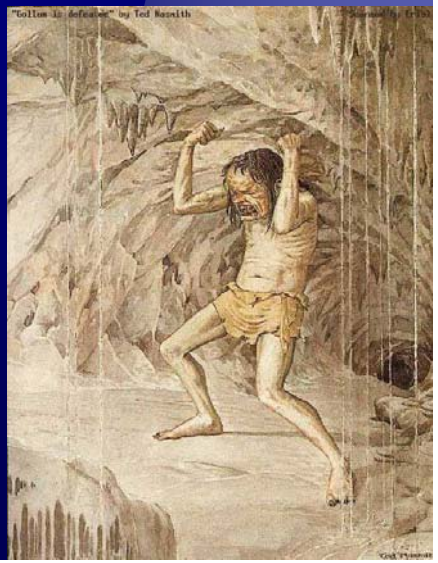
- Queuing theory demonstration

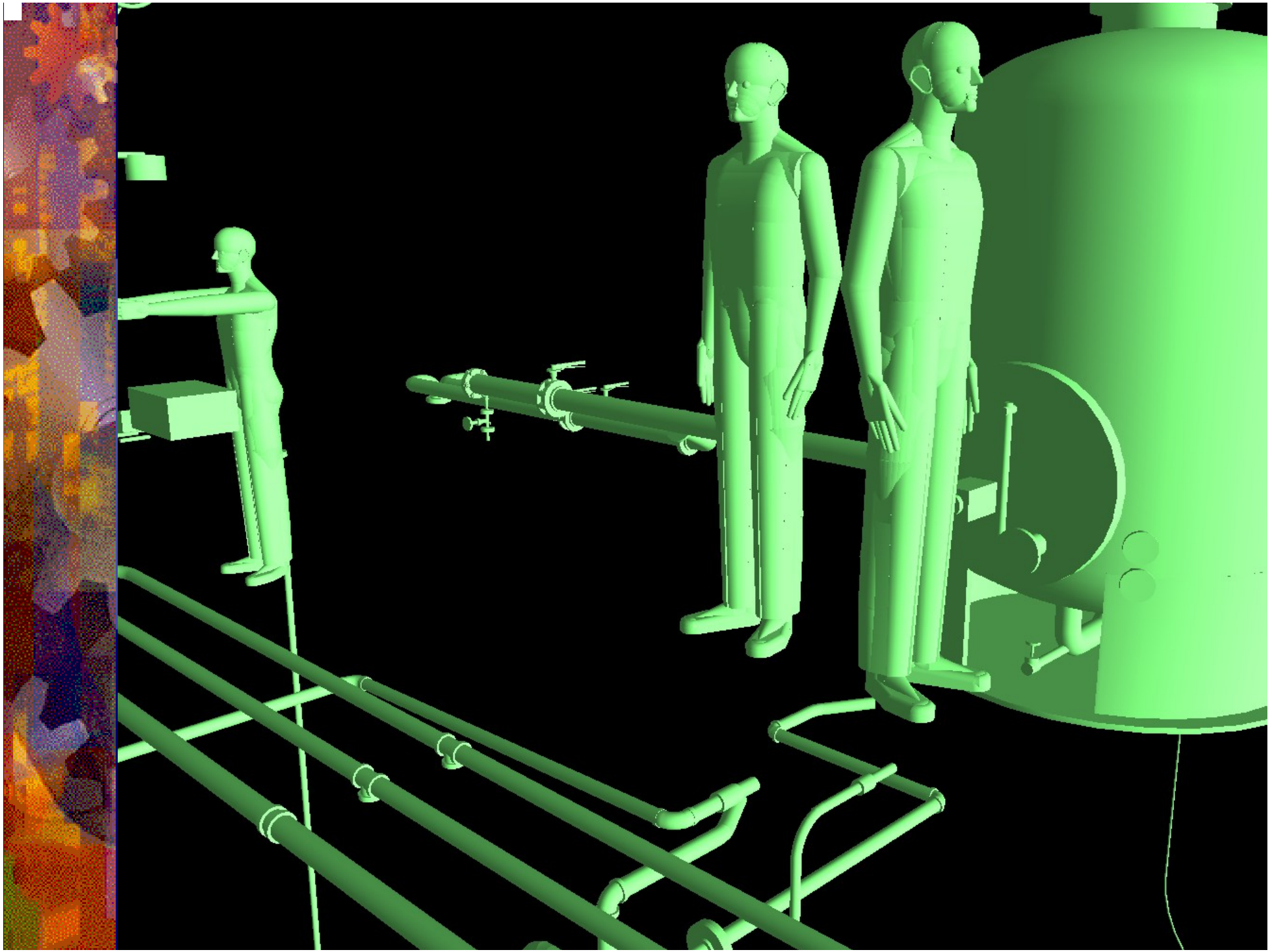
- Input: None
- Method: Demonstrate graphically illustration of queuing theory. A good example would be a simulation of road traffic flow, to illustrate wave phenomena (standing and moving waves) associated with partial obstructions.
- Output: Graphical demo, preferably in form of 2d image/ map [along lines of Sim city with graphs].
- Difficulty: variable

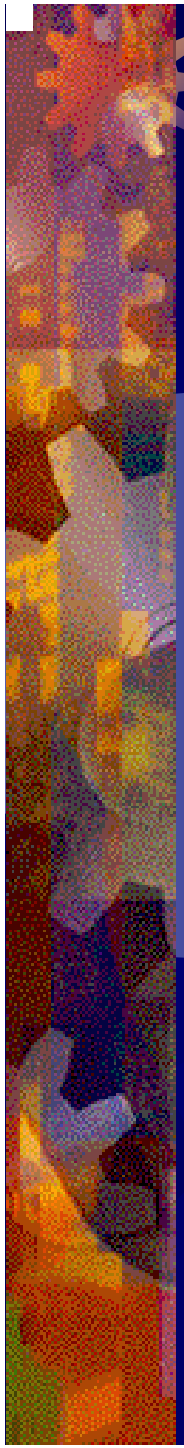
Cautious drivers

Project 14 Avatar/ dancer

- Aim: to place some avatars in a street scene
- Input: Street scene
- Aim generation of some realistic human figures walking about is street scene. Can you add facial expression.
- Output: video clip with avatars moving
- Alternative, avatar walking up stairs, dancer dancing
- Remarks: Difficulty variable



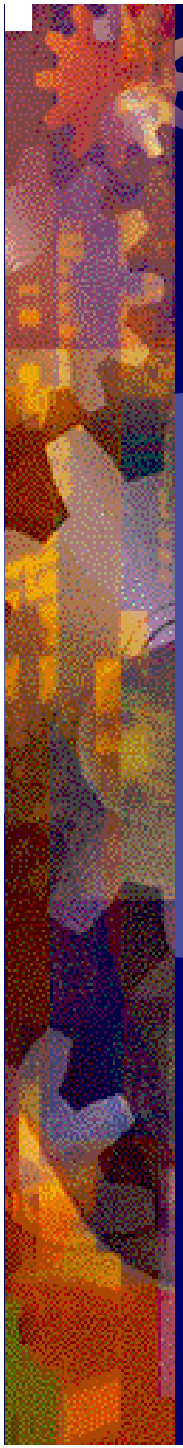




Project 15 Counting objects

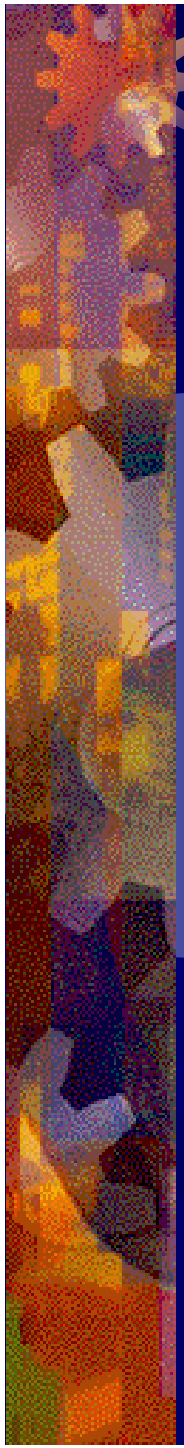
- Counting windows
- Input: photo of a building
- Task detect and count windows
- Output: a number plus indication of where the windows are
- Difficulty: medium

View from my window



Alternative Count roofs

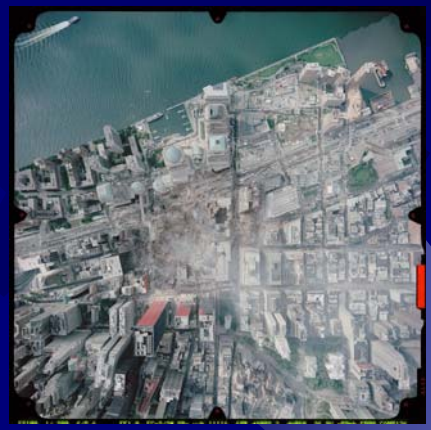
- Counting roofs.
- Input: a digital photo of roofs
- Task: count all of roofs in the image, give every roof a unique id (number)
- Output: identifies roofs.
- Difficulty: hard

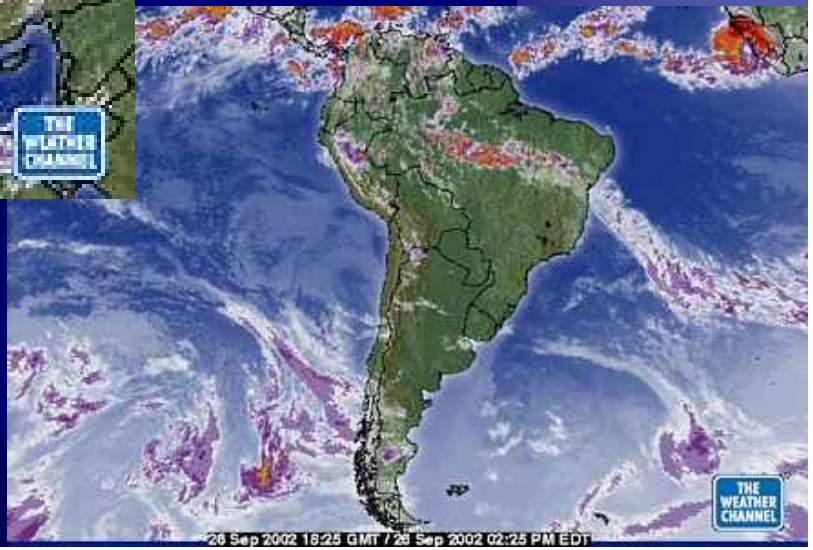


Project 16 Landsat classification

- Input: Landsat images of terrain, plus sample images of fields/ sea, forest etc
- Aim: segmentation of scene based on texture (and colour)
- Additional goal: intenfication of key featuers such as cave openings etc
- Output: labeled scene
- Remarks: Difficulty – reasonably easy

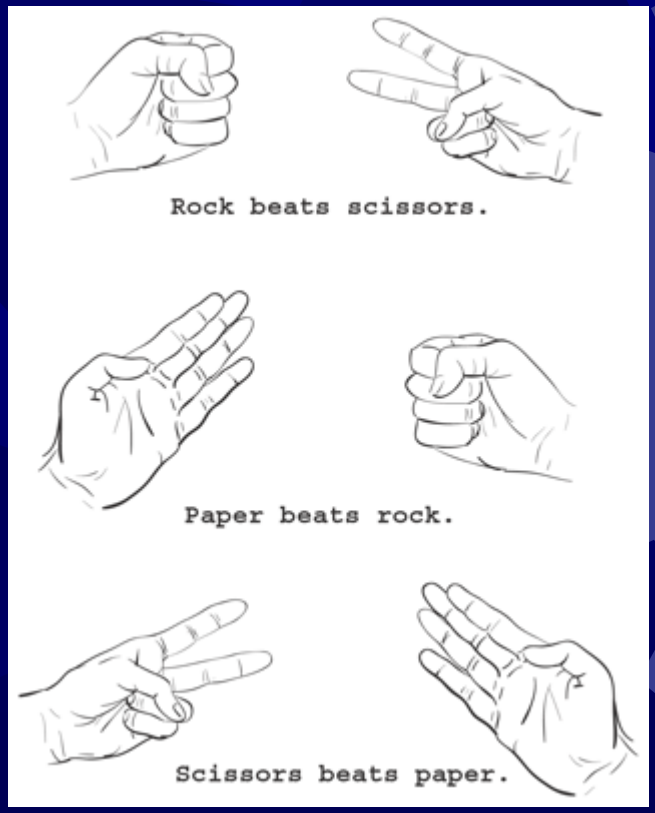
Satellite images





Project 17:Vision-based paper-scissors-rock game

- Use a webcam (positioned e.g. above the hand), which you can play against the computer.
- Difficulty: Medium



Project 18: Top model

- Input: photos of participants and fashion models from web
- Aim: classification of models v. normal unattrative faces
- Sub goal: what makes models apparently attrative (which features) and can you simulate this by distorting facial images
- Output: images of participants with attractiveness score
- Difficulty medium

Are these models?

Project 19: Terrorists

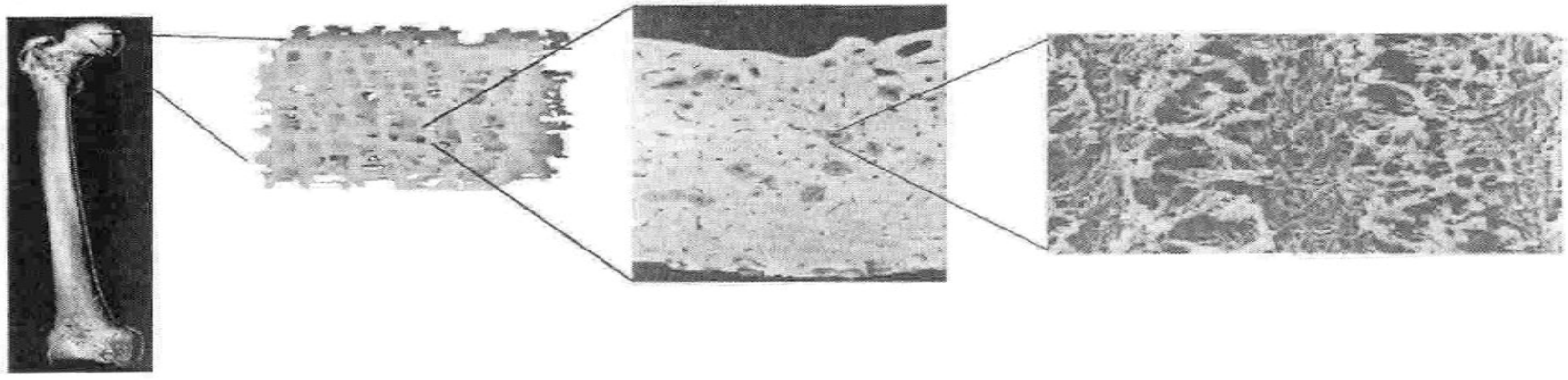
- Take photographs of your group and maybe other participants
- A few of you are terrorists and need to be identified when passing a security screen
- Aim is positive identification of a few faces
- Problem is that terrorists try to disguise themselves.
- Can you positively identify the disguised person
- What kind of disguises are difficult to handle and can the algorithm be improved in this respect

- Remarks: Difficulty medium

Some terrorists?

Project 20: FEM model of bone

- Create a fine level model of bone
- Estimate strength of bone as a function of direction and forces
- Difficulty hard



Summary

- 1. Mobile monuments
- 2. Hand geometry
- 3. Ear Biometry
- 4. Gender detection
- 5. Football
- 6. Game partner
- 7. Badge detection
- 8. CAPTCHA
- 9. Binary Tomography
- 10. Facial emotion

Cont.

- 11. Photo restoration
- 12. Korean OCR
- 13. Traffic flow
- 14. Avatar/ dancer
- 15. Counting windows/ roofs
- 16. Landsat classification
- 17. Paper/ scissors/ rock
- 18. Modelling of models
- 19. Terrorist detection (disguised)
- 20. FEM of Bone

- 21. … any suggestions?


Please ask questions