

Information technology for active perception: *Itap*

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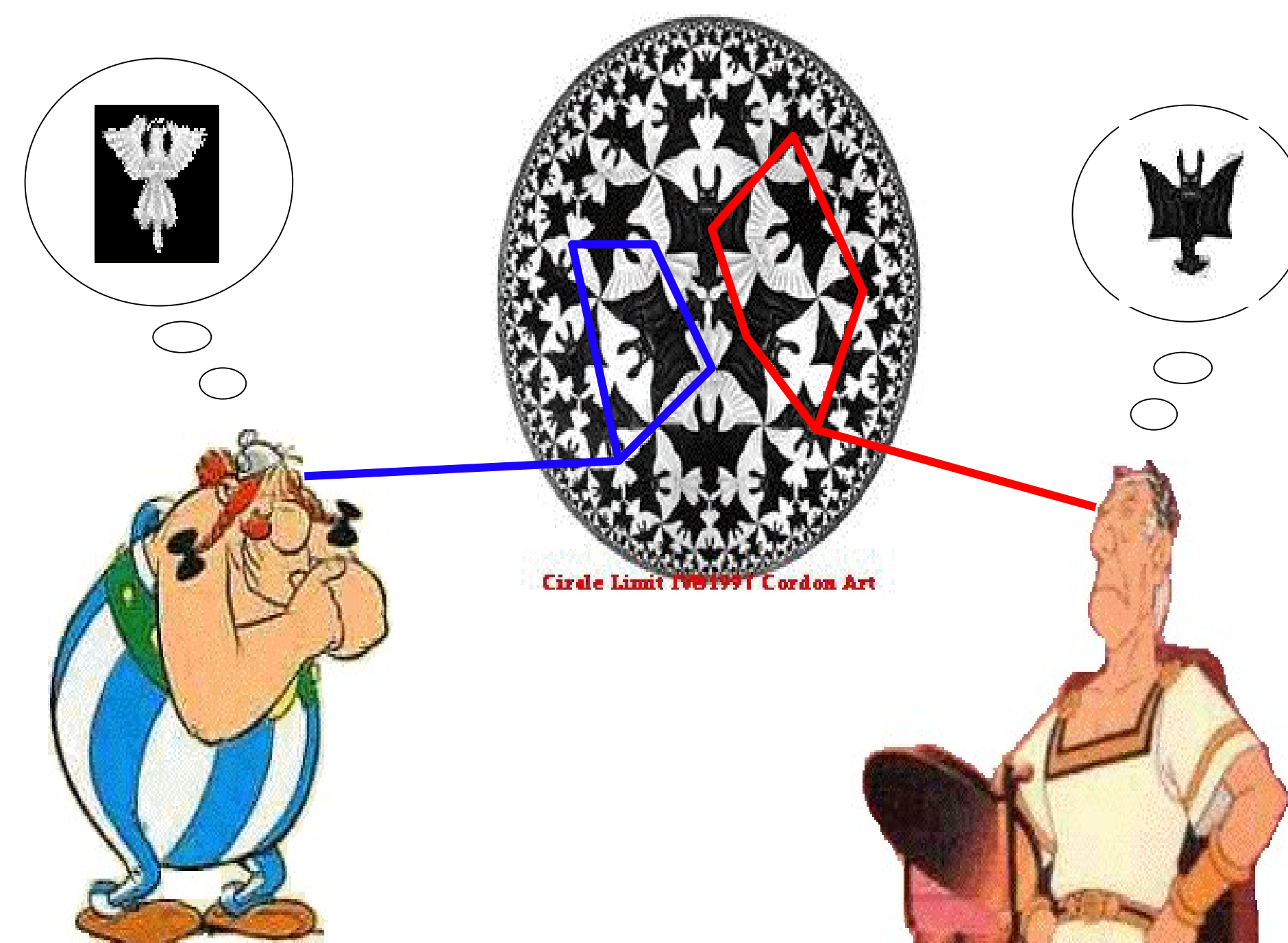
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Visual communication today

The message that is conveyed by an image depends very much on the *scan-path*, i.e., the sequence of eye movements that are used to look at an image.

Visual communication systems, however, are based on only the classical image attributes, luminance and color.



Same image but different messages.

Major *Itap* challenges

- Remote, user-friendly eye tracking.
- Better understanding of eye movements.
- Scan-path enforcement (directing a persons gaze towards a particular location).
- Development of gaze-contingent interactive displays on which information is presented in a closed loop as a function of gaze direction.

***Itap* idea:** The *scan path* and the active component of vision must become part of visual communication systems. Therefore the *scan-path* should be recorded, processed, and “displayed”.

Applications

- Visual communication
Images will be defined not only by brightness and color, but will be augmented with a recommendation of what to see, of how to view the images.
- Augmented vision
Attention is directed towards objects that have been detected by a computer-vision system.
- Training systems
Novices can learn to see with the eyes of experts, e.g. in radiology or in flight simulators.
- Optimal scan path
The scan-path of an observer can be optimized by a computer program.
- Reading systems
Itap will be used to relax the unnatural scan-path of reading.

Automotive applications

- Attention monitoring
The intelligent car will monitor and manage the attention resources of the driver.
- Augmented vision
With *Itap*, the driver's attention can be directed, for example, towards a pedestrian who has been detected by other sensors looking out of the car.

Vision systems in the car

- Fatigue measurement (wake up).
Video-based blink measurement PERCLOS to be enforced by law in the US.
- Head tracking for airbag control.
- Driver identification.



Future car vision by Renault

- Future communication systems define images not only by light intensity and color but also by considering the active role of the observer.
- *Itap* will improve visual communication by helping people see what they are intended to see.
- *Itap* offers an ideal interface for human-machine interaction because it allows for an unconscious exchange of information.
- *Itap* aims at technology that is active in the background and helps people communicate and interact with other people and with their environments.