Optical illusions and their influence on machine vision

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You don’t only need eyes to see, you need vision!

- Vision = set of processes that makes sense of the information acquired through the visual system

You certainly know that … a digital camera is the eye of a machine vision system

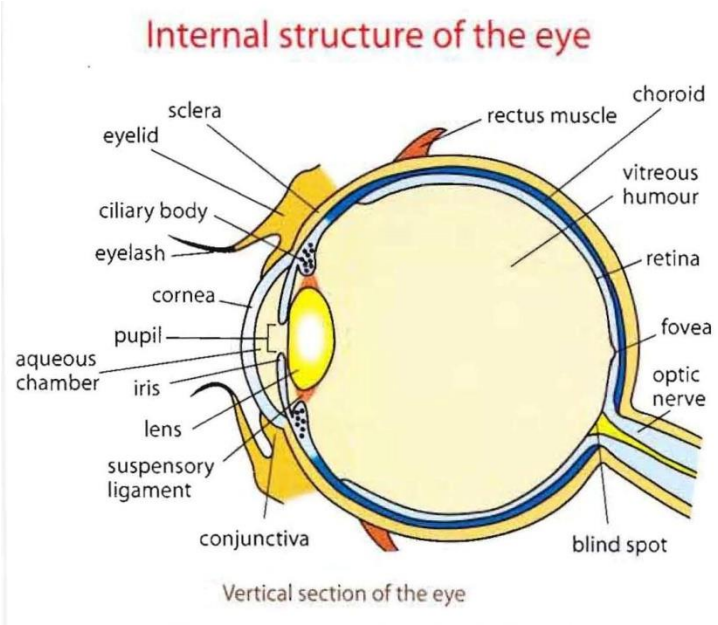
- The functioning of digital camera can be easily compared with the functioning of a human eye
- Both convert light waves into electric signals

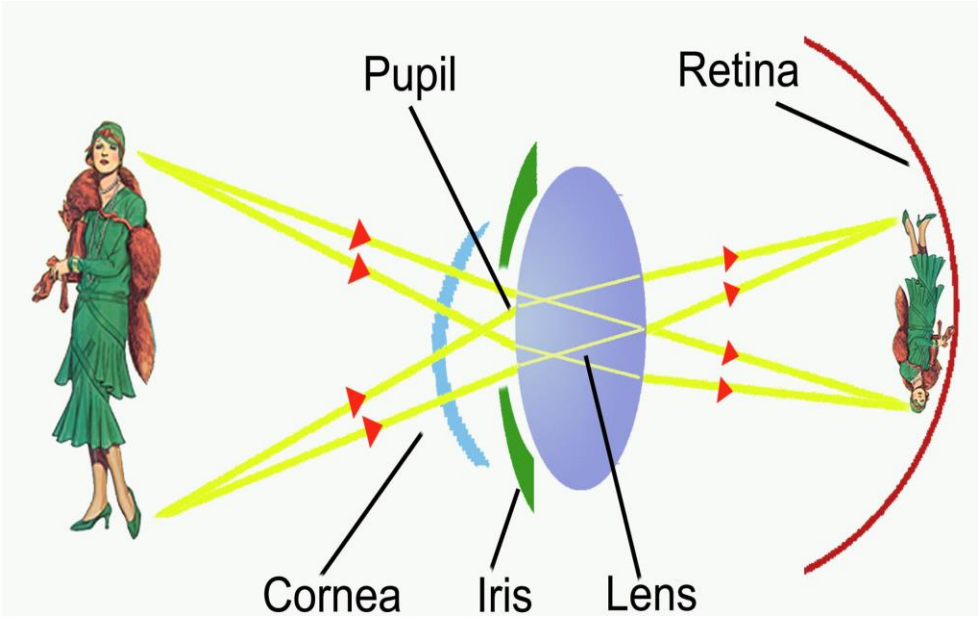
But did you also know that … knowledge about the human visual system is essential for building a machine vision system?

- Hardware structures and software: same principles as human vision works
- Artificial visual perception is increasingly used in industrial automation, non-industrial automated processes and even in our everyday life

A little on the human visual system …

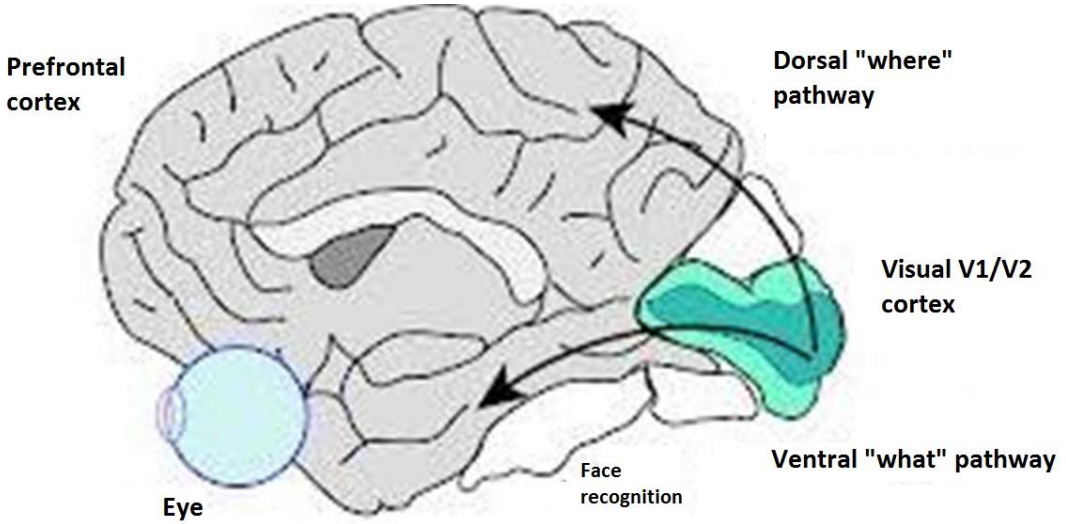
- Light is captured through the eyes and converted in electrochemical signals





A little more on the human visual system …

- Signals are sent by the optical nerve via the thalamus to the cortex where the visual perception occurs



Visual input -> Processing -> Unconscious mind -> Mental awareness

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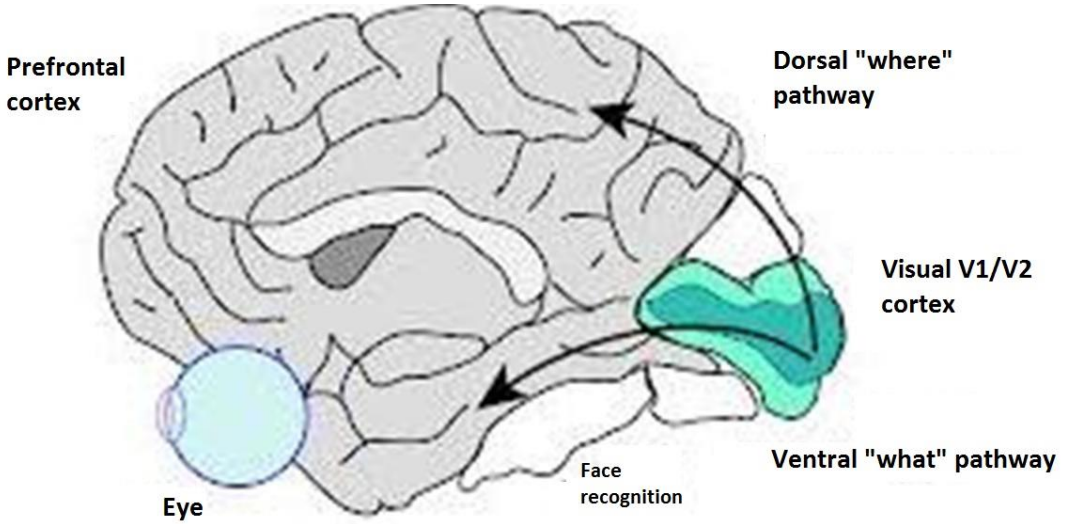
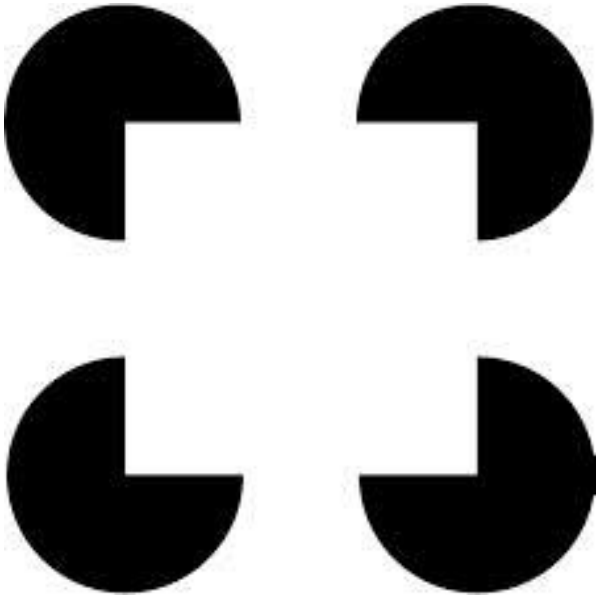


Visual input -> Processing -> Unconscious mind -> Mental awareness

Even more on the human visual system …

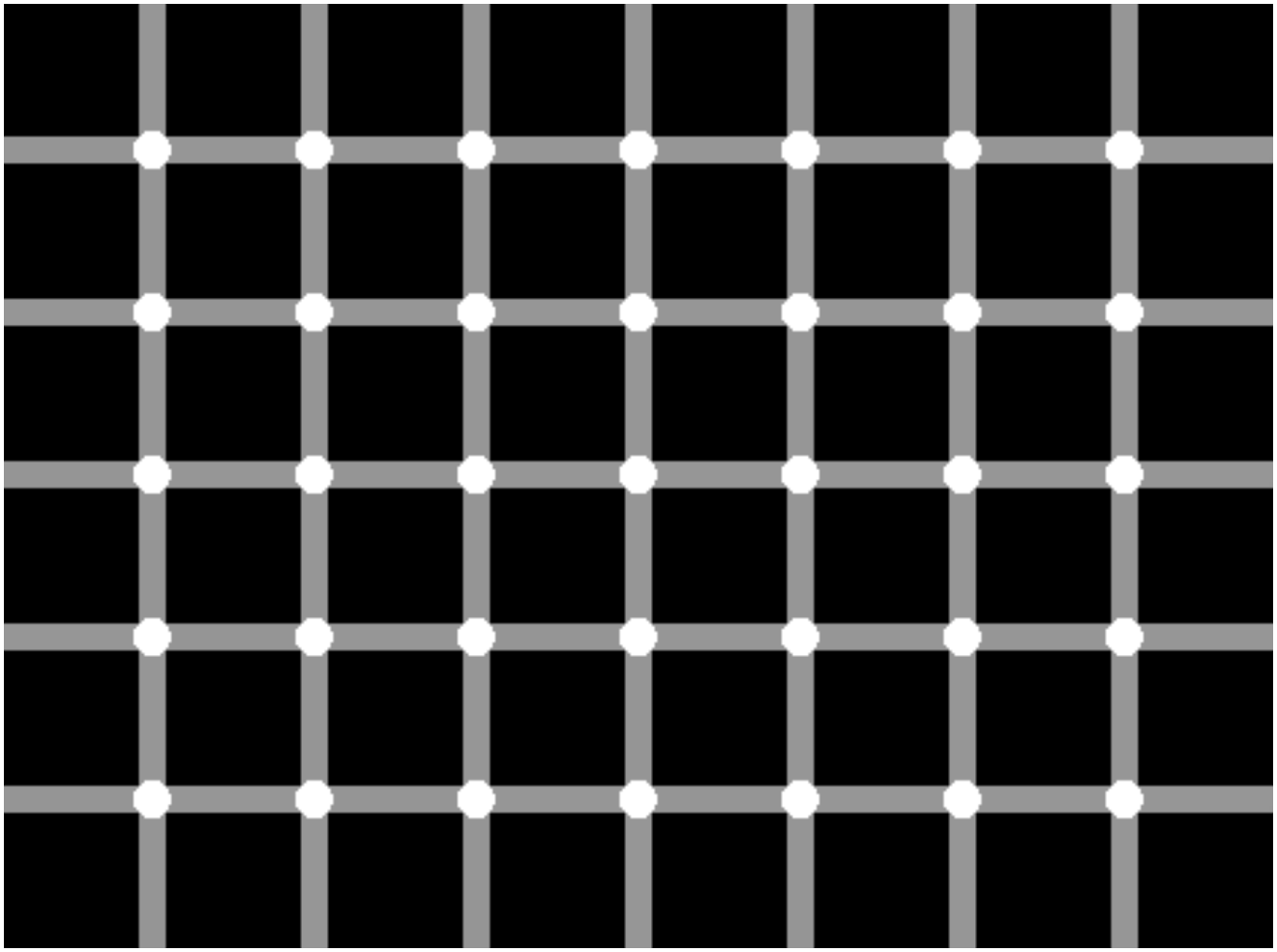
- Almost all higher order features of vision are influenced by expectations based on past experience



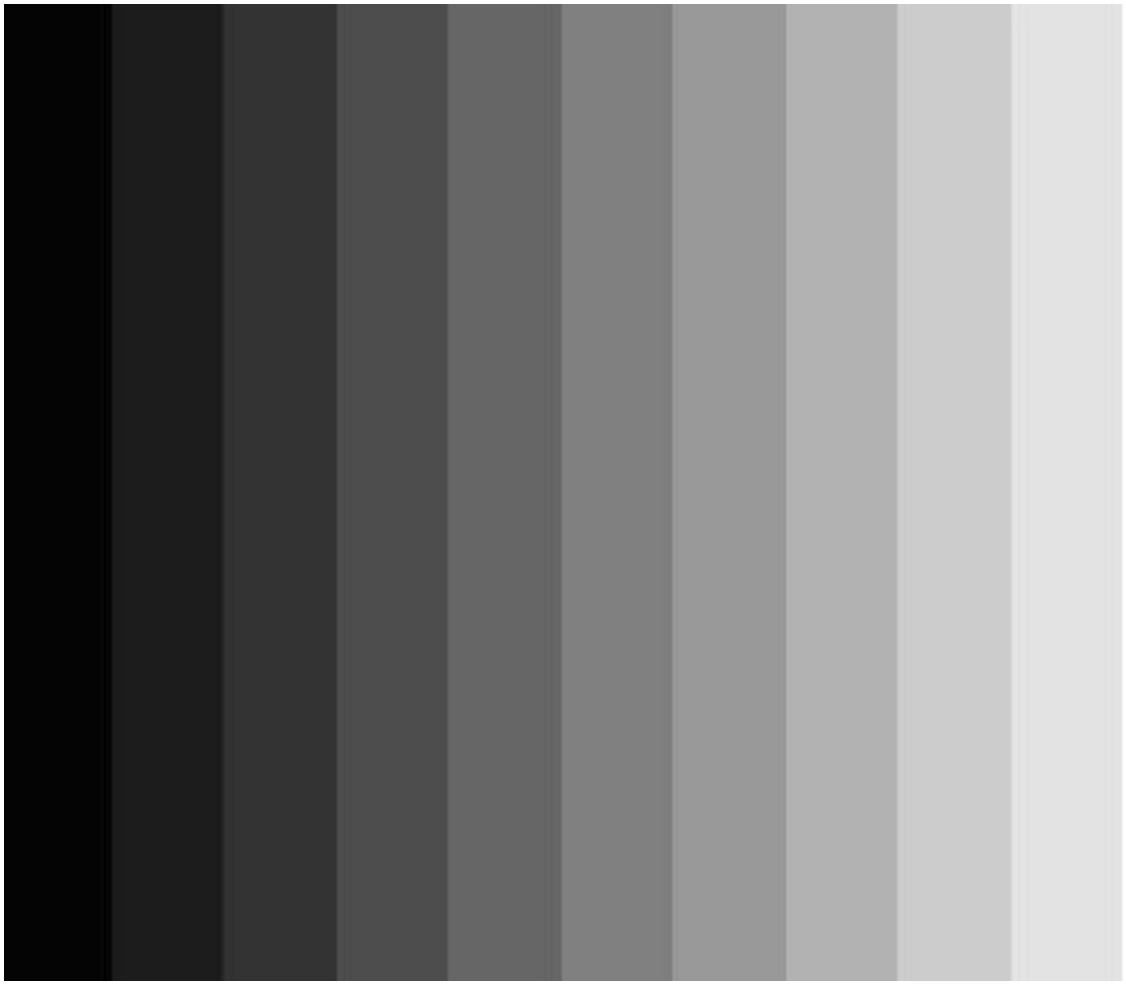
Expectations lead to (optical) illusions

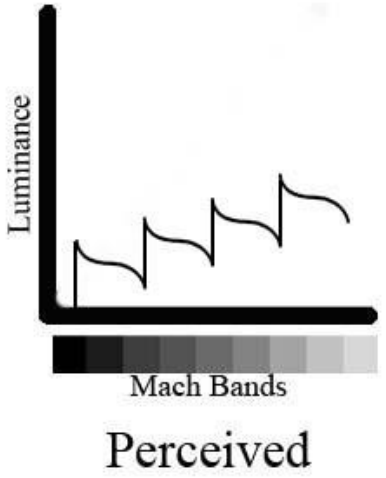
- Optical illusions = visually perceived images that differ from the reality

Hermann Grid

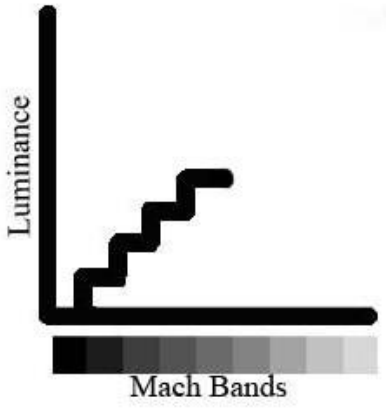


Mach bands



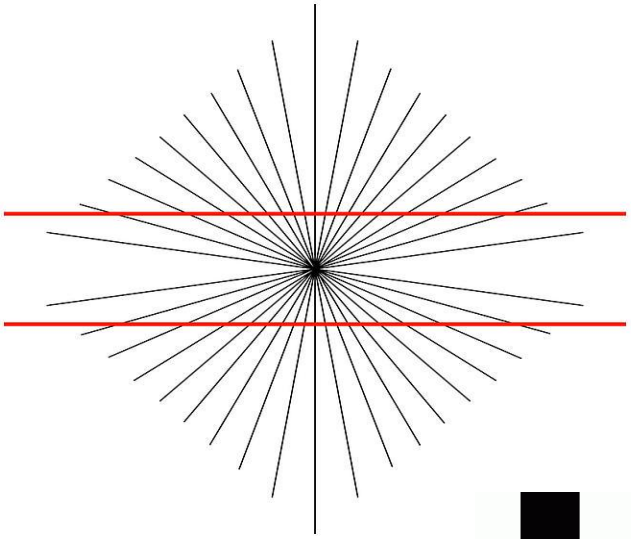


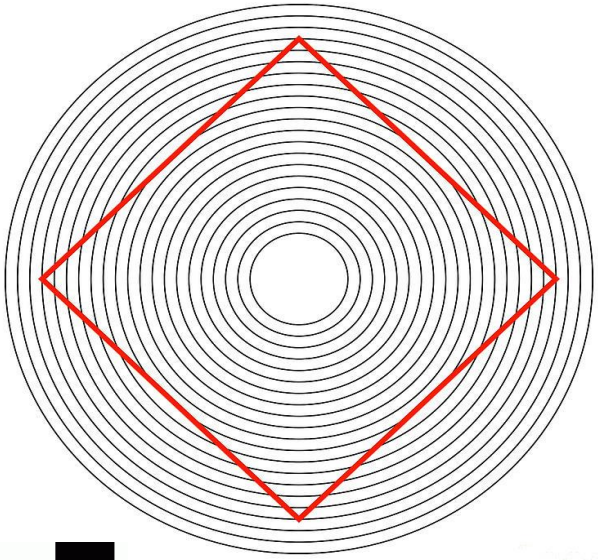
Perceived

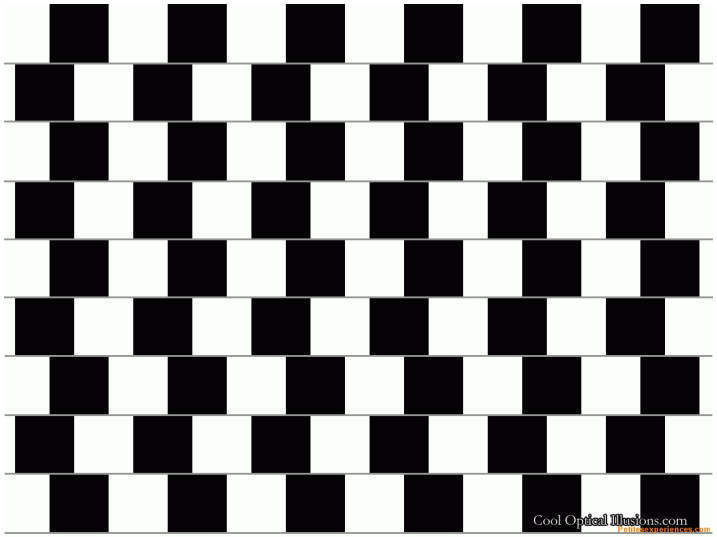


Actual

Geometric illusions





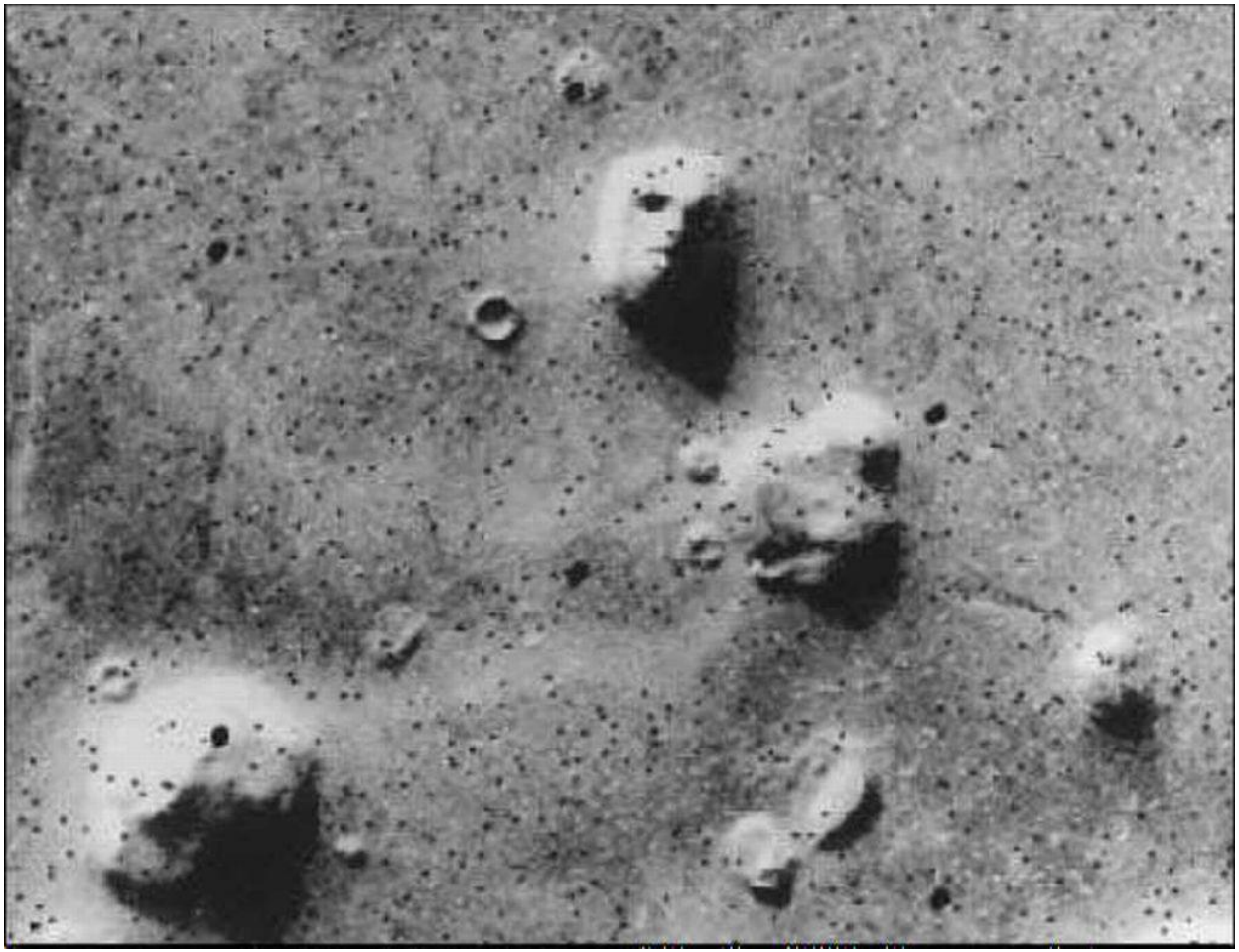


More interesting illusions …

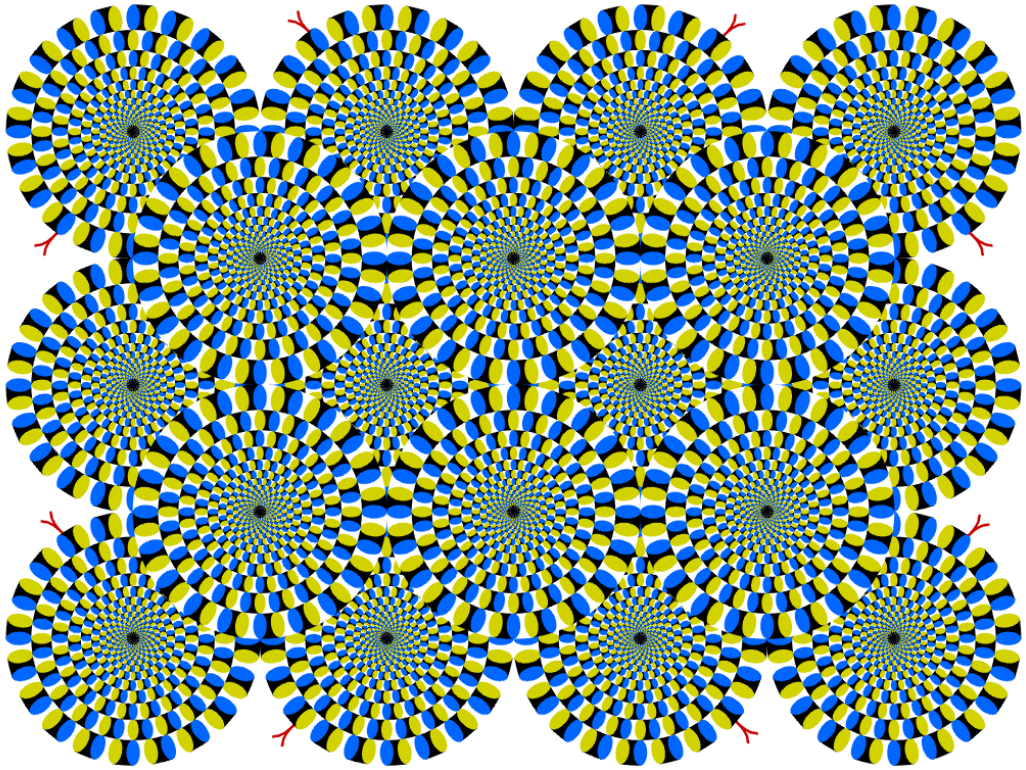
Mars Tomb

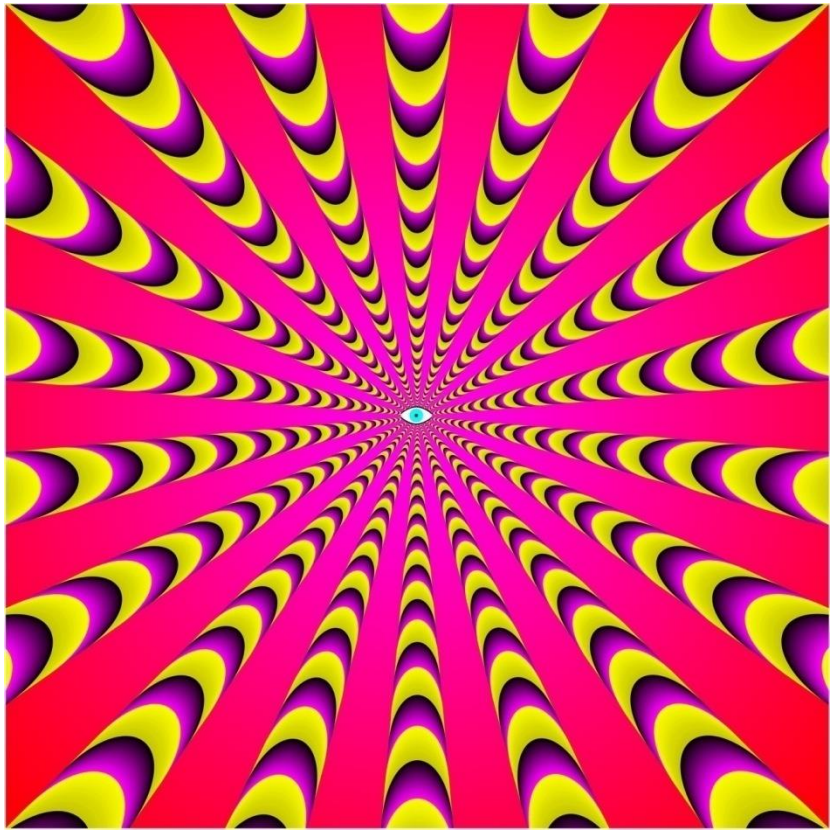
Kofun Era Tomb

Applications in face recognition

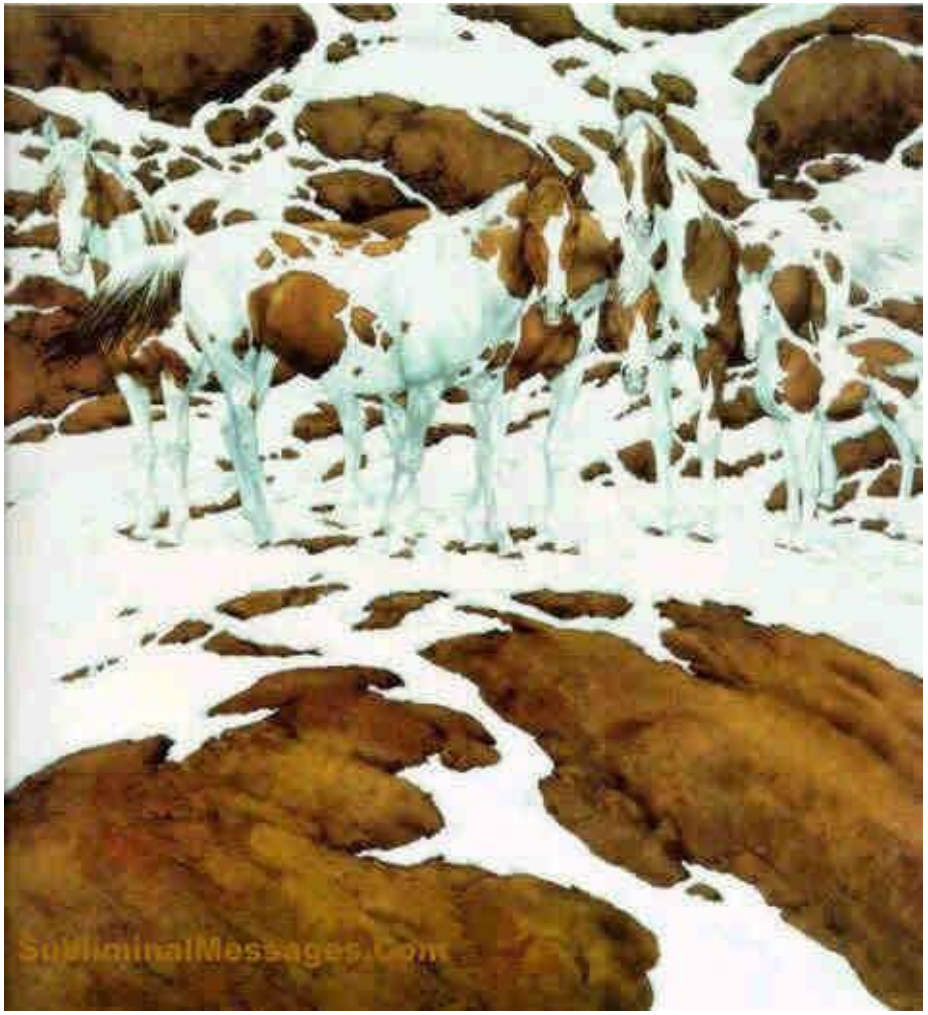


Applications in image understanding

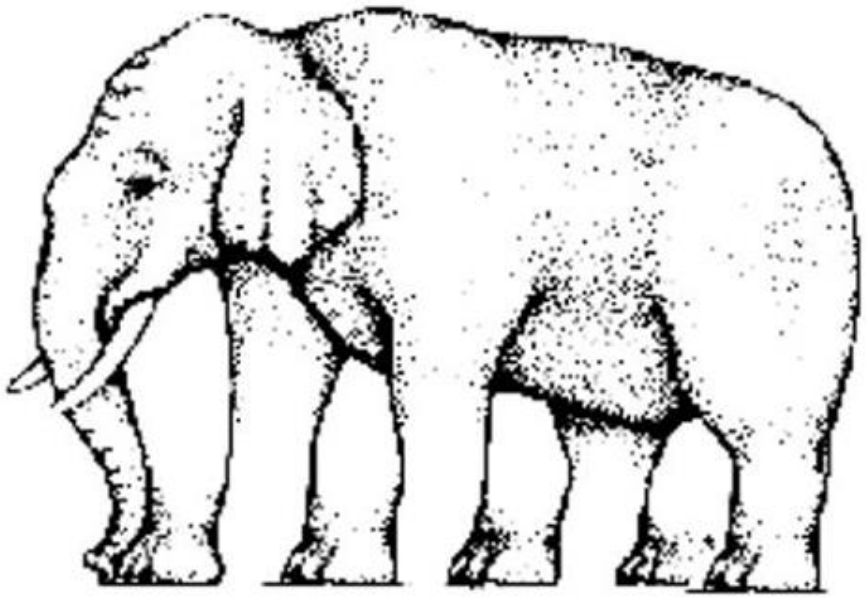


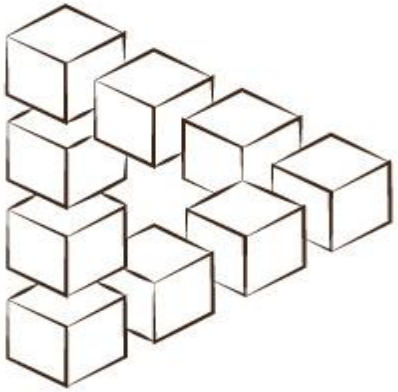


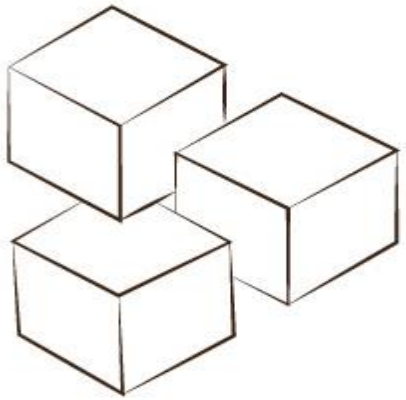
Applications in object detection



Applications to object recognition







Optical illusions lead to a better understanding of the human vision system

- Why? Because we can identify the patterns our mind implicitly uses for understanding images

Better understanding of the human vision system leads to better machine vision

- Why? Because we can develop biology inspired algorithms
- Is there a better vision system than our own?

Additional information

- Great website with lots of visual illusions

  http://www.michaelbach.de/ot/index.html

- Awesome Ted Talk

http://blog.ted.com/2009/10/08/optical_illusio/

Thnak you for yuor attnetoin!

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