Vision, an Optical User Interface
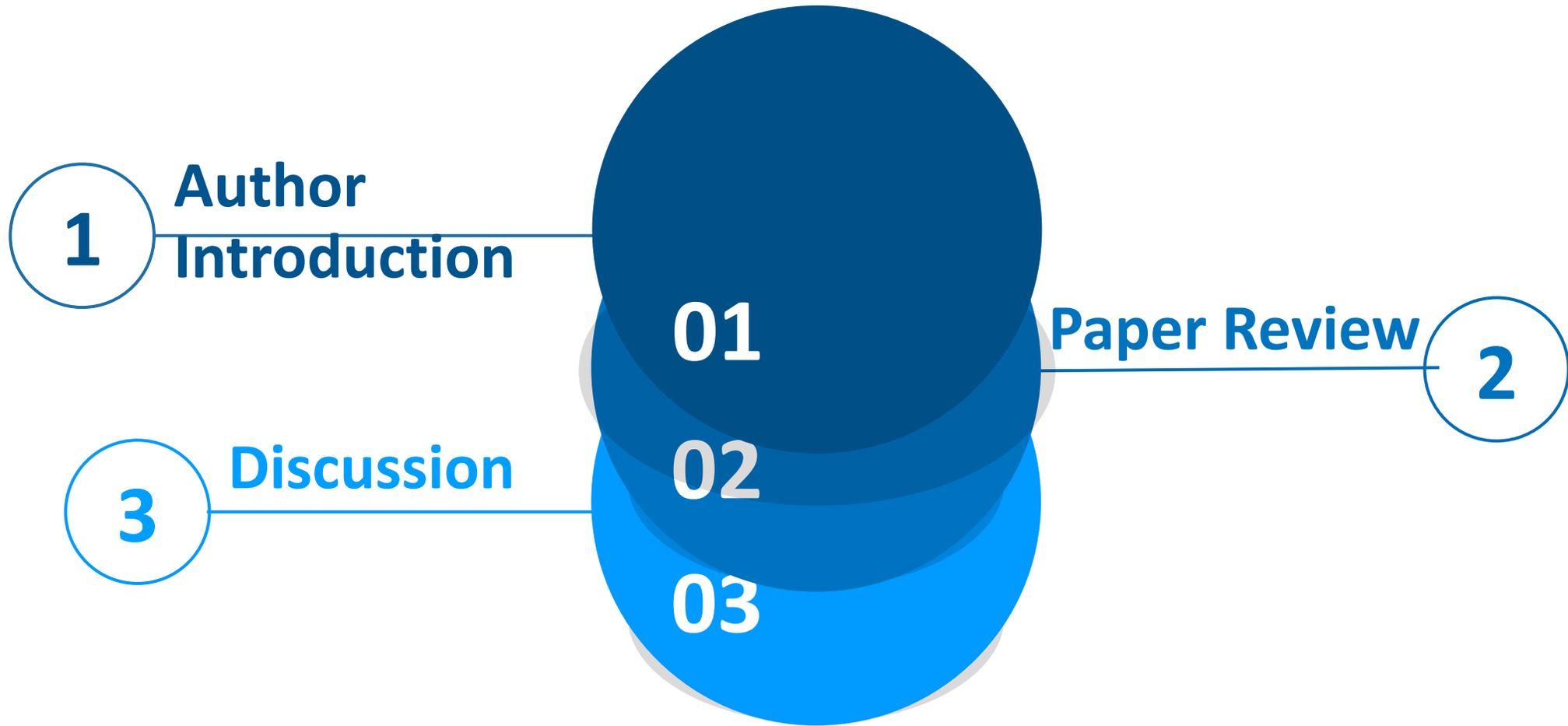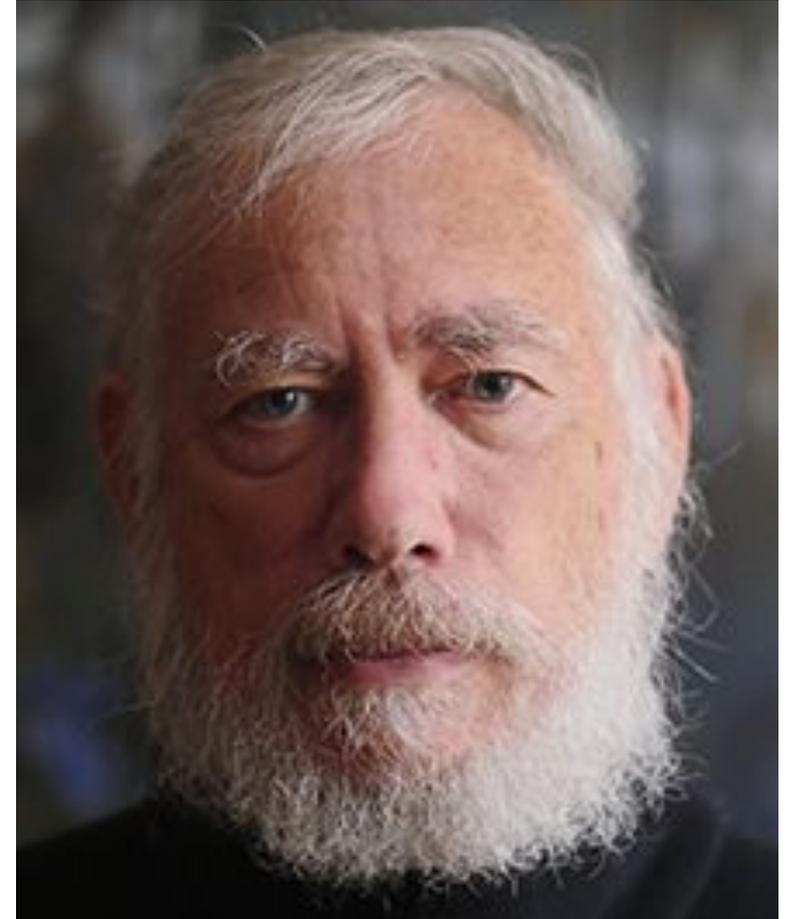
Yuhang Mei and Ruifeng Xu

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1. Author Introduction

Jan Koenderink

- a Dutch physicist and psychologist

- researches interest:
  philosophy of consciousness,
  perception cognitive science,
  ecological physics and machine
  intelligence.

- Books by him:
  Color for the Sciences 2010
  Solid Shape 1990

2. Paper Review

Introduction

What is Vision?

- Type I: electrochemical activity of the brain caused by irradiation of the retina
  E.g. Hartline's work on the Limulus eye
- Type II: optically guided behaviour
  E.g. Von Uexküll's (1909) Outer World and Inner World of Animals
- **Type III:** awareness on opening the eyes in full daylight
  E.g. Kanizsa's (1980) Grammar of Vision

Differences: the awareness of the subject and experimenter

Introduction

How does one study awareness?

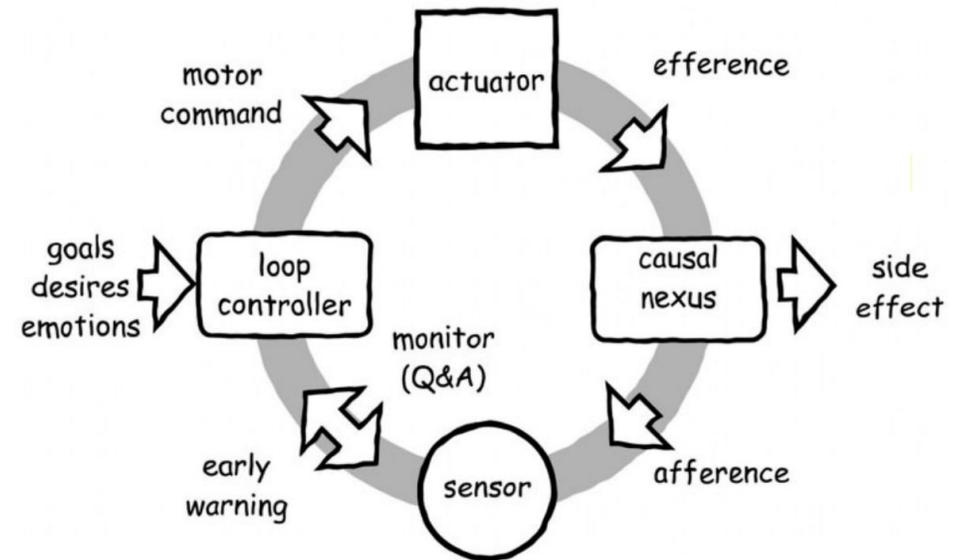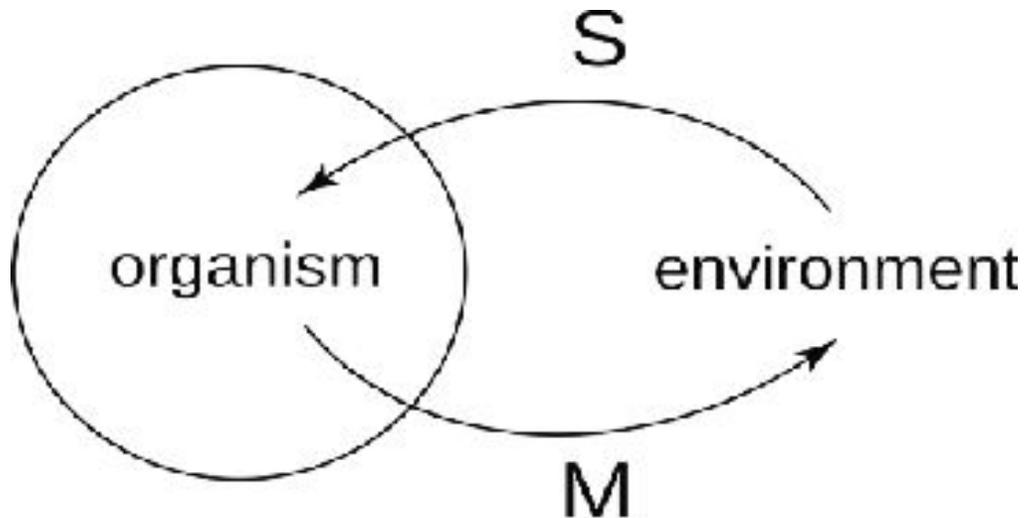Human Psychiatry(for type I and II)
Ethology(for type III):
The Sensorimotor Loop   ->   The New Loop

Loop Controller!

Introduction

A model of psychogenesis:

Habits, Types and Phantasmatic Self-Stimulation

'If I see someone bite a lemon, I cannot help but feel the sour taste on my tongue.'
—- Kant

Psychiatry: Controlled Hallucination
theory of psychogenesis developed by Jason Brown, from the study of various agnosias, discarded the theory of "inverse optics" , proposed "controlled hallucination" or "analysis by synthesis".

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Distributed Awareness
The concept of distributed awareness refers to the idea that awareness is not solely located in one individual or entity, but rather is distributed across various levels and components of a system

How Vision Proceeds

Unit Looking:

- Glimpse: a single beat (almost no awareness)

- Glance: maybe half a dozen beats and includes one or two fixations (the smallest intentional unit)

- A Good Look: one or two dozen beats and includes at least one voluntary fixation

- Scrutiny(not discussed in this paper): involves awareness

Vision as an action !

How Vision Proceeds

The specious present:

'Awareness has "tentacles" that reach out into the future as it were. There are a present of the past and a present of the future, all rolled into the present moment.'

— Husserl's retention and protention

Concrete Actuality:

Ticks:
- Neither see nor hear
- Small
- Live for a long time

Can we call it "blind"?

Brute facts will likely be different!

User Interface Elements and Their Effect on Behaviour

Fixed Action Patterns of Animal Ethology:

swans feeding fishes

warblers treating cuckoo chicks as their young
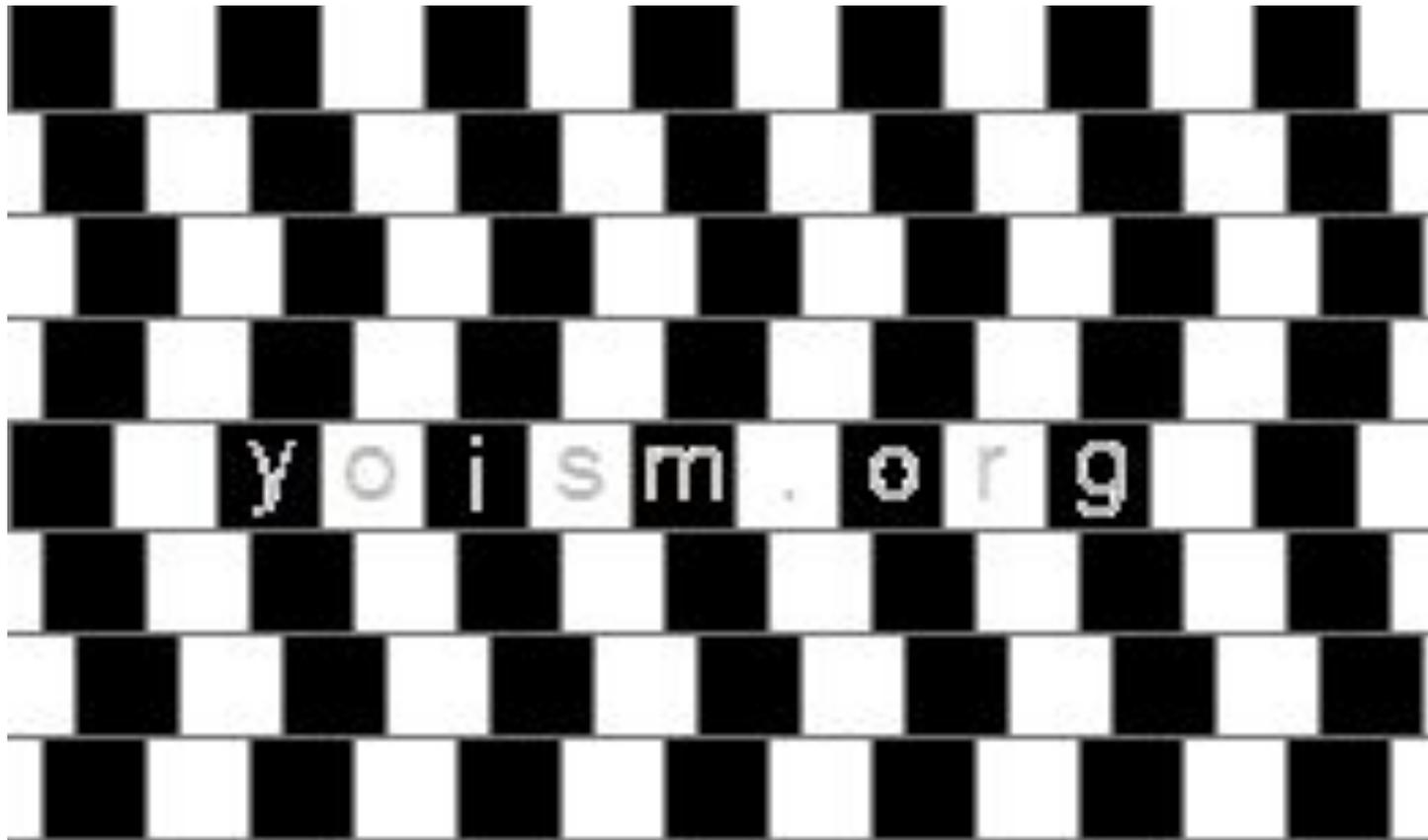

Jewel beetle-beer bottles

stickleback females preferring gross artifacts

User Interface Elements and Their Effect on Behaviour

Ilusion applied to human-beings?

The classical "geometrical illusions," say the "cafe´ wall illusion" (Gregory, 1997)

User Interface Elements and Their Effect on Behaviour

Temporal Coherence through Multimodal Coherence:
Time coherence:

Vicario worked on sequences of two or three tones.

DIH—DAH : high low tone

SZSZ : noise sound

DIH—SZSZ—DAH has the same experience as DIH—DAH—SZSZ!

Spatial Coherence:

watch the nose part

Space

The Notion of a "Point":
 "A point is that of which one ignores the parts."

Canvas, Blackboard, image
The "blackboard" is the collection of samples, and is considered a representation of the optical structure at the eye.

"brushes" are described as actuators that add local touches to a "canvas," which is considered the visual field of awareness.

Space

Scale-Space:

A way of representing visual information by sampling it at multiple scales.

Laplacian Scale-Space:

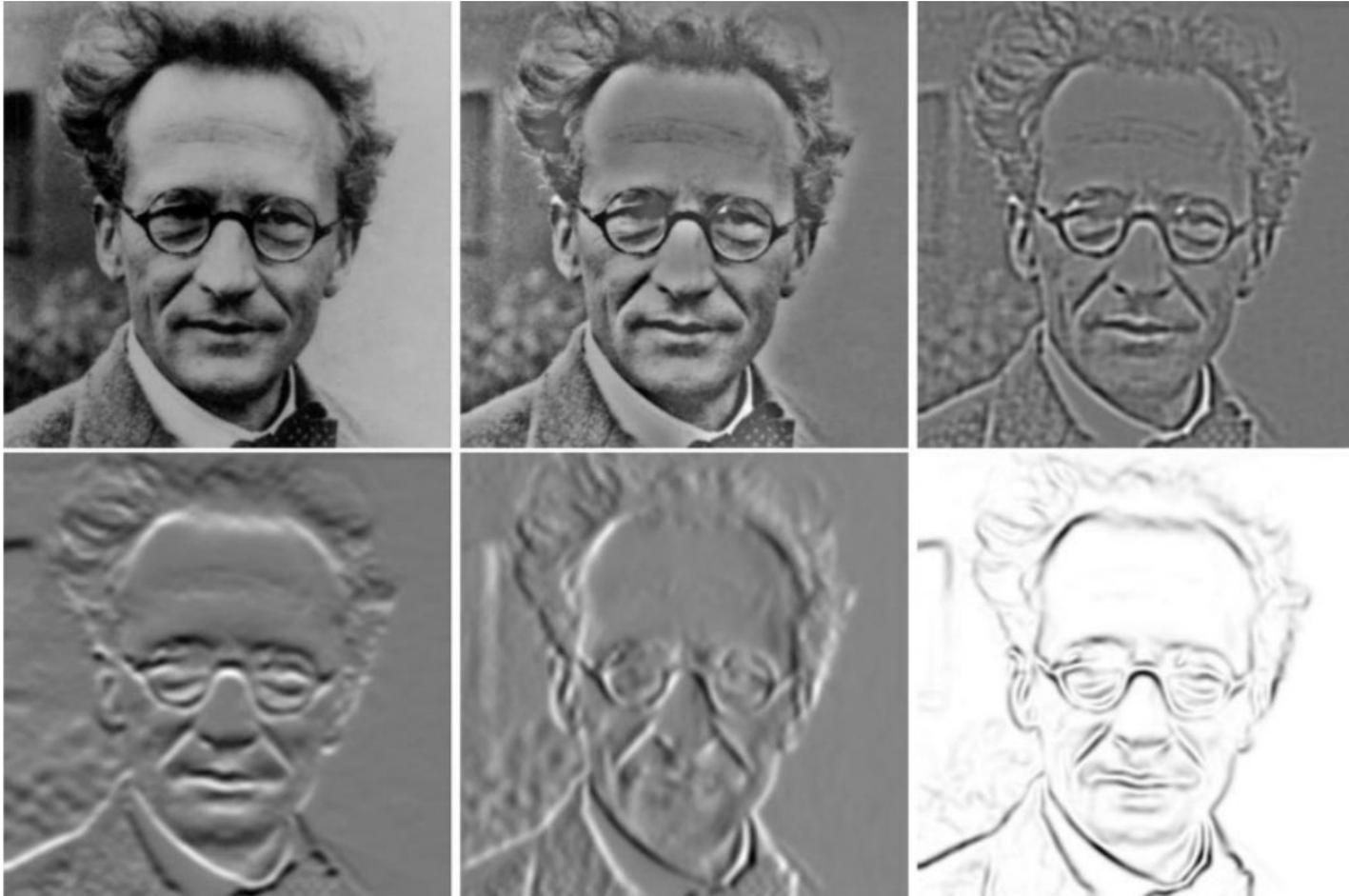Get rid of redundant data

Atlas Model:

a model to understand the Scale Space model.
-lower resolution: leave out results
-higher resolution: reveal novel results

Space

Edge detector vs Laplacian Space Filter

Space

Local sign issue:

- use sensorimotor map to set up a system of local signs

- small random eye movements may "sniff out"

- precise topology in a small fixed area, unmanageable on the large area

Qualia Dimensions

Fiber Bundle:
base space + fibers(another space copies)
+ cross section(intersection of base space
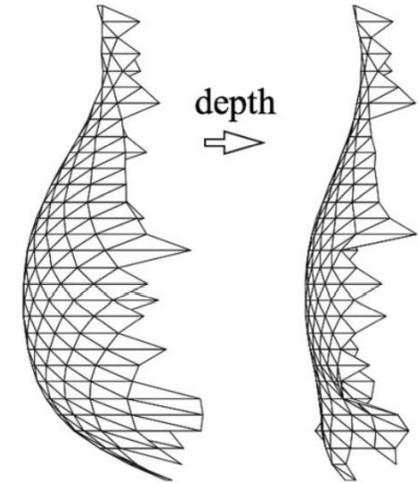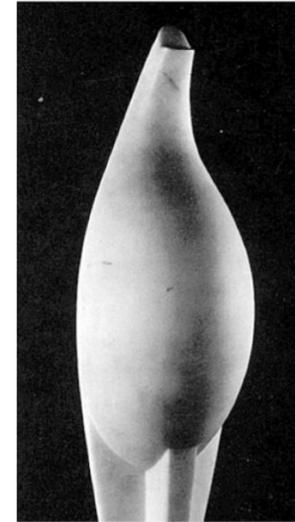and fibers)

Example:
base space: "pictorial space"
fibers: "depth"
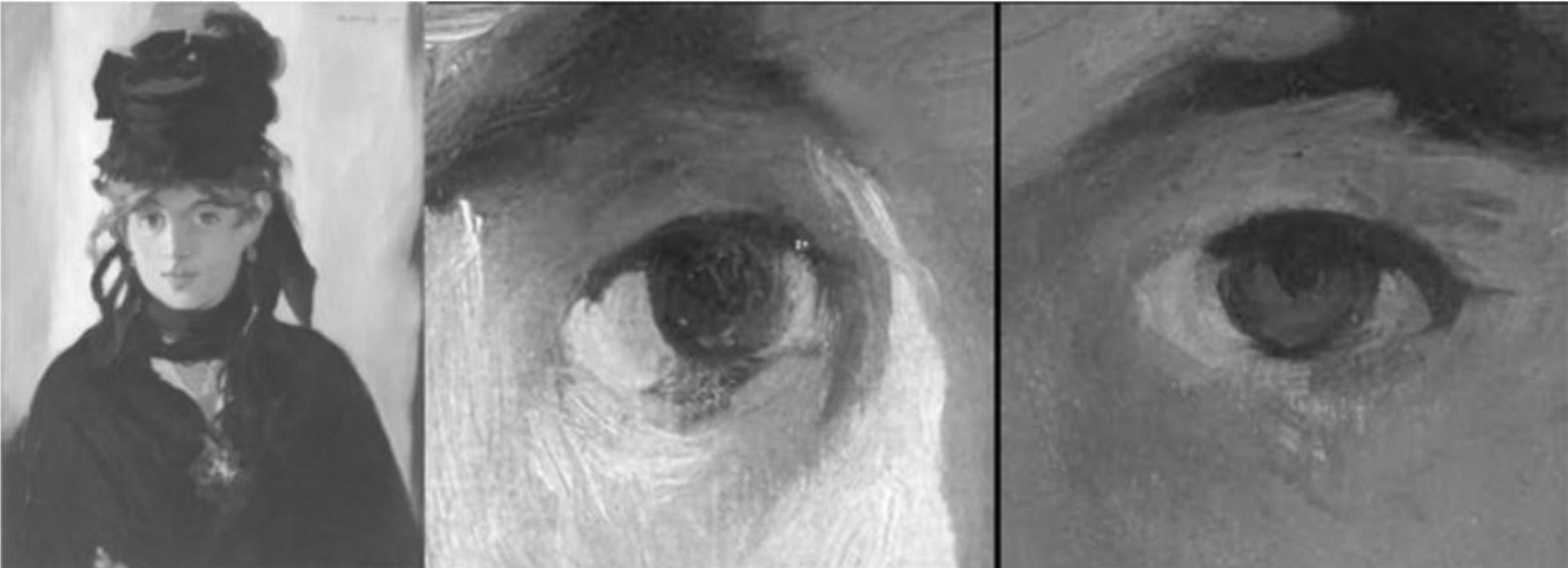cross sections: "pictorial reliefs"

fibers:"grey tones"
cross sections: monochrome images

Heterotopic Areas

Local processing vs global processing:

sometimes global processing does not make sense.

Example: shape from shading (SFS)

3. Discussion

Discussion

Piazza:@25_f1

In the conclusion section of this paper, the author said that "I failed to specify any algorithms that would enable you to compute the layout of the scene in front of you on the basis of the optical data and it is impossible.".

Do you agree with the author's statement?

Student1: he disagrees with the author because definition of things will be different according to what we define. But he also agrees that there is not optical data at all.

Then the professor claims that the author expresses language as someone way Kant does, which we might find it difficult for reading. But our challenge is: where is the gold? The author has substantial reputation in perception field. It must have gold for us to dig out.

Student2: agrees that the paper has dirt. If the optical data exists, how can we gather it?

Student3 states assumption that optical data not exist from the view of insects but optical data will exist in terms of human-beings.

Student4 agrees with the author that writing an algorithm for processing optical data is hard. However, he discards the point that optical data is not exist.

Student5 mentions that we might use 20 questions loop to generate optical data.

Student6 disagrees with the author because he thinks proof by existence is not a good idea.

Student7, algothm from human brain. Frequency of light. Limited. Cannot print truth.

Student8 also agrees that optical data does not exist.

Discussion

What is the most inspired point in the papar to apply in Computer Vision field?

Yuhang: attention mechanism, hard attention, soft attention, what you need , matrix, value 1, 0. Soft attention in an area.
Connection with other papers?
Student10: proposes that for the café wall illusion, if we pay attention to a single square, the illusion will weaken or be eliminated.
Student11: gives a new point that from beetles' view it would not be an illusion. It is unfair for them to put our human's thought on them, since we have reference.

Reference

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Thanks for your listening!

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