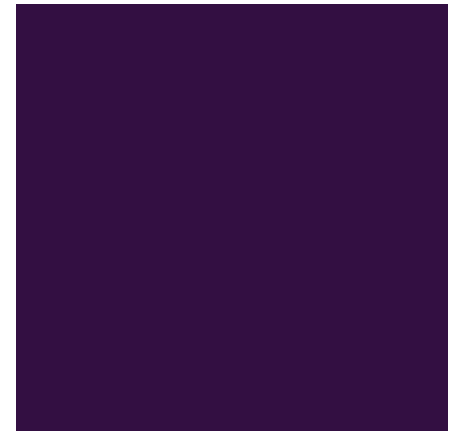
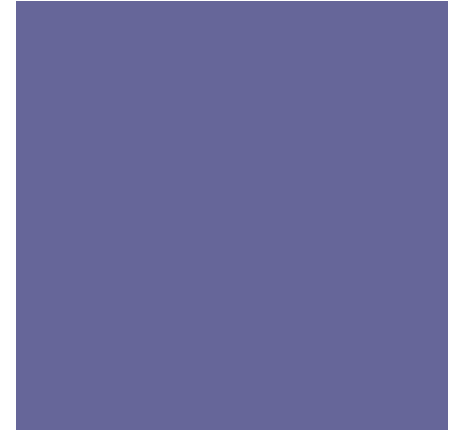


# Constraints: *visual object recognition*

Popov Vsevolod



# Glossary



- Object recognition – распознавание объектов
- Edge-based description – описание объекта по его краям
- Primal sketch – первоначальный (грубый) эскиз
- Vertexes – вершины
- Surface normals – нормали к поверхности
- 2.5D sketch: 2D эскиз с нормальями

# Glossary



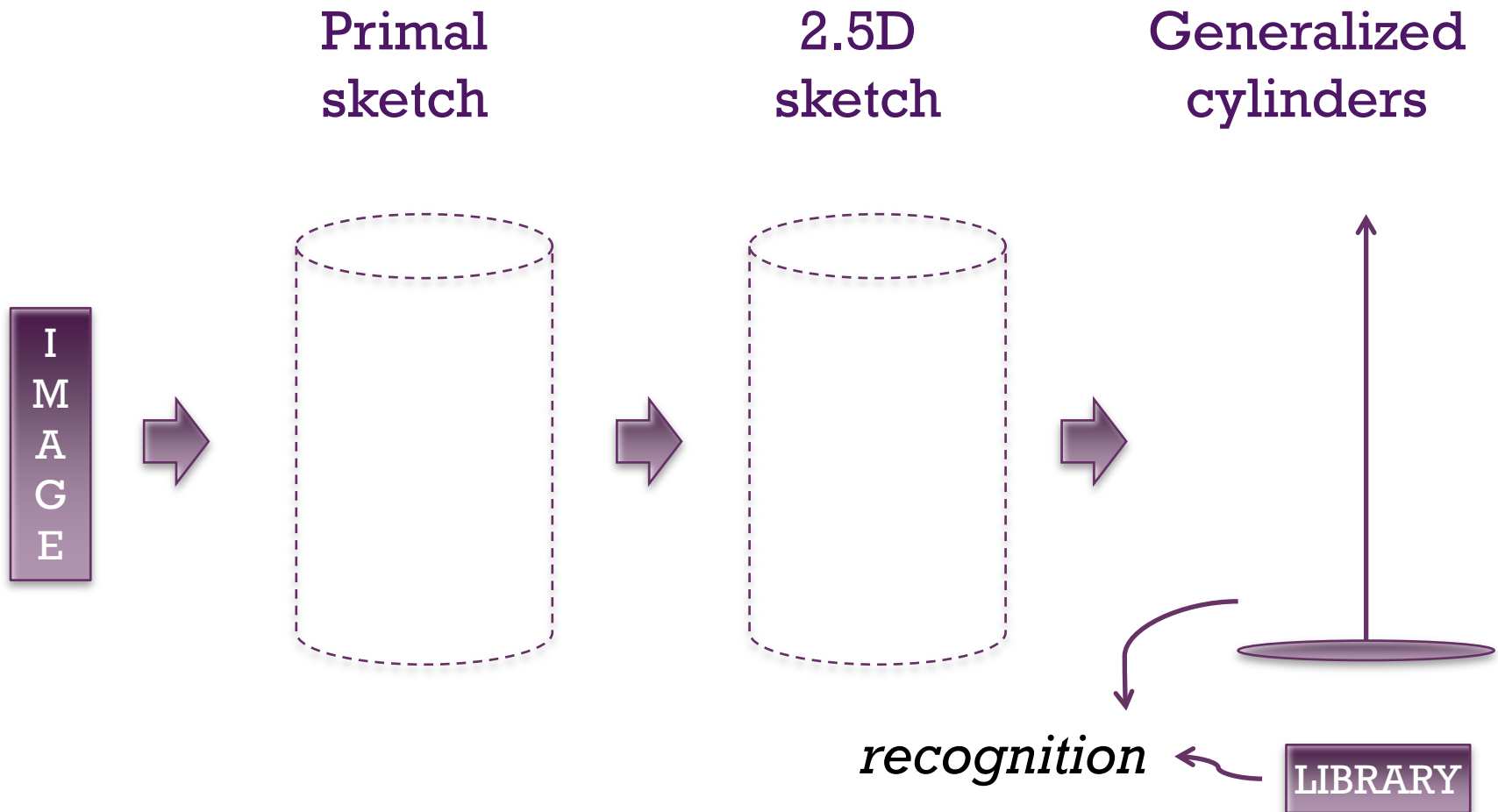
- Face – грань
- Generalized cylinder – обобщённые цилиндры
- Alignment theory – теория выравнивания
- Orthographic projection – ортогональная проекция
- Basis set – базисный набор
- Goldilocks (Rumpelstiltskin) principle – принцип Златовласки

# Content

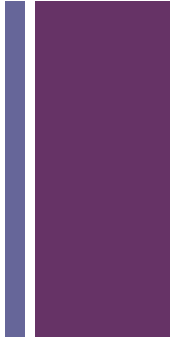


- David Marr: representational framework  
(based on transformation of representational apparatus)
- Shimon Ullman: alignment theory  
(corresponding points)
- Shimon Ullman: Goldilocks principle  
(correlation)

# Representational framework



# Representational framework



## Disadvantages:

- Hard to do
- Produced generalized cylinders are too coarse

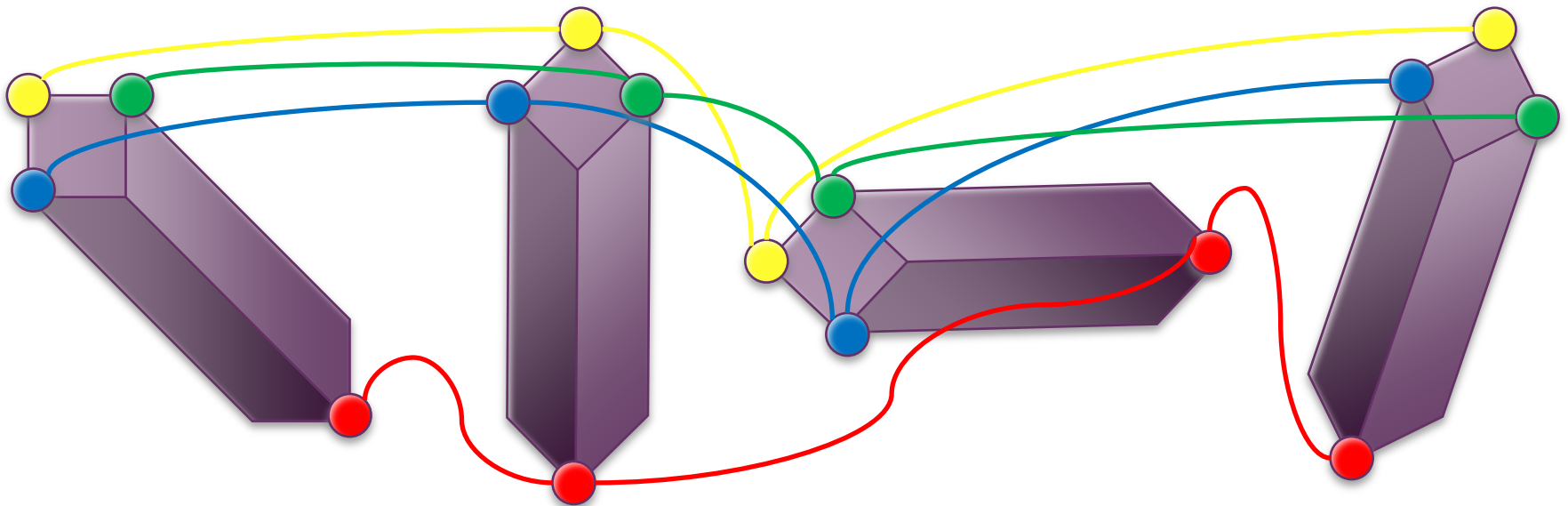
# Alignment theory

A

B

C

Unknown



●	$X_U = \alpha * X_A + \beta * X_B + \gamma * X_C + \tau$
●	$X_U = \alpha * X_A + \beta * X_B + \gamma * X_C + \tau$
●	$X_U = \alpha * X_A + \beta * X_B + \gamma * X_C + \tau$
●	$X_U = \alpha * X_A + \beta * X_B + \gamma * X_C + \tau$

We can generate the points in some 4<sup>th</sup> (Unknown) object from the points in three sample objects (A, B, C) with linear operations

# Alignment theory



## Disadvantages:

- It doesn't work fine on natural objects

## Conclusion:

Alignment theory works great in some circumstances (manufactured things with identical dimensions)

**BUT**

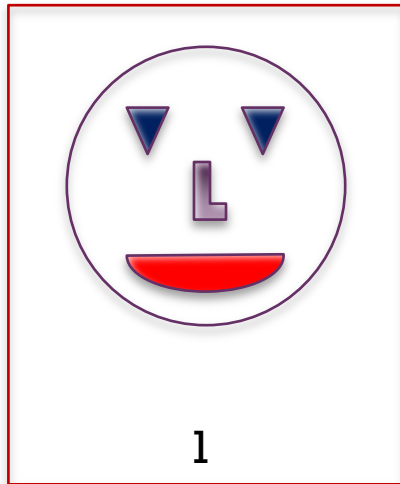
it doesn't seem to solve the whole recognition problem.



# Goldilocks principle

Pre-recorded LIBRARY

unknown



Does the whole face #1 correlate with face #3 or face #4?  
**NO!**

# Goldilocks principle

Pre-recorded LIBRARY

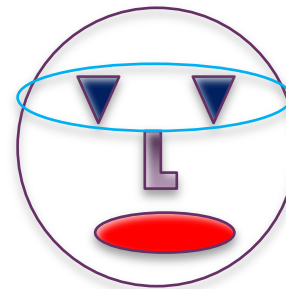
unknown



1



2



3

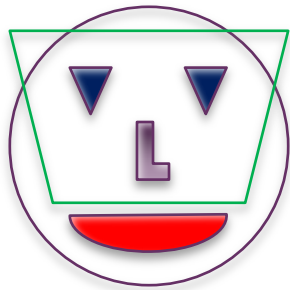


4

If we're looking for eyes of face #1,  
than we have got these eyes everywhere (3,4)

# Goldilocks principle

Pre-recorded LIBRARY

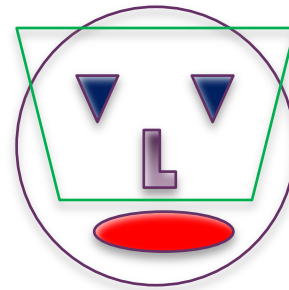


1



2

unknown



3



4

We DON'T look for:

- **big** features (whole faces)
- **small** features (individual eyes)

We LOOK for:

**intermediate** features  
(two eyes and a nose)

# Goldilocks principle

- How do we go about finding the exact face?

Answer is:

we use maximization function and it gives a very big number if there is a correlation and a very small number if there isn't.

Main problem:

How can we visually determine what's happening, **actions**...?



Thank you  
for your attention!