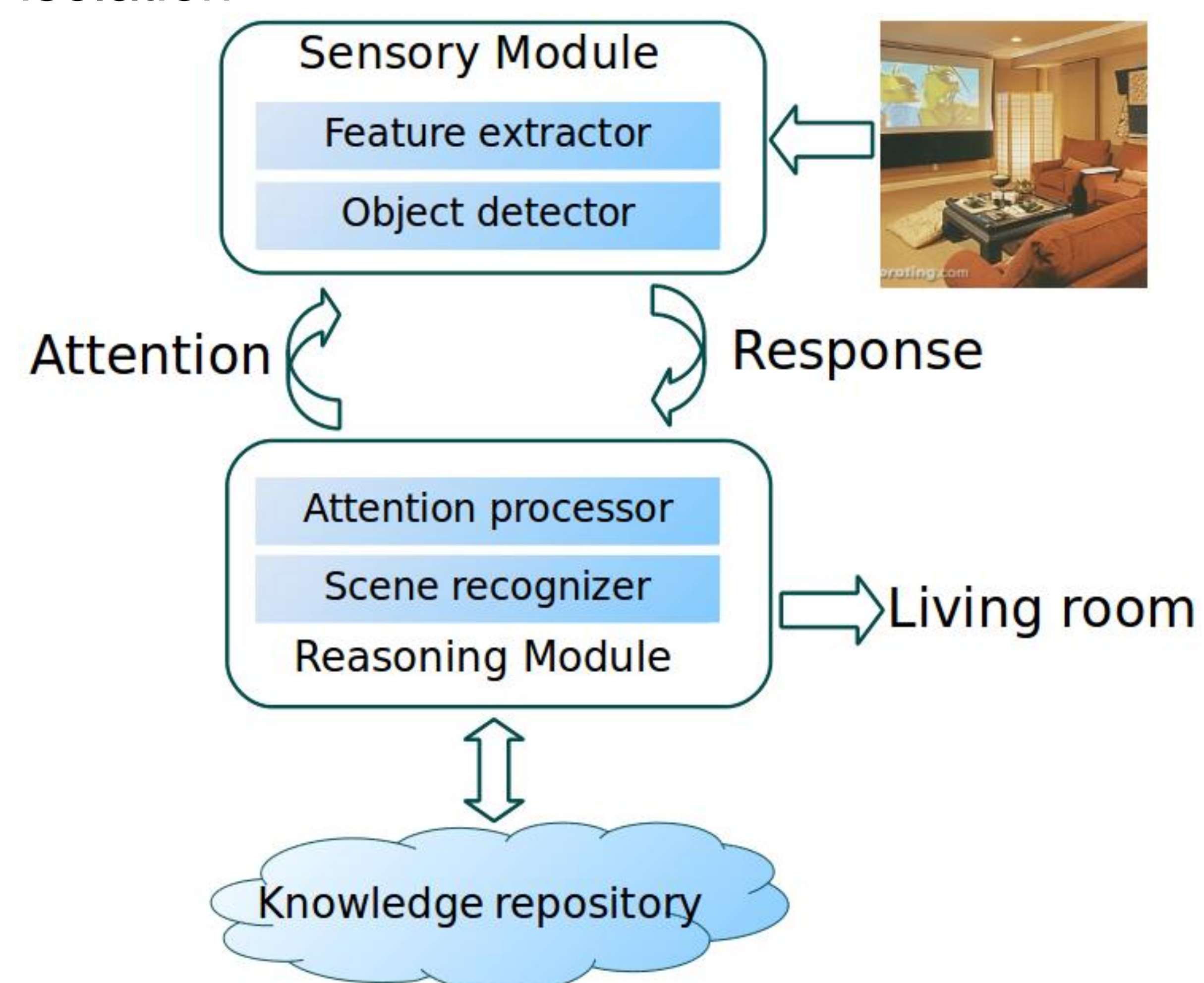


Overview

- Inspiration in biology
 - In nature, vision is used by systems that are active and purposive
 - Human perception is active and exploratory
- Motivation in computer vision problems
 - Many problems require complicated formulations and/or under-constrained if we study visual perception in isolation



Recognizing Static Scene

1. Scene recognition by object detection

$$P(S|X) = p(S|d_{1:k}, l_{1:k}) \\ \propto p(d_{1:k}, l_{1:k}|S) \\ = p(d_{1:k}|S)p(l_{1:k}|S)$$

2. Detecting objects by the sensory module

- a) Spatial Pyramid Matching
- b) Discriminatively Trained Part Based Models
- c) Texture classifier by Hoime

3. Attentional instruction from the reasoning module

$$\{O_k^*, L_k^*\} = \arg \max_{O_k \in \tilde{\mathcal{N}}_{k-1}, L_k \in \mathcal{L}_k} I(S; d_k, l_k | d_{1:k-1}, l_{1:k-1})$$

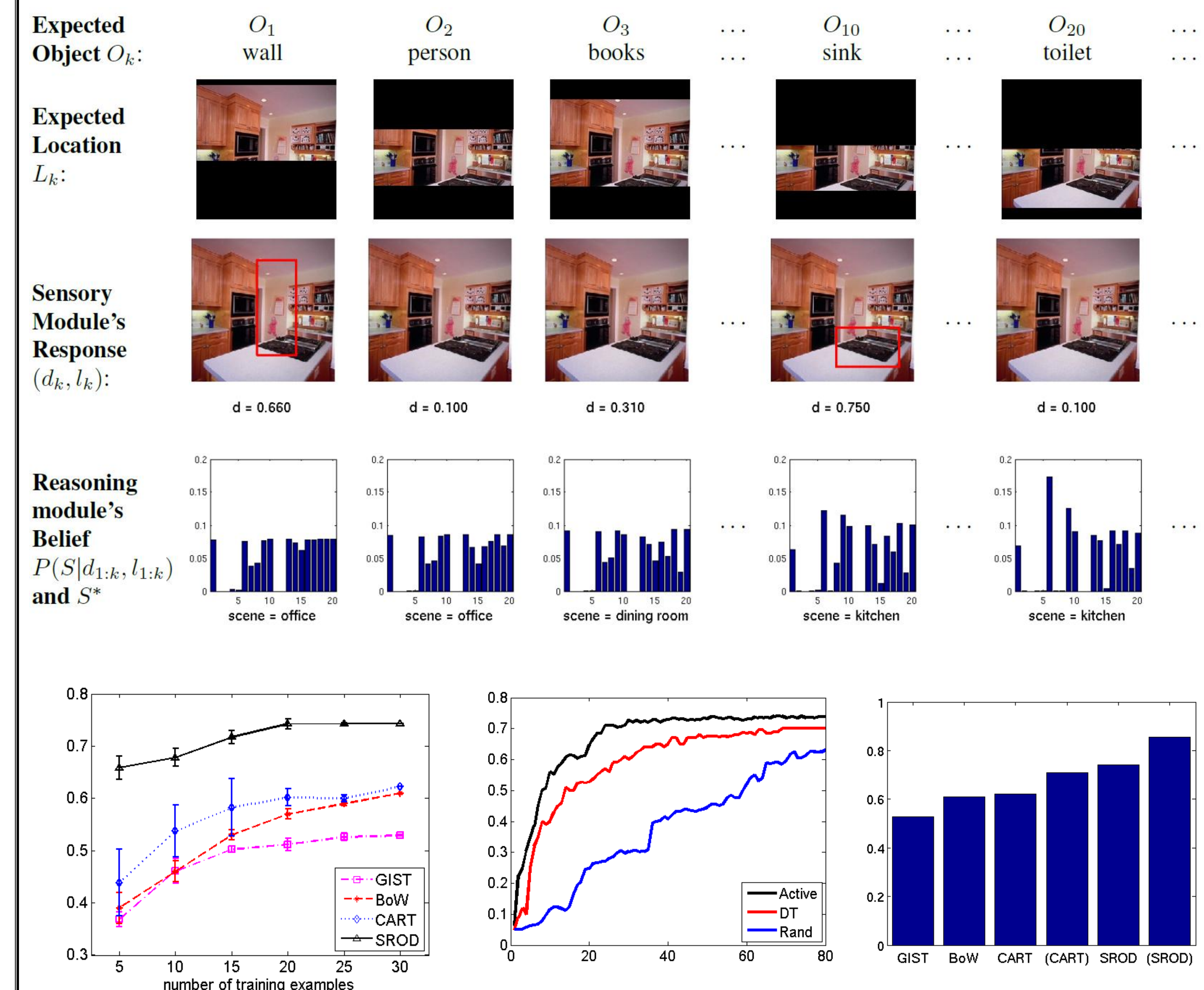
4. Initializing the interaction

- a) Select the object at time 1 with maximum information gain

5. Terminating the interaction

- a) Stop after a fixed number of iterations
- b) Stop when the information gain of the new object is below a threshold

Results



Dataset

□ Static scene: SUN20 Image Dataset

- A subset of SUN dataset including 20 scene classes and 127 object classes
- Each scene class has 30 training images and 20 testing images

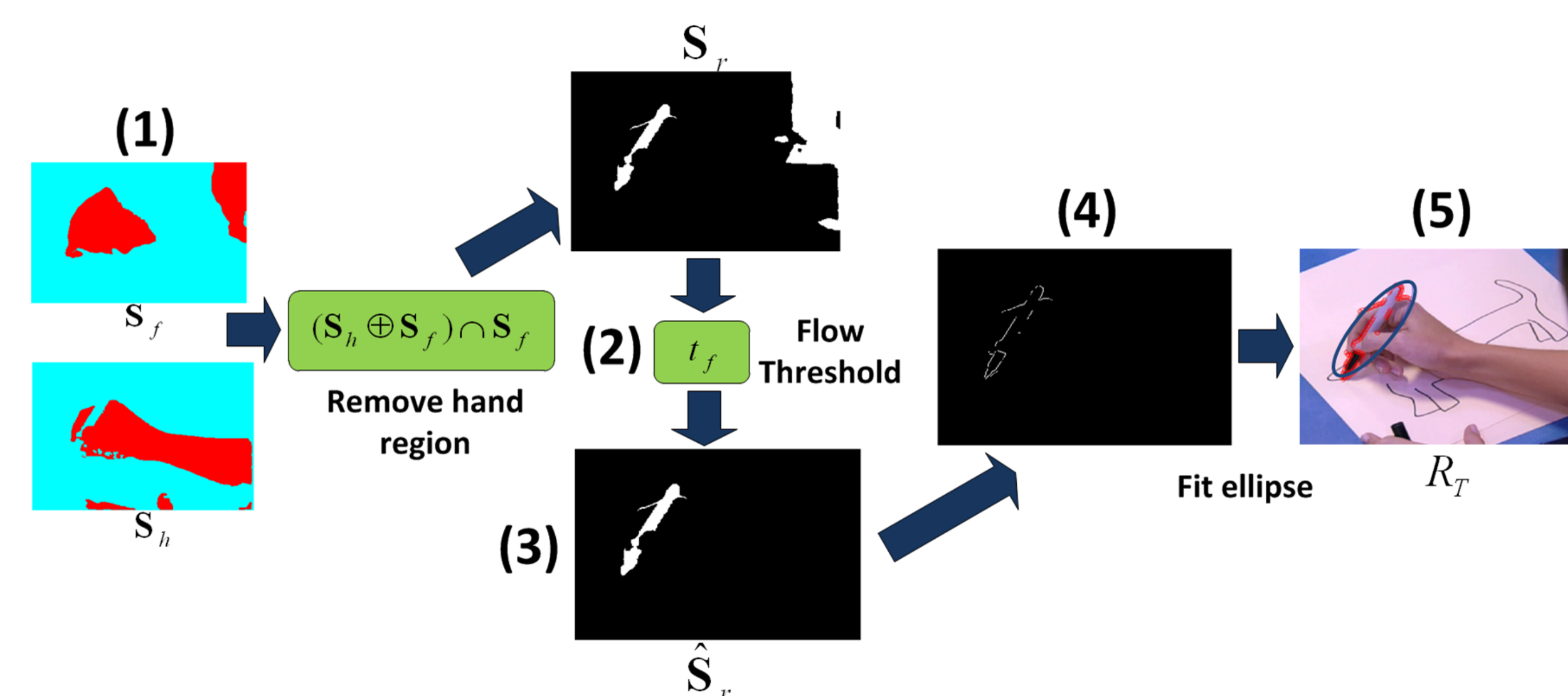
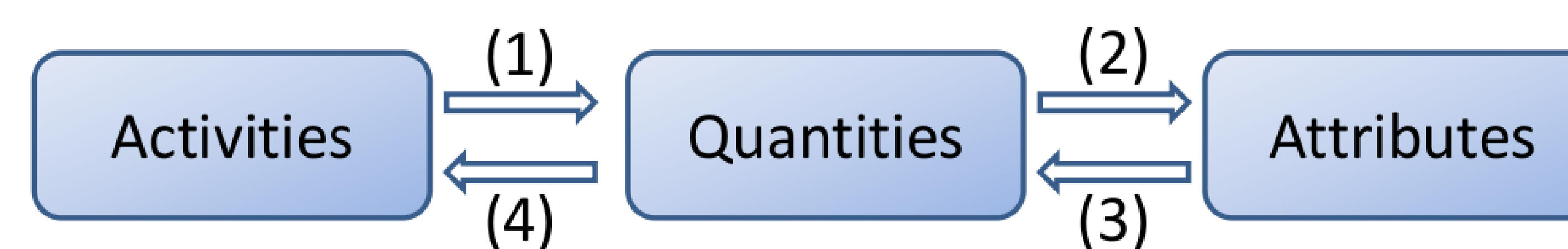


□ Dynamic scene: Sprout Video Dataset

- 30 Videos from PBS Sprout handcraft show including 5 classes of hand activities
- 4 motion attributes and 4 tool attributes



Recognizing Dynamic Scene



Iteration	1	2	3	4
Expected quantity	Tools	Tools	Tools	Motion
Expected attribute	Elongation	Color	Texture	Duration
Sensory module's response	0.770	1.000	0.656	0.813
Reasoning module's conclusion	Coloring	Painting	Painting	Painting
Reasoning module's confidence	0.257	0.770	0.865	0.838

Future work

- Relax the independent assumption among attributes
- Propagate the belief of scene to previously detected attributes
- Test on larger dataset to investigate the impact of the proposed active scheme