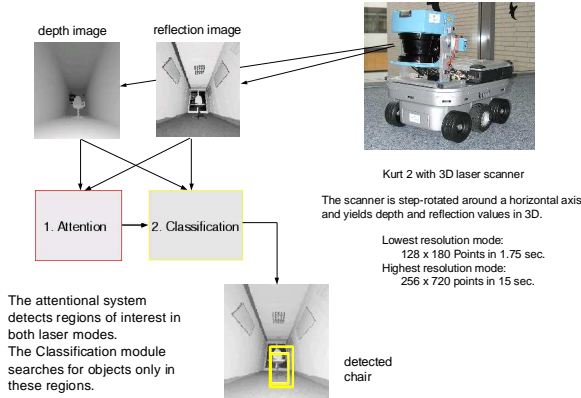


# Focussing Object Recognition on Regions of Interest

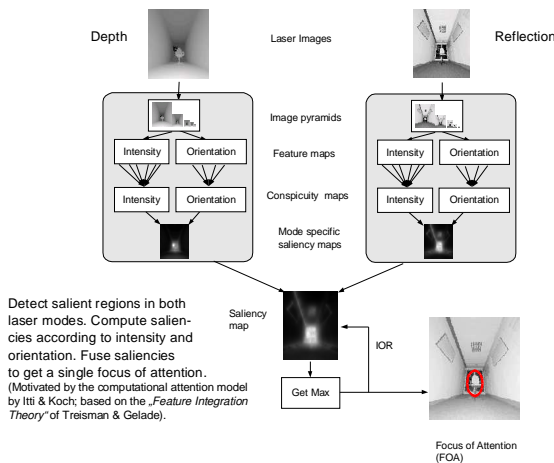
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## Motivation:

**Challenge:** Detect objects in laser data supported by attention.



## The Bimodal Attention System



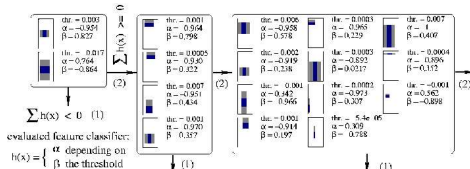
## Classification

Classification of objects according to Viola & Jones:  
 - Compute 6 Basis features with *Integral Images* in constant time:



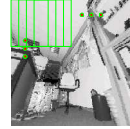
- Train with *Ada Boost Algorithm* on 200 images of office chairs.  
 - A cascade achieves a high detection rate and a low error rate.

### The Chair Cascade:



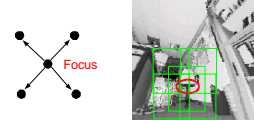
## Object detection:

Search for object in specified search window (20 x 40 pixels).



**Usual approach (uninformed search):**  
 Scan whole image with search windows.  
 Time consuming, specially for many object classes!

**Our approach (attentive search):**  
 - Detect regions of interest with attention.  
 - Determine 5 starting points for classification from each focus.  
 - Search for objects in the neighborhood of these points (30% of the image!).



## Results:



Classifier detects almost all focussed chairs: 14 test images with focussed chairs, in 13 images the chairs are detected by the classifier. (Viola&Jones: Classifier achieves detection and false positive rates equivalent to the best published results).

Classification: 200 ms for the uninformed search (Pentium IV, 2400 MHz)  
 60 ms for the attentive search (30% of uninformed search)  
 230 ms for the attention system

m	uninformed m * 200 ms	attentive 230 + m * 60 ms
1	200	290
2	400	350
3	600	410
4	800	470
5	1000	530

=> for more than one object class the attentive search is useful!

## Future work:

- 1) Extend the model to combine laser and camera data:
- 2) Integrate *top-down influences* depending on the robot's task,  
 e.g.: (task = find an object to grasp) => increase depth influence  
 (task = detect a red poster) => increase color influence

## References:

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**Acknowledgements:** We thank Joachim Hertzberg and Erich Rome for supporting our work.

