

visual attention

jelena ristic

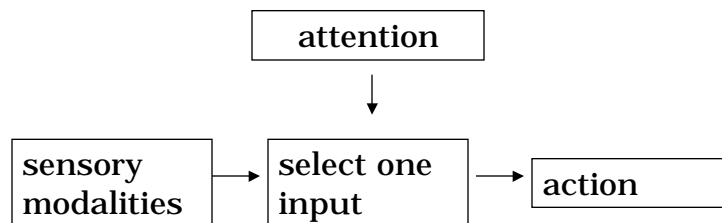
what is attention?

Everyone knows what attention is. It is taking possession of the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought.

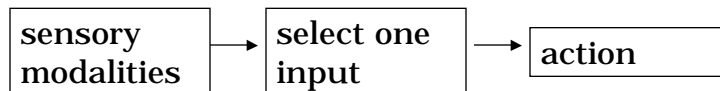
William James, 1890.

what is attention?

active selection of information available through our sensory channels.

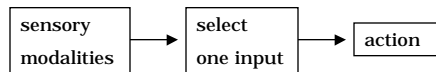
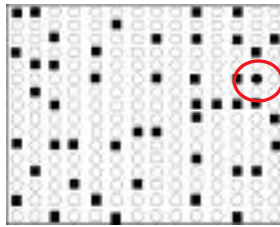


the input



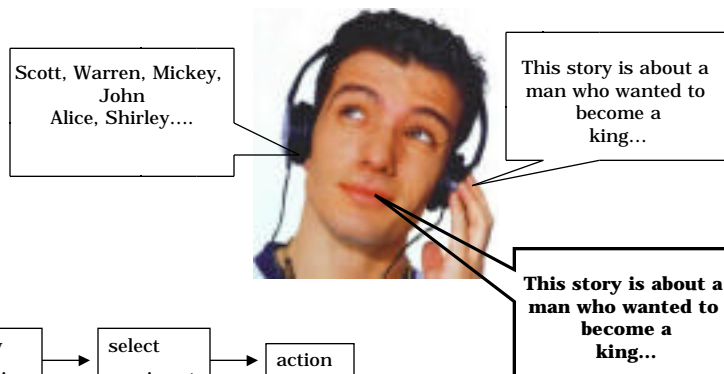
the input: attention within a modality

- vision



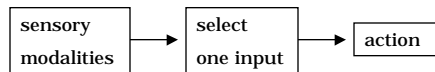
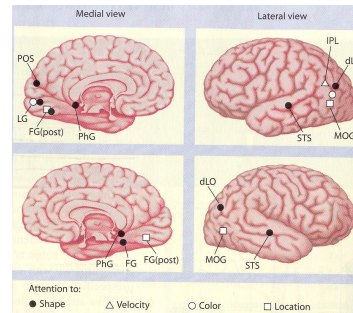
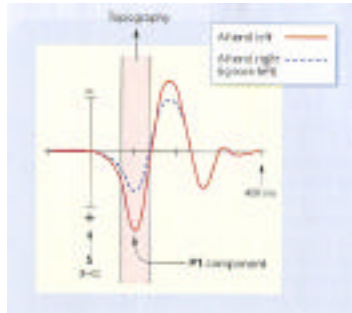
the input: attention within a modality

- audition



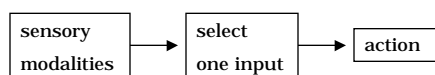
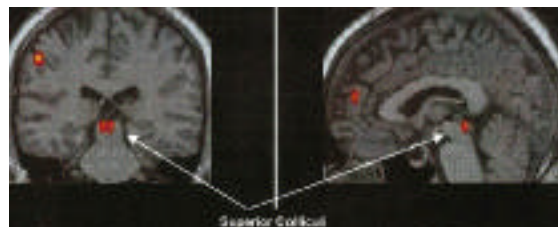
the input: attention within a modality

- attention boosts perceptual processing

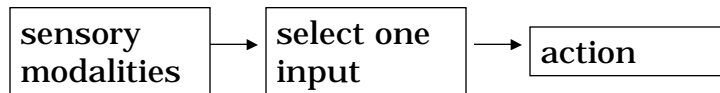


the input: attention between modalities

- vision and audition

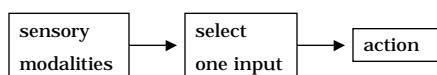


attention: a selection mechanism



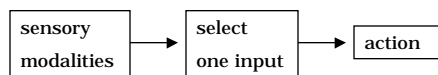
attention: a selection mechanism

- attention movements
 - across space (spatial)
 - across objects (object-based)

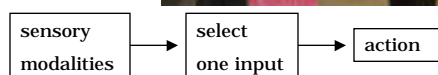


attention: a selection mechanism

- attention movements
 - overt (includes eye movements)
 - covert (eyes fixed to a certain position)



attention: a selection mechanism

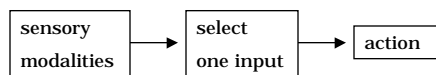




attention: a selection mechanism

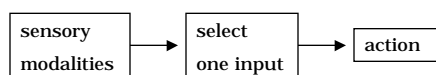


- attention movements
 - automatic (reflexive, exogenous)
 - controlled (voluntary, endogenous)



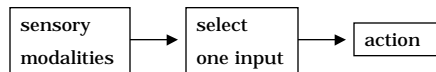
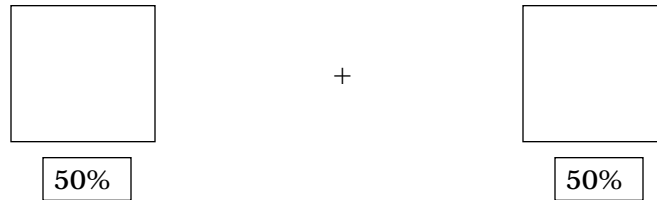
attention: a selection mechanism

- posner cuing paradigm
 - measure target detection RT

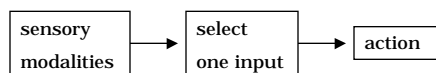


attention: a selection mechanism

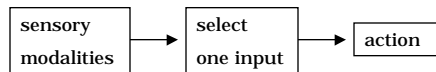
- reflexive



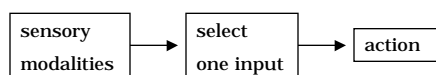
attention: a selection mechanism



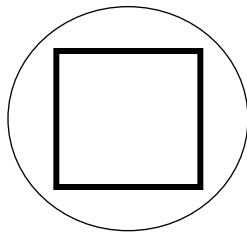
attention: a selection mechanism



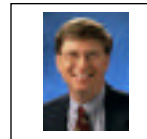
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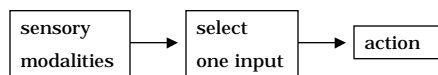
attention: a selection mechanism



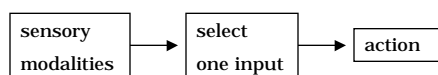
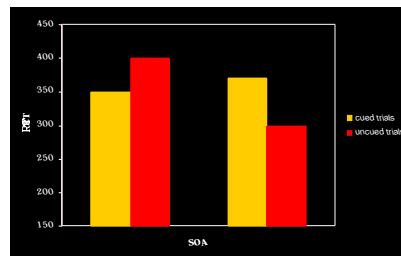
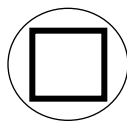
+



slow to detect a target

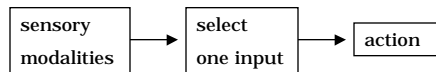


attention: a selection mechanism

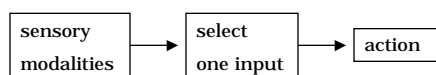
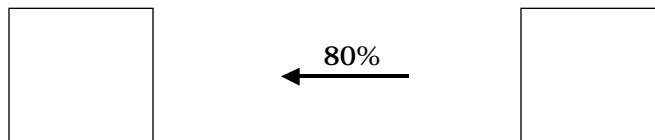


attention: a selection mechanism

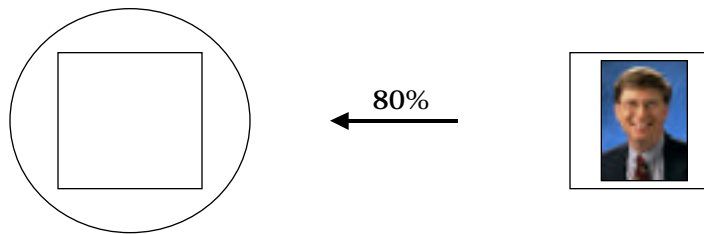
- voluntary



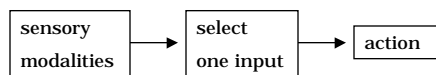
attention: a selection mechanism



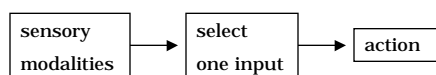
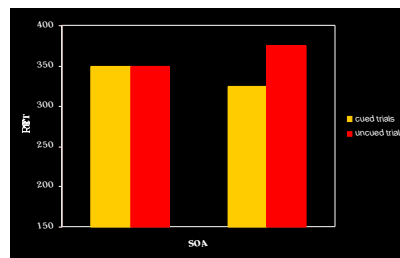
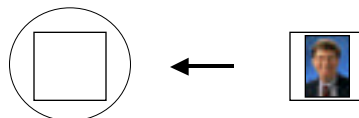
attention: a selection mechanism



very slow to detect a target

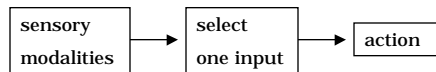


attention: a selection mechanism



attention: a selection mechanism

- benefits of attention can be observed in behavior



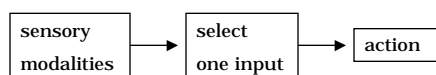
attention: a selection mechanism

reflexive

triggered by unexpected peripheral events
benefit rapid but short lasting

volitional

triggered internally by expectation
benefit slow but longer lasting

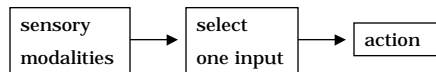


attention: a selection mechanism

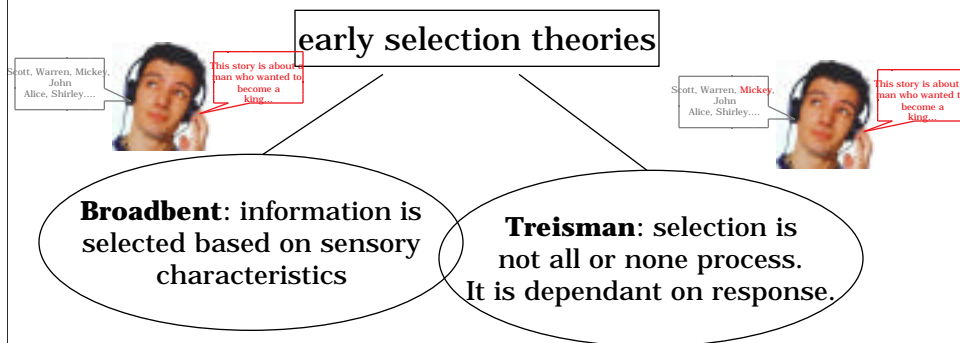
- how does attention select specific events?

two general theories:

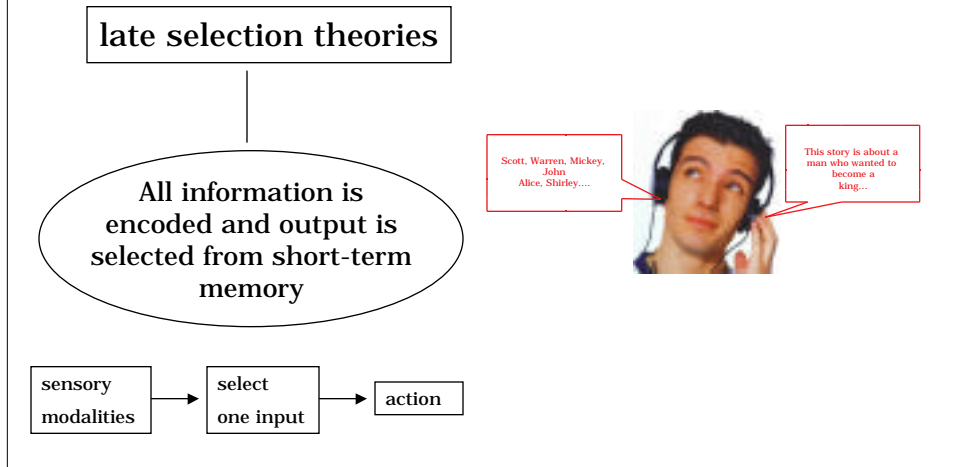
1. early selection models
2. late selection models



attention: a selection mechanism

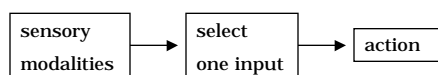


attention: a selection mechanism



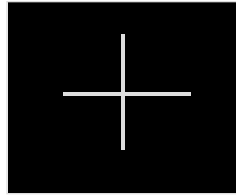
attention: a selection mechanism

- similar findings recently reported in visual domain only
 1. inattention paradigm (Mack&Rock)
 2. change blindness(Rensink)

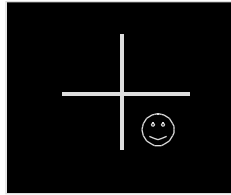


attention: a selection mechanism

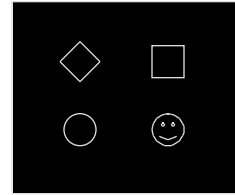
inattention paradigm



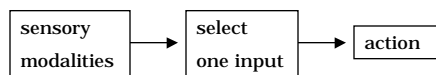
trials 1-3



inattention
trial



recognition
trial

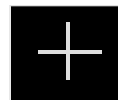


attention: a selection mechanism

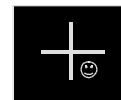
inattention trials

divided attention trials

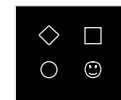
full attention trials



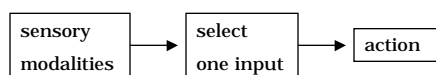
trials 1-3



inattention
trial



recognition
trial

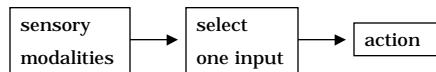


attention: a selection mechanism

results:

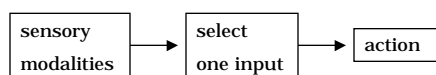
- color, position, # of objects perceived without attention
- shape and texture could not
- 25% of subjects did not report seeing anything
- effect depends on personal meaningfulness of the extra stimulus

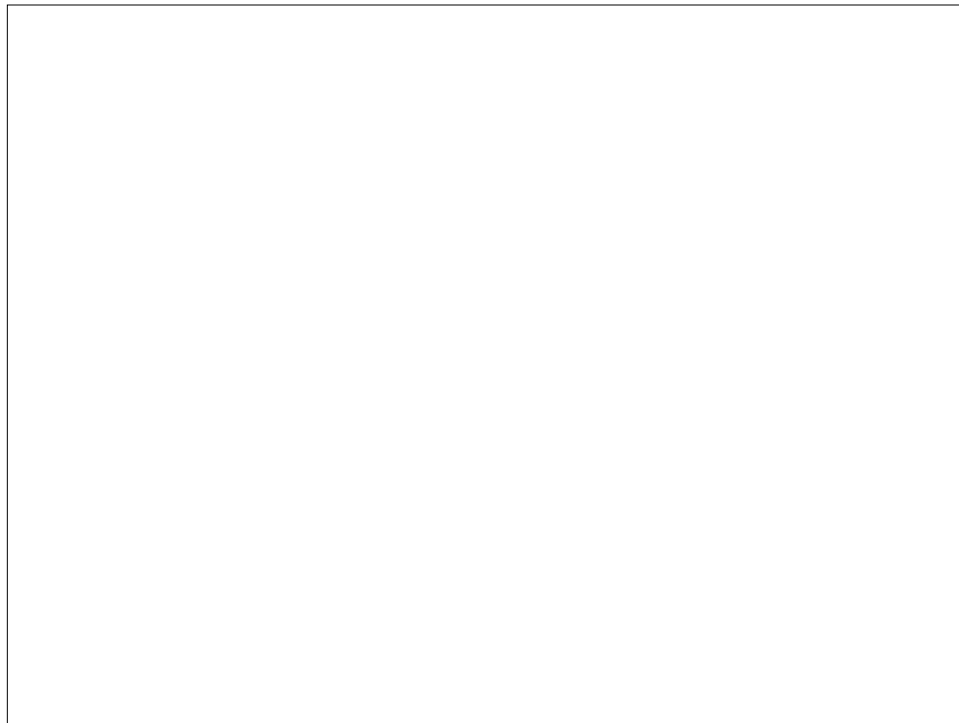
some late selection must also occur in visual attention as well



attention: a selection mechanism

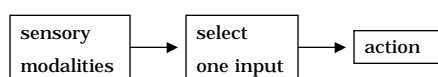
similar effects observed for dynamic events as well





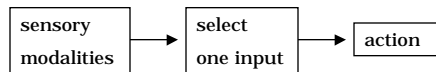
attention: a selection mechanism

change blindness paradigm
difficulty detecting gross changes in
complex scenes

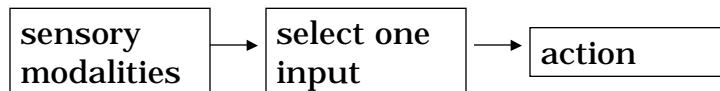


attention: a selection mechanism

task is easy if there is no blank interval
between the pictures



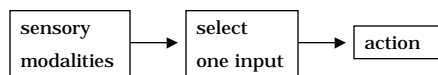
attention: applications to HCI



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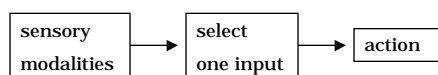
drawing visual attention to an object or a position in space

e.g, process control: important events could be missed if they are incremental



attention: applications to HCI

- Pop-up windows on the web draw attention reflexively



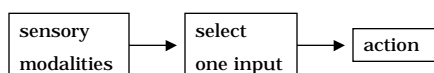
attention: applications to HCI



attention: applications to HCI

use voluntary rather than reflexive
attentional cues

reflexive attention is very short lasting,
while voluntary attention is longer lasting
(e.g, have a place for important events)



attention: applications to HCI

use caution when using both visual and auditory events

if visual event and the auditory event occur at the same position in space, they will be perceived together

