

**Suffered from real-time operation**

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# Real-time system

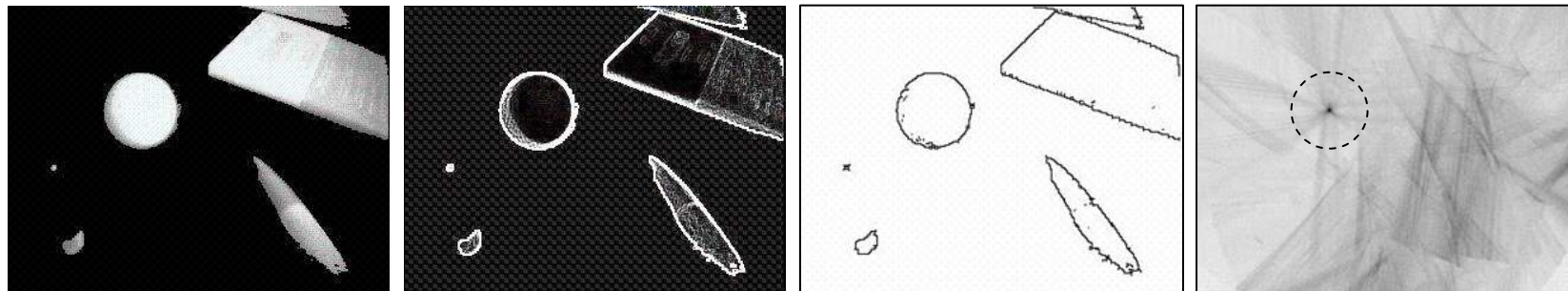
- (A good) Real-time system is a system which has enough computational power (concerning task it performs) to enable designer to predict what happens and when (within known latency)
- Example: robot which measures distance from obstacle each 200 ms and stops within 250ms when an obstacle is detected.

# Living creatures & RT

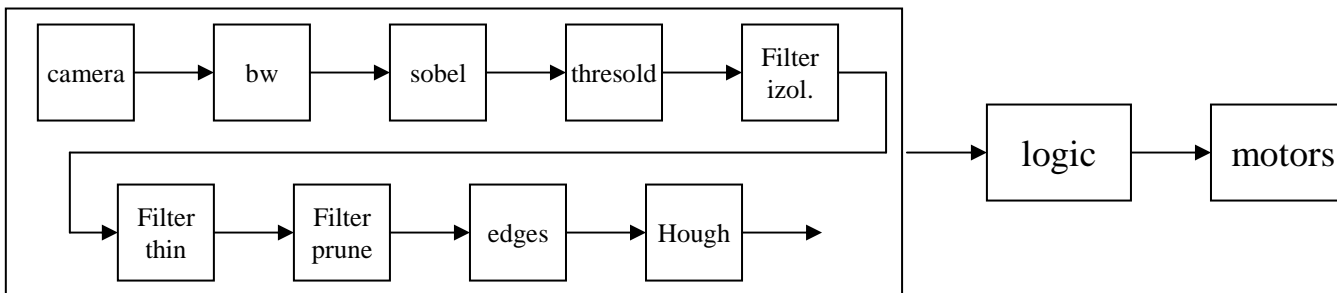
- Living creatures operates in real-time
- They perform extremely complex tasks
- Often results of calculation they perform is useless until the results are carried out within a time limit
- Do living creatures enough computational power to be a good real-time system? If no, what we should observe on them?

# Demonstration

- what strategy could a system use to treat lack of computational power which disables it to be a good RT system ?
- Demo: robot following ping-pong ball



perception



# Demonstration



## Strategy 1.

- Robot senses environment, selects an action and does not sense again until the action is performed
- Control is based on pure pipeline architecture
- Robot takes enough time to complete action
- Its behavior is less fluent, but perfectly predictable and repeatable

# Demonstration



## Strategy 2.

- Robot is trying to operate as real time system
- Control is based on decentralized architecture
- The architecture decreases frequency of all processes which cannot be performed within limited computation power
- Robot behavior is more fluent, but less predictable and repeatable

# Conclusion

- Strategy 1 is typical for contemporary industrial robots, but far from living creatures
- Strategy 2 is closer to living creatures
  - What trick are living creatures using to decrease the disadvantage of limited computational power?  
Perhaps, they act upon prediction
  - Could living creatures employ the ‘suffering’ from real-time in a way?  
Perhaps yes, as one source of creativity

**Thank you !**

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