



# SYST 101: Intro to Systems

## Lecture 9

Feb. 21, 2002

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# Agenda

- Systems & Events
- System Architecture Descriptions



# Events vs Systems

- So far, we've discussed systems
  - Implied that they interact with each other
  - Implied that they do things themselves
- Brings us to how systems interconnect, and the topic of events



# System Interfaces

- Systems connect to each other through interfaces
- In man-made systems, the interfaces are pretty easy to see...



# Interfaces on Common Systems

- The components of a PC have interfaces to each other

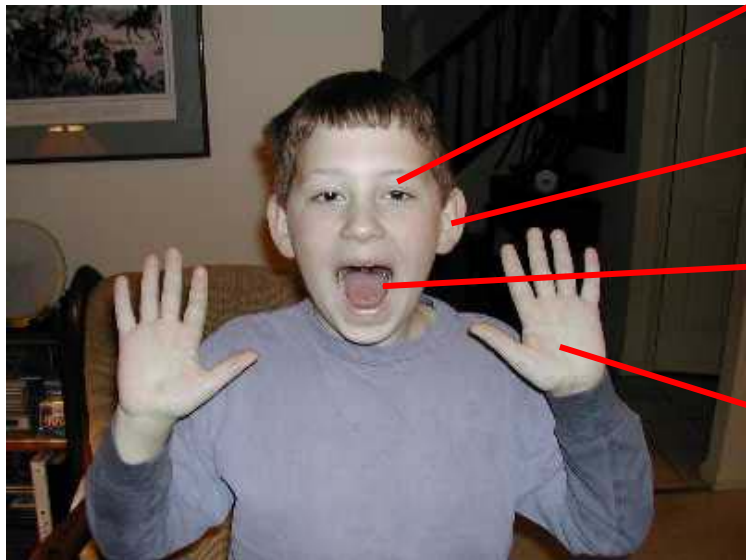


- and some of them have interfaces to you.



# Interfaces to a familiar system

- Some of the interfaces to the system  
Human Being



visual input

audio input

food input, speech output

tactile input.  
manipulation output



# Events

- Events are things that happen in or to your system
- Events usually have relatively short time durations.
  - Functions, on the other hand, can take a long time to perform



# Example Events & Systems

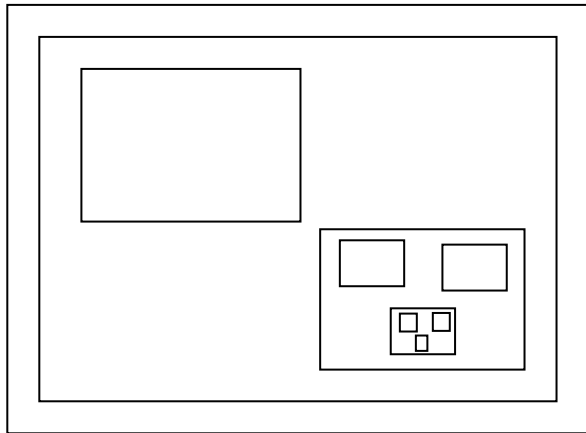
- System: Road Traffic System
  - Events: Accident, Repair Activity starts
- System: PC
  - Event: Type on keyboard, move & click mouse
- System: Human Being
  - Event: Burns hand on stove, sees pretty picture, gets hungry





# Internal vs External Events

- Systems are made up of sub-systems.
  - And often a system can be viewed as a sub-system to some larger system



Systems inside systems  
inside systems ...



# Internal vs External Events

- A system can experience events that come from external systems, or can experience events that come from one of its internal systems
  - When you get hungry, your brain subsystem is responding to low-sugar signals from your endocrine system.



# Events vs Functions

- A common modeling technique:
- Envision systems as responding to events by performing a function.
- Events “trigger” functions
- Biology: Stimulus-response



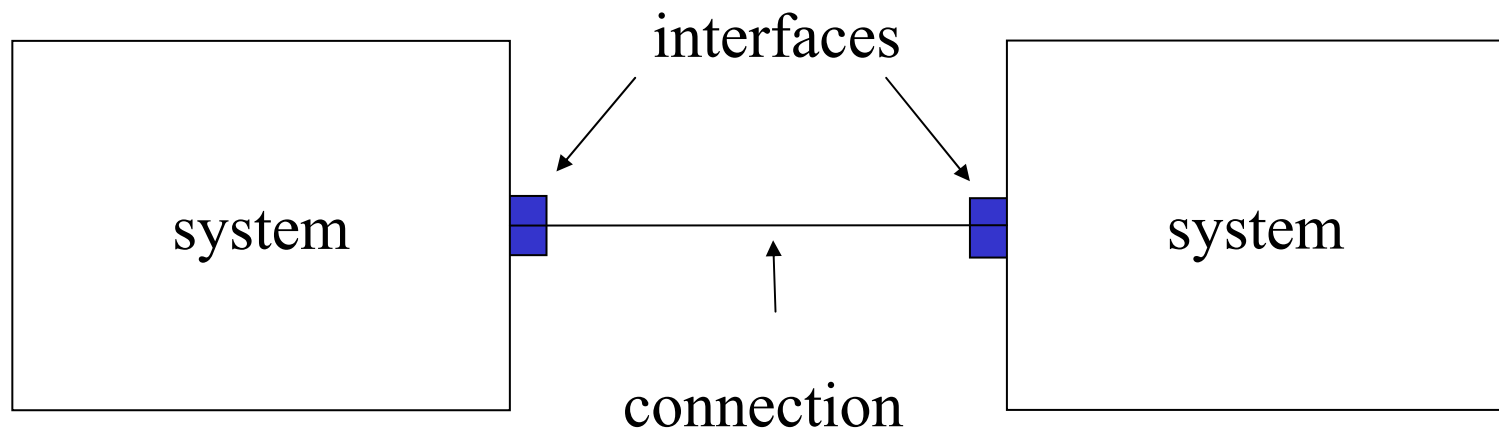
# Events & Interfaces

- Systems relate to each other through their interfaces
  - Events are often “transmitted” through some sort of interface.
  - Interfaces are much easier to see in man-made systems
  - Sometimes not so easy to see in natural systems.
    - That’s what makes medicine so hard...



# Events, Interfaces & Functions

- Basic modeling concept:





# Stimulus-Response

- Basic general form: “When event {a} comes in over interface {i}, then do function xyz.”
  - Optional: “and send event {b} out over interface {k}.”



# Example

- When I burn my hand, I jerk my arm.
- When event {my hand feels pain} comes in over interface {nerve endings in hand}, do function {react} and send event {move arm} to interface {muscle nerves in arm}.



# Note!

- A System's interfaces will exist whether or not they are connected to anything!!
- A system's interfaces and what information they carry to and from the system are a key part of system design, and a key element in understanding natural systems.





# Interfaces and Good Design

- A good design has stable interfaces that do not need to be changed over many generations of the system design.
- Best example: Stereo System



Input/Output jacks on back





# Stereo Input/Output Jacks

- Although the technology of stereo equipment has changed significantly over the last 60 years....
  - Then: Vacuum tube amplifiers, phonograph players, open reel tape decks
  - Now: All solid state circuitry, CPUs instead of analog amplifiers, CD players, what next?
- The interfaces have remained the same!
  - Physical nature of the plugs & jacks, and the standards for the audio signals.



# Not so good design

- Car parts
  - There is no such thing as a generic alternator or radiator for cars.
  - You have to get exactly the right radiator
    - “75 Chevy Impala with the 250cc 6-cylinder engine....”
- Every redesign of the system (car) leads to redesign of every sub-system.
  - Increased designing costs, increased supportability and maintenance costs, increased maintenance training costs
  - Increased frustration in the consumer as well