SYST 101: Intro to Systems

Lecture 9

Feb. 21, 2002

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Announcements

- Midterm exam next time

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

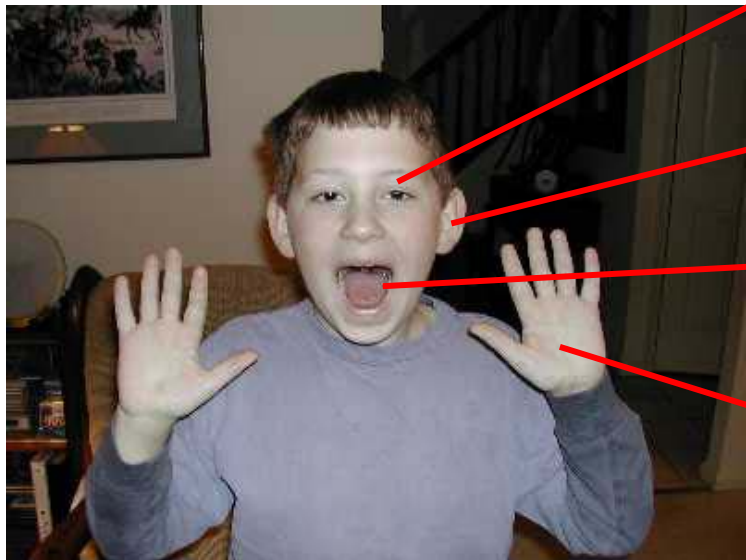- The components of a PC have interfaces to each other

- 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
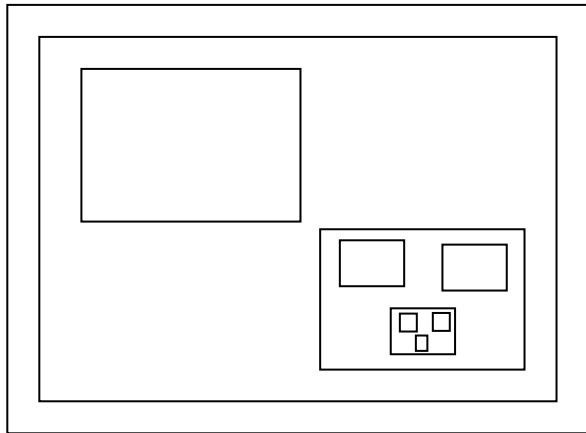
Systems inside systems inside systems ...

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 sub-system 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
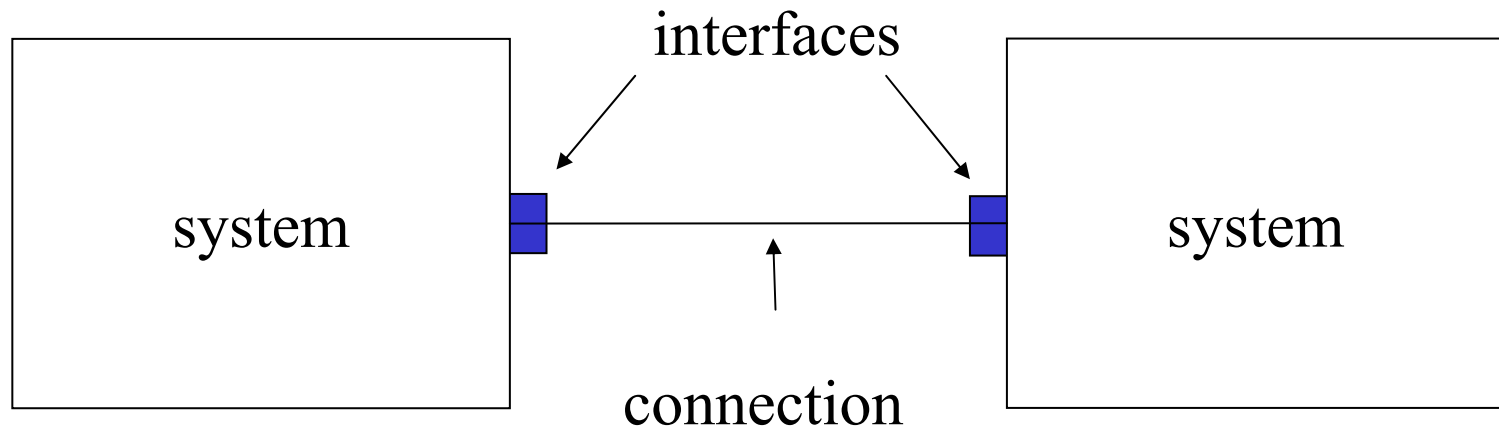
- Biology: Stimulus-response

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: Vaccuum 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

Assignments

- Reading
  - None this week. Study for midterm

- Homework. Individual Basis, Due Tuesday after spring break
  - For a system of your choice
    - a) Define its external interfaces (at least 4)
    - b) Define its internal interfaces (at least 3)
    - c) For each interface:
      - Define what input and output events are carried (transmitted)
      - Define what functions in the system are triggered by the input events, and define which functions produce the output events.

Possible Systems

- Human Being

- PC (or Mac)

- Automobile

- A forest

- U.S. Government (or country of your choice)