CS5127/6027: Requirements Engineering

(Fall 2024)

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Office Hours: 10am-11am, Mondays, Rhodes 832

Today's Menu

Last Lecture (Friday 8/30):
What're req.s?

This Lecture (Friday 9/6):
Meaning of req.s
Release ASN1

Next Lecture (Monday 9/9):
Importance of req.s
Eliciting req.s

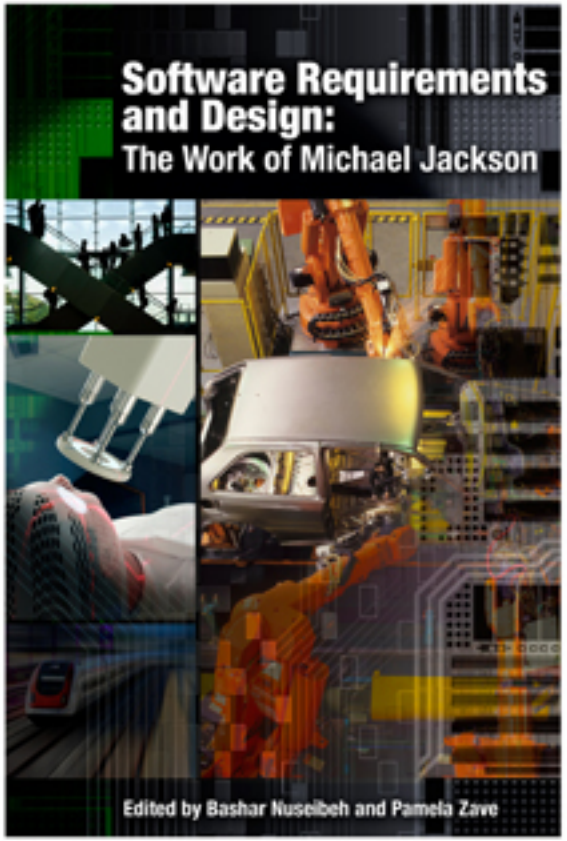
Take-Aways

- Week #1
  - Requirements = stakeholders' needs and desires
  - Stakeholders = those who have a stake in the change being considered & who stand to gain or lose from the change
- Week #2
  - Meaning of requirements is: _____

The Meaning of Requirements

Software Requirements and Design: A Tribute to Michael Jackson

ICSE 2009 VANCOUVER



Michael Jackson (not the singer)

$$\mathcal{E}, S \vdash R$$

Source: *Jackson's Website, & ICSE'09 Website*

The *req.s* concerned in Jackson's paper

- The computer must not weigh more than 0.25 Kg.
- The system must be completed by 1st January 1998.
- The programs must be written in Ada.
- The system specification must be formally accepted by the steering committee.
- The operator interface must be easy to learn.
- The system must produce a monthly report of outstanding debts.
- If passenger in the lift presses the *open-doors* button while the lift is stationary at a floor, the doors should begin to open within 0.5 secs.

→Functional requirements

↳Real-time response

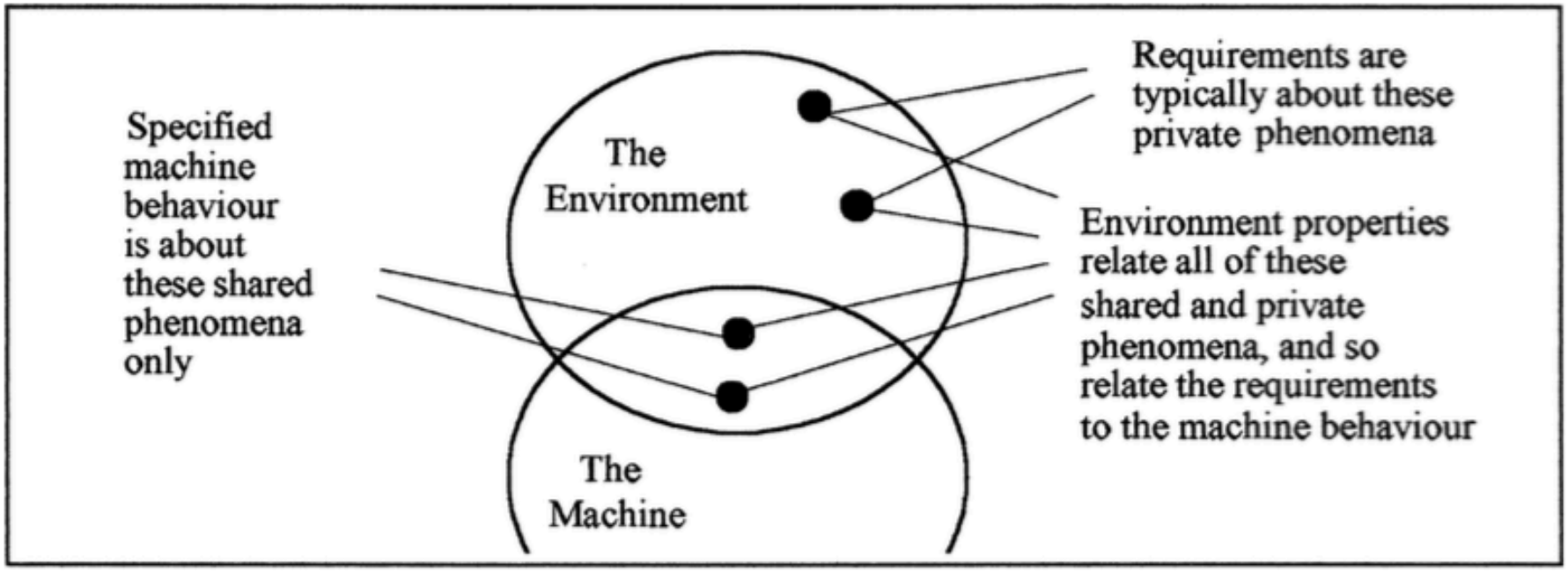
↳Those properties (of operational safety that) can be *precisely* stated in terms of system behavior

Requirements are in environment

- Environment = the part of the world
  - into which the machine will be installed
  - with which the machine will interact
  - in which the effects of the machine will be observed and evaluated
- Machine = software-to-be
  - with which programmers do programming
  - sth. that we transform a general-purpose computer into in order to satisfy stakeholder needs & desires

We want to do programing/transformation without further environment knowledge. ← *What RE is for*

Understanding R, Ɛ, S



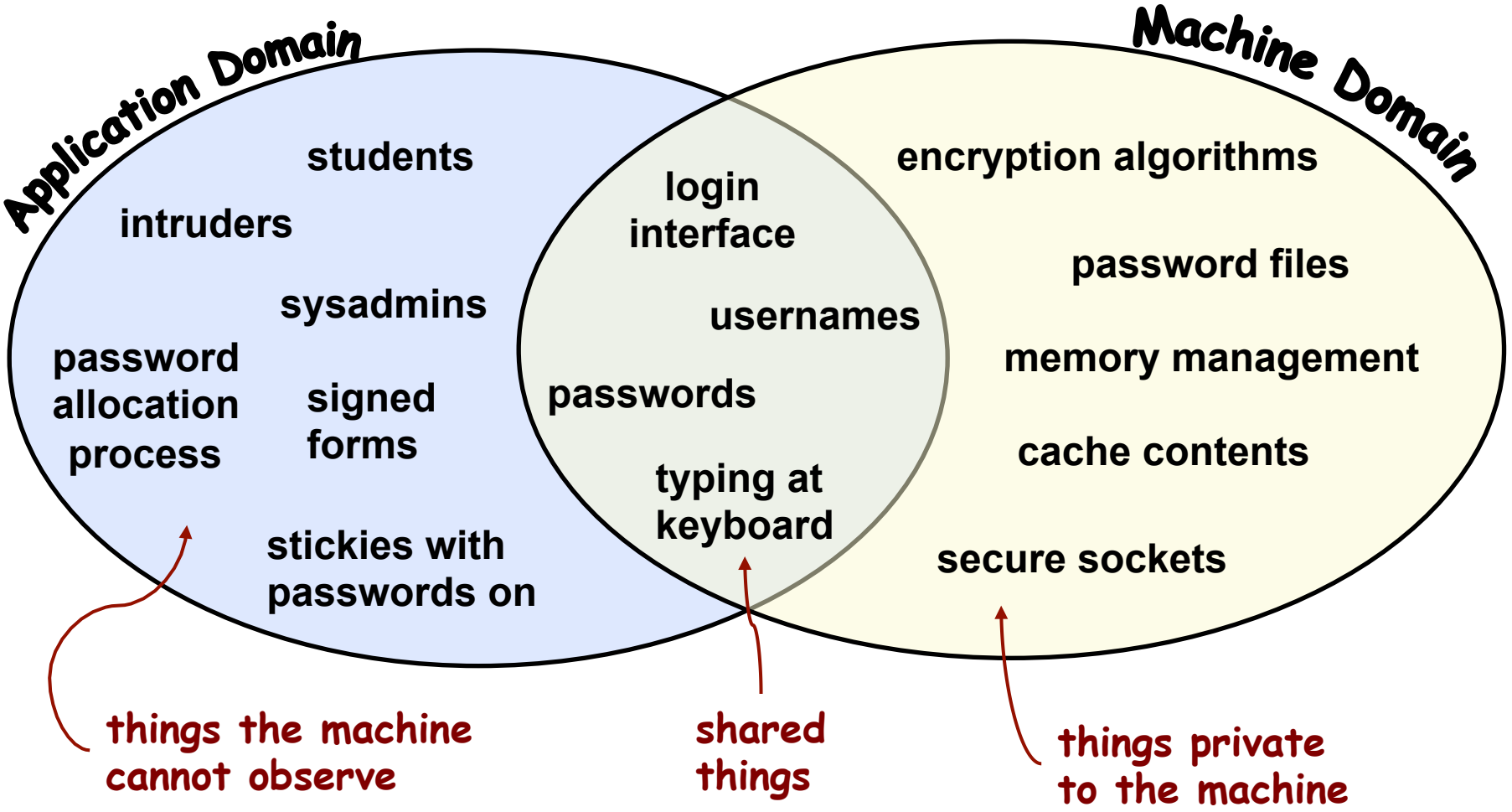
R: requirements (optative/desired)

Ɛ: environmental assertions (indicative/given)

S: specifications (optative/desired)

Software is a science of description

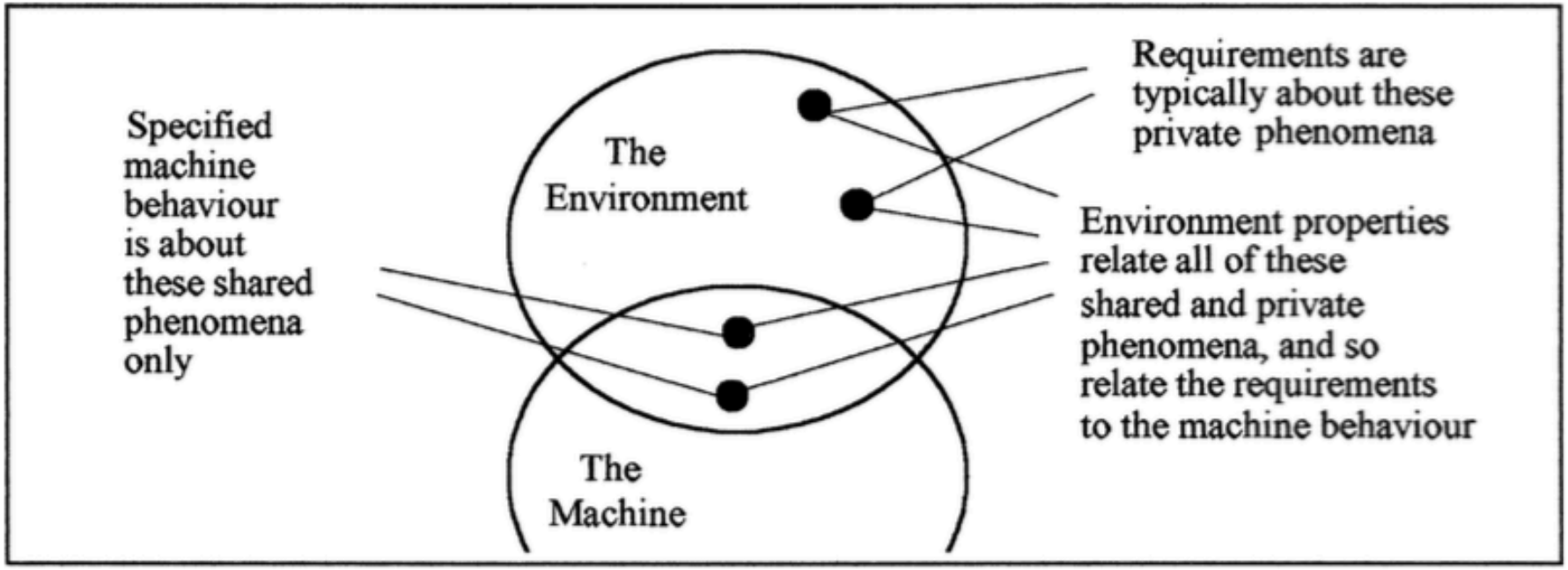
→ E.g. "allow only authorized access to lab computer"



To be more specific

- Requirement R:
  - "The lab computer shall be accessible by only authorized personnel"
- Domain Properties E:
  - Authorized personnel have usernames
  - Authorized personnel have passwords
  - Passwords are never shared with non-authorized personnel
- Specification S:
  - Access to the lab machine shall be granted only after the user types an authorized "username, password" pair
- S + E entail R

Req.s = Stakeholders' needs & desires



A library system allows its member to renew books.

An auto-pilot helps the pilot to fly the plane safety & efficiently.

An elevator controller provides safe & convenient transport from floor to floor in a tall building.

Req.s are *OUTSIDE* the machine

A library system allows its member to renew books.

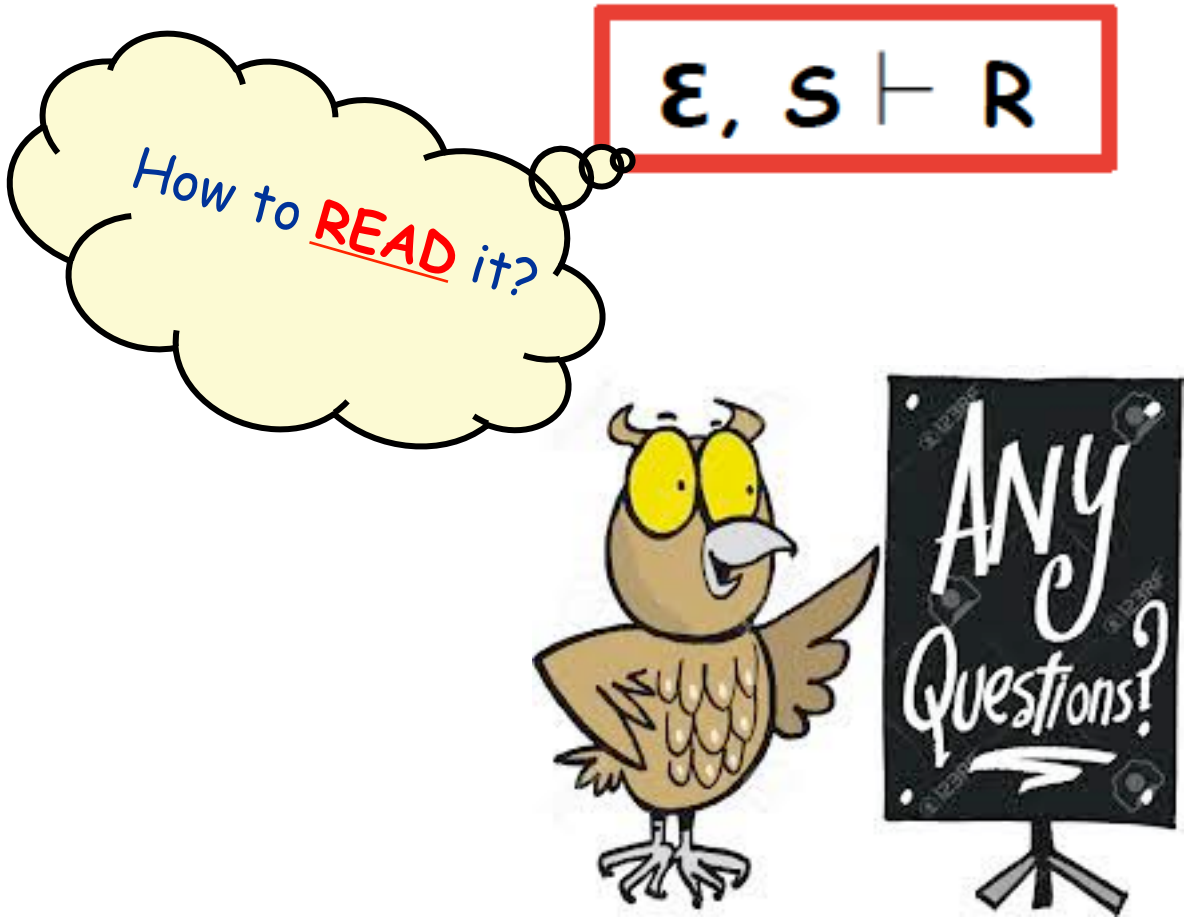
An auto-pilot helps the pilot to fly the plane safety & efficiently.

An elevator controller provides safe & convenient transport from floor to floor in a tall building.

If the software-intensive system fails, *where* are the complaints?

"The true subject matter of the software development is not the computation performed inside the computer, but the desired behavior that these computations evoke and control in the world outside."

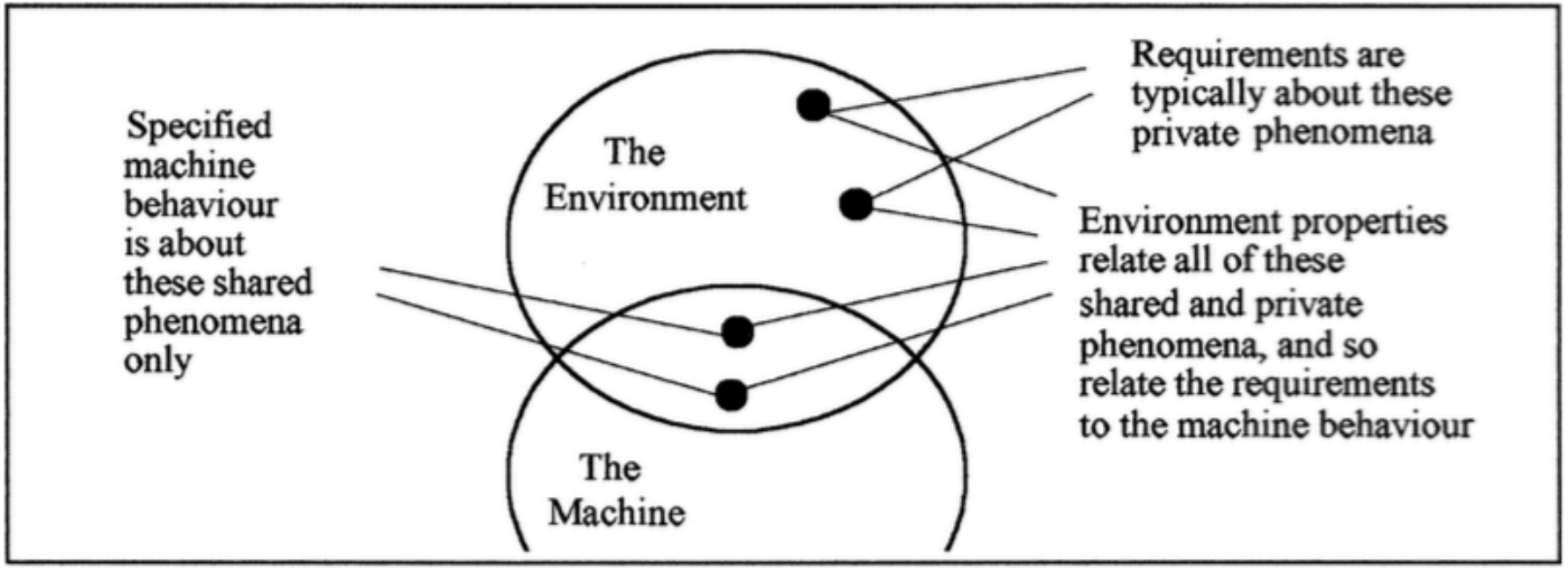
The Meaning of Requirements



Quiz 2 questions

$\mathcal{E} \wedge \mathcal{S} \Rightarrow \mathcal{R}$ $\mathcal{R}$ can be deduced from $\mathcal{E}$ and $\mathcal{S}$

$\mathcal{E}, \mathcal{S} = \mathcal{R}$ $\mathcal{R}$, in general, can be fulfilled in multiple ways



In-Class Exercise

→Form your group (or work individually)

→Instantiate R, Ɛ, S for the elevator system such that your instantiated R, Ɛ, S satisfy "Ɛ,S |- R".

Requirements

→R: "attend a class at a different floor"

→Requirement is in the OPTATIVE mood, expressing a wish

→Requirement can (and SHOULD) be stated entirely without reference to the machine

- Private phenomena of the environment
- Requirements are located in the environment

→The GOAL (needs & desires) of stakeholders

Environmental Assertions

→ R: "attend a class at a different floor"

→ Ɛ is in the INDICATIVE mood, expressing what is claimed to be a known truth

→ Instances of Ɛ: knowing …

- "different floor of the SAME building"
- "LOCATION of the elevator inside the building"
- "DIRECTION ('up' or 'down') to go"
- …

Finally: "Ɛ,S |- R"

- R: "attend a class at a different floor"
- Ɛ: …, "initiate the right trigger", …
- S: "trigger → sensor → controller → move"

- Specification
  - Optative
  - Shared phenomena of environment and machine
  - A nexus of constraints and causal chains

ASN1: Meaning of Requirements

- Background
  - You're provided with three F's in the video conferencing domain (more specifically, three features of Zoom)
    - F1: Don't Show This Again option for mtg disclaimer prompts
    - F2: View main stage in Backstage before webinar starts
    - F3: Estimated wait time in video Waiting Room
  - The full description of each F is in the "Assignment1-Description.pdf" on Canvas
  - These F's are best understood as the implemented spec.s (S's) of a machine (e.g., Zoom). *Therefore, E=F in the context of Assignment 1.*

ASN1: Your Task

- Now that F is given (in English), you're asked to
  - Come up with "R" and "E" for each "F"
    - Do "E, F |- R" at least once for each "F"
  - Express "R" and "E" in English
    - Expressing "R" *without* referring to the machine (Zoom or any video conferencing software)
    - Making sure "E" is *relevant*; note that "E" can be a *set* of environment assertions
    - For each given F, justifying why your "E" (the set of indicative properties) is valid

ASN1: When & how to submit?

- Before 11:59pm on Wednesday (Sept 18, 2024)

- Upload your ASN1 solution in one PDF file to Canvas before the deadline
  - Uploading the file multiple times is allowed, but only the closest one before the deadline will be graded
  - Your ASN1 solution needs to have a title, author information (including email address), date, and proper citations (if applicable)
    - If you use generative AI tools like ChatGPT, then you shall explicitly acknowledge it and your own uses.

Today's Take-Aways

- Meaning of req.s = "E, S |- R"
  - Locations & moods

- To-do
  - Review today's slides & clear Quiz2 questions
  - Begin working on ASN1 (due: Wednesday, 9/18)
  - Attend the "Importance of req.s & eliciting req.s" lecture on Monday (9/9) where a sample ASN1 solution (on a different Zoom feature) will be provided