Natural Language Requirements

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Recap

- Requirements elicitation – determining the needs of the stakeholders
- Requirements specification – documentation of the desired external behavior of the system

*"In a 1993 article, my coauthors and I put **a long list** of attributes that a well written set of requirements should exhibit. For my part, I must have been feeling obsessive compulsive at that time..."*

Alan M. Davis

Just enough – properties

enough is enough

Correctness
Consistency
Achievability
Annotation

Traceability
Unambiguousity
Completeness
Verifiability

Correctness

- Essential property!
- Requirement is correct if it helps to satisfy a stakeholder need

Consider:

The system shall include a...

Consistency

- Requirement is consistent if satisfying it is not in conflict with satisfying other requirements, set of requirements or other approved documents.

- Does not refer to development, only specifications.

Achievability

- A set of requirements is achievable if it is possible to construct a system that satisfies ALL the requirements in that set.

- Related to consistency, inconsistent requirements → not achievable.

Annotation

- A requirement is annotated if it is easy to find characteristics of that requirement as well as relationships to other requirements.

- Examples of characteristics:
  - Origin - why
  - Advocate – who is responsible for satisfying it
  - Responsible party – preparations
  - Primary customer – who to ask
  - Details - refinement

Traceability

- A requirement is traceable if it has a unique identifier.

- For tracing requirements → Design → Implementation → Tests etc.

Unambiguousity

- A requirement is unambiguous if it has only one possible interpretation.

- Difficult in natural language, not the less important. Keep in mind reasons for ambiguousity (negotiations?)

- In contracts: "As interpreted by reasonable and prudent people."

Completeness

- A requirements document is complete if it includes all the requirements that the stakeholders expect to have satisfied in the corresponding release. (focus on customer, not the development)

- Exists in a certain moment using available information

Verifiability

- A requirement is verifiable if there is a finite, cost-effective method to check that the system (as built) meets the requirements (as stated) to a degree sufficient enough to convince all relevant parties (contractor and customer side)

IEEE Standard for Requirement Specifications

- http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=720574

- Or simply Google "IEEE Standard Requirements" or "IEEE Std 830-1998"

Your task today

- Using elicited needs from a customer, write requirements that satisfy the 8 properties mentioned earlier.

Railroad crossing – elicited information

- You are designing the software for a railway crossing. A sensor on the rails detects when a train is arriving and lowers the bars over the road. The bars remains lowered until another sensor detects that the train has passed or until a signal from the Railway Control Centre (RCC) is received. If the sensors malfunction, or if the connection to the RCC is lost, the bars are lowered and shall remain lowered until everything is working again and they are reset from the RCC. While the bar is being lowered or raised and while the bar is in its lowered position, red lights will flash and a bell will ring. When the bars are in their upper, un-lowered position a white light is shown (not flashing).

Solution Example

- R1: The bars at the railway crossing shall be lowered if a train is coming.
- R2: The bars shall remain lowered until the train has passed / or until a signal from the RCC is received.
- R3: During lowering and raising the bars and while the bars are in its lowered position, a signal light shall flash and a
- bell shall ring (according to the local traffic laws).
- R4: The arrival and departure of a train must be detected by sensors which are located on the rails.
- R5: Each railway crossing must be connected to a RCC.
- R6: In case of a malfunction (e.g. sensor is broken, connection to RCC is lost), the bars shall be lowered until everything
- is okay and works again.
- R7: After fixing the malfunction, the railway crossing has to be reset from the RCC.