Lecture 13. Logical Consistency: System Specifications

A list of statements is consistent if it is possible to assign *truth values* [1] to the proposition variables so that each statement in the list is true.

Example 13.1 Consider the following list of three statements. Is the list consistent?

1. "The diagnostic message is stored in the buffer or it is retransmitted."
2. "The diagnostic message is not stored in the buffer."
3. "If the diagnostic message is stored in the buffer, then it is retransmitted."

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[1] either of T or F

System Specifications

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- **p**: The diagnostic message is stored in the buffer.
- **q**: The diagnostic message is retransmitted.
- Propositional logic: $(1) = p \lor q$; $(2) = \neg p$; $(3) = p \to q$.

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- **p**: The diagnostic message is stored in the buffer.
- **q**: The diagnostic message is retransmitted.
- Propositional logic: $(1) = p \lor q$; $(2) = \neg p$; $(3) = p \to q$.
- When p is false and q is true **all three statements are true**. So the list is **consistent**.

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Practice 13.2. Determine whether the following system specification is consistent.

1. "The diagnostic message is stored in the buffer or it is retransmitted."
2. "The diagnostic message is not stored in the buffer."
3. "If the diagnostic message is stored in the buffer, then it is retransmitted."
4. "The diagnostic message is not retransmitted."

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4. "The diagnostic message is not retransmitted."

Consistent system specifications do not contain conflicting requirements that could be used to derive a contradiction.

When specifications are not consistent, there is no way to develop a system that satisfies all the specifications

MSC Activity 13.3 An AI ethics committee provides these specifications for a chatbot's behavior. Is the set consistent? If the set is not consistent, analyze whether there's a way to satisfy all statements without conflict.

1. The chatbot provides factual answers, or it flags uncertain responses.
2. The chatbot does not provide factual answers.
3. If the chatbot flags uncertain responses, then it avoids giving opinions.
4. The chatbot gives opinions.