CMPT 473
Software Testing, Reliability and Security

Model Checking

Nick Sumner
wsumner@sfu.ca
Technique limitations vs risks

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    - Show the program can behave correctly
    - Provide confidence for given criteria
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  - Distributed file system integrity
  - Coordinating telephony
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- But what if these components are mission critical?!
Proving properties of programs

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• *Model checking* is one such tool for proving these properties
Model Checking Overview

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How can we specify the model?

- Often written in a formal specification language
  - temporal logic (CTL, LTL), Alloy, TLA, ...
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Start ¬ Close ¬ Heat Error
¬ Start ¬ Close ¬ Heat ¬ Error
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![Diagram of the oven model](attachment:oven_model_diagram.png)
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  - p will hold eventually in the future
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  - p holds until another proposition q holds
Traffic Lights

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- You can also specify lights at an intersection as a distributed system & check the consistency!
Do people actually use it?

- Aerospace
- Hardware
- Critical infrastructure providers (including Amazon)
- Microsoft holds internal (& external) lectures on it
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- Now used by several teams within AWS
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It is increasingly desirable for platform providers
What does TLA+ look like?

- Let’s walk through an example...
Summary

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- While it requires more effort and cost, it can prevent critical issues.
- One such platform for model checking is TLA+.