Putting Software Testing Terminology to the Test

MASc Seminar

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Department of Computing and Software

Fall 2024

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2. Project
   - Drasil
   - The Common Drasil Workflow
   - Why Test Generated Code?
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About Me

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- Graduated from McMaster University (2022)
  - Bachelor of Engineering (B.Eng.) in Software Engineering
  - Worked on Drasil as an Undergraduate Summer Research Assistant (during the summers of 2018 and 2019)

About Me

- I am **Samuel "Sam" Crawford**
- Graduated from McMaster University (2022)
  - Bachelor of Engineering (B.Eng.) in Software Engineering
  - Worked on Drasil as an Undergraduate Summer Research Assistant (during the summers of 2018 and 2019)
- Currently pursuing a Master of Applied Science (M.A.Sc.) in Software Engineering under the supervision of **Dr. Jacques Carette** and **Dr. Spencer Smith**

Overview of Progression Towards M.A.Sc.

Course-related progression

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  - CAS 741: Development of Scientific Computing Software - Winter 2023
  - CAS 781: Advanced Topics in Computing and Software (High-Performance Scientific Computing) - Winter 2023

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- Formed my supervisory committee; we are currently having our first supervisory committee meeting!

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Drasil is "a framework for generating all of the software artifacts from a stable knowledge base, focusing currently on scientific software" [Hunt et al., 2021]

[1] https://jacquescarette.github.io/Drasil/

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- This knowledge, using recipes, is used to generate software artifacts, including:
  - SRS (HTML, PDF, Jupyter)
  - Code (Python, Java, C#, C++, Swift)
  - READMEs
  - Makefiles
  - Its own website[1]!

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Visualizing Drasil's Traceability

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- This does not actually say anything about Drasil's output!

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  2. Targets a more complex artifact that is harder to verify
  3. Gives Drasil another "bragging point"!

The Common Drasil Workflow

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   - Manual system tests (3 pass, 4 fail with known reason)

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   - Changes made to "stable" to faciliate testing
     - The inclusion of `__init__.py` files to improve `import` statements
     - Wrapping `Control.py`'s functionality in a `main` function
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     - Wrapping `Control.py`'s functionality in a `main` function
     - Changing how command line parameters are passed to `Control.py`
   - Changes to be made to generated code to improve correctness
     - Invalid values should stop the calculations [**?**]
     - Assumptions, such as values of constants, should be verified

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3. Testing provides a greater degree of confidence in Drasil's capabilities
4. Generating code for testing allows for it to be done "properly" instead of taking shortcuts commonly taken by humans

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"The information you have should be just as useful for generating tests as it should be for manually running them." — Dr. Jacques Carette

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   - Test cases will then be written for:
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     - Projectile's implementation in other languages
     - Other examples where code is generated: GlassBR, NoPCM, DblPendulum, PD Controller [Hunt et al., 2021]

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   - These test cases will also be added to Drasil's CI/CD to ensure that future changes preserve the code's functionality

Acknowledgment

- Dr. Smith and Dr. Carette have been great supervisors in the past and have, both then and now, provided me with valuable guidance and feedback
  - They have helped me refine the scope of this project
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- The past and current Drasil team have created a truly amazing framework!

Thank you!

Questions?

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