

Putting Software Testing Terminology to the Test

M.A.Sc. Seminar

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Drasil

What is Drasil?

My project was originally focused on Drasil, “a framework for generating all of the software artifacts from a stable knowledge base, focusing currently on scientific software” [Hunt et al., 2021]



Drasil's Logo [Carette et al., 2021]

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- I worked on Drasil as an Undergraduate Summer Research Assistant during the summers of 2018 and 2019



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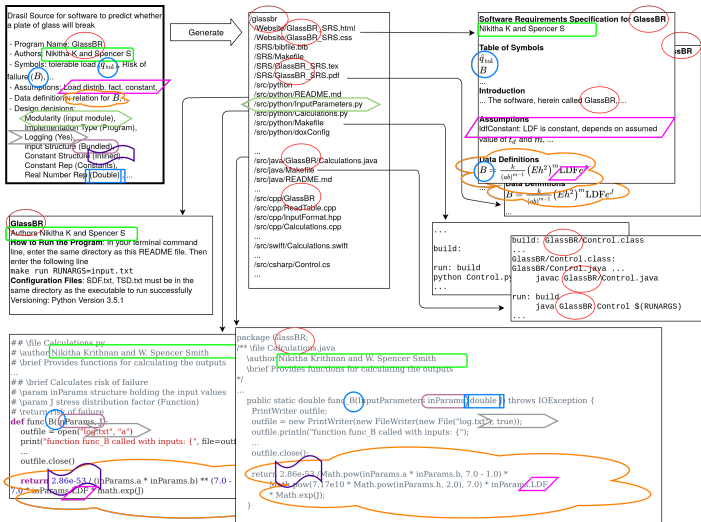
- I worked on Drasil as an Undergraduate Summer Research Assistant during the summers of 2018 and 2019
- “Recipes” specify how information from the knowledge based is used to generate software artifacts, including:
 - SRS (HTML, PDF, Markdown)
 - Code (Python, Java, C#, C++, Swift, Julia)
 - READMEs and Makefiles
 - Drasil’s own website¹!



Drasil’s Logo [Carette et al., 2021]

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Visualizing Drasil's Traceability



Knowledge flow from knowledge base to artifacts; by Dr. Spencer Smith

Generating Test Cases

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 - 2 Understand the stable knowledge base to create new “recipes”
 - 3 Generate test cases!
- There was a big assumption in this plan that drastically changed my project

The Need for a Knowledge Base

- Drasil is built for “(well understood) research software” [Carette et al., 2021] based on knowledge of:

² READMEs excluded for brevity; see

<https://github.com/JacquesCarette/Drasil/tree/main/code/drasil-data/lib/Data/Drasil>

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(drasil-data package² part #1)

```
├── Concepts
│   ├── Thermodynamics.hs
│   ├── Computation.hs
│   ├── Math.hs
│   ├── PhysicalProperties.hs
│   ├── Physics.hs
│   └── SolidMechanics.hs
└── Constraints.hs
```

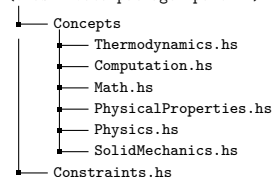
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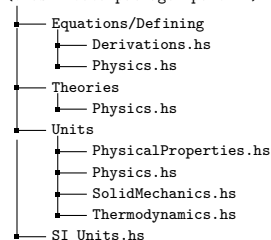
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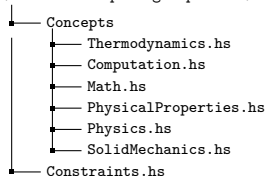
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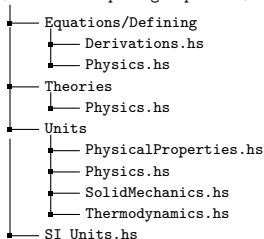
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 - 3 Information used by Drasil used for generating artifacts

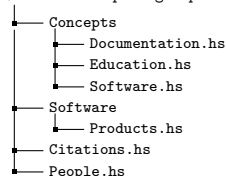
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The Need for A Knowledge Base (cont.)

- Before we can generate test cases, we need to “teach” Drasil how to build them and what information is needed to do so
- If knowledge about testing is to be “well understood”, it needs to be documented clearly, consistently, and correctly

The Need for A Knowledge Base (cont.)

- Before we can generate test cases, we need to “teach” Drasil how to build them and what information is needed to do so
- If knowledge about testing is to be “well understood”, it needs to be documented clearly, consistently, and correctly
- Independently of Drasil, if the field of software engineering holds code to a high standard in terms of clarity, consistency, and robustness, then the literature that supports code development should be held to this same standard!

The Problem with Testing Literature

Unstandardized Standards

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- The purpose of this research is to implement test case generation to verify generated code
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- Why use test cases for verification as opposed to, say, consistency/correctness checks?
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 - 2 Targets a more complex artifact that is harder to verify
 - 3 Gives Drasil another "bragging point"!

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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:
 - Other variabilities of Projectile's Python implementation
 - Projectile's implementation in other languages
 - Other examples where code is generated: GlassBR, NoPCM, DbIPendulum, 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

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- The past and current Drasil team have created a truly amazing framework!

Thank you!
Questions?

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-  Carette, J., Smith, S., Balaci, J., Wu, T.-Y., Crawford, S., Chen, D., Szymczak, D., MacLachlan, B., Scime, D., and Niazi, M. (2021). Drasil.
-  Hunt, A., Michalski, P., Chen, D., Balaci, J., and Smith, S. (2021). Drasil - Generate All the Things!