

Ada Runtime Error Generator

Vision Document

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DECLARATION

I hereby declare that this research project titled “Ada runtime error generator” has been written by me under the supervision of Dr. Christophe Meudec.

The work has not been presented in any previous research for the award of bachelor degree to the best of my knowledge.

The work is entirely mine and I accept the sole responsibility for any errors that might be found in the work, while the references to published materials have been duly acknowledged.

I have provided a complete table of reference of all works and sources used in the preparation of this document.

I understand that failure to conform with the Institute’s regulations governing plagiarism constitutes a serious offence.

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Table of contents

1. Project Overview	3
2. Vision Statement	3
3. Target platforms & Technologies	4
4. Target Users	4
5. Main Functionalities	5
6. Main Risks	5
7. Conclusion	5
8. References	6

1. Project Overview

The Ada runtime error generator will be a tool for Ada developers, to allow them to test their code to find if there is a possibility that runtime errors may be possible under certain conditions.

Ada is a language that is targeted at critical systems such as avionics and military. These systems need to be both correct and robust due to the nature of the systems that they are controlling and the lives at stake if something should go wrong.

While Ada does have exception handling built into the language, exception handling is not always a good idea to take as it would be safer to build a system that has no possibility of errors rather than inserting error handling code into the system that may even have errors themselves. With embedded systems size really matters also and adding exception handling into the mix can really increase the size of a program and reduce its speed. The cost of testing software is a substantial investment, with numbers ranging from 15%-50% of the total cost of the project. With a tool such as the Ada runtime error generator at the disposal of the developer this will cut down the time needed to test for the presence of run time errors and save a lot of money and improve reliability.

2. Vision Statement

Making the world's safest code even safer by helping developers find the possible presence of runtime errors.

3. Target platforms & Technologies

The runtime error generator will be used in partnership with Mika, a test data generator for Ada code, Mika's core technical paper [1] and Mika Developer guide [2].

The target platform for the runtime error generator will be Microsoft Windows 10.

It will also use Microsoft Visual Studio Studio 2019 to compile itself.

Yacc will be used also as a means for inserting the generated test data into the supplied program.

Google Docs will be used to document the project and provide openness of all findings.

Doxygen will be used to document the source code.

Github will be used as the source control for the project.

4. Target Users

The runtime error generator will be targeted at developers of Ada programs who feel that correctness and safety of their program is of critical importance.

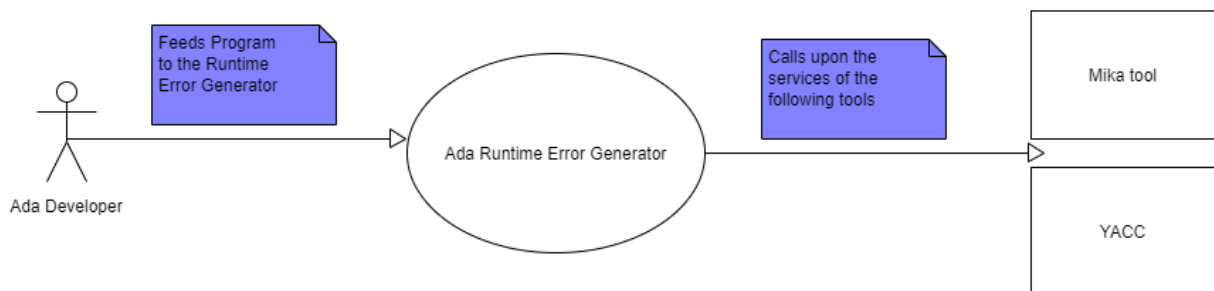


Figure 1. Runtime Error Generator Context Diagram

5. Main Functionalities

The main functionality of the Ada runtime error generator will be for an Ada developer to supply their code to the program, the mika program will generate test data that will trigger a runtime error if one is present in the code or no test inputs if no errors are detected. It will simulate the execution of the code and provide the developer an output of where any runtime errors were found and what inputs lead to that error.

6. Main Risks

Runtime error testing is quite an unknown field and there is not much material available to provide guidance for how to approach this project. The use of unfamiliar software will also come with a learning curve that will need to be surmounted, with both the mika tool and the yacc software being a concern.

There is also competition in the form of the GNATprove tool for Ada SPARK which does tests on code to detect if the code is susceptible to runtime errors. It does this in a different way than is being proposed here, but with it being supported by the official Ada language they will have an advantage of getting developers to use the tool.

7. Conclusion

The Ada Runtime Error Generator is designed for Ada developers who wish for their programs to be as correct and robust as possible.

It will assist developers in the testing of their programs and reduce the time and cost of the testing phase of the software and give them an answer to if their code is likely to contain the possibilities of having runtime errors under certain conditions.

With a great deal of Ada development being for critical programs this will hopefully be of great benefit.

The project will also be a great learning experience, opening up many new technologies and areas of research to the team.

8. References

[1] Meudec, C., 2001, AT Gen: Automatic Test Data Generation using Constraint Logic Programming and Symbolic Execution Software Testing Verification and Reliability. [Online] Available at: <https://doi.org/10.1002/stvr.225> [Accessed 11 November 2020].

[2] Meudec, C., 2020. Mika Developer Guide. [online] Google Docs. Available at: <https://docs.google.com/document/d/16Z8awURB70k1Z8bpx1n2jurZQNQGSknNwikNHh9hw/edit#heading=h.bxj2rlgfm9yh> [Accessed 11 April 2021].