CTU
CZECH TECHNICAL UNIVERSITY IN PRAGUE

THESIS REVIEWER'S REPORT

I. IDENTIFICATION DATA

Thesis title:	**Analysis of the Scope of Variables Using the Graph Theory**
Author's name:	**Tran Hoang Nam**
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Electrical Engineering (FEE)
Department:	Department of Cybernetics
Thesis reviewer:	Ing. Jakub Dupák
Reviewer's department:	External (Developer Division, Microsoft)

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment — **extraordinarily challenging**

How demanding was the assigned project?

The project required the student to understand multiple topics in compilers, static program analysis, and graph theory on a sufficient level to be able to implement them from scratch or use production-level libraries to achieve the functionality. Such topics are usually taught at the master's level at OI, but only in a limited fashion. In addition, the student needed to integrate a visualization tool to create an interactive tool, which required an understanding of another distinct group of tools.

Fulfilment of assignment — **fulfilled**

How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.

The student fulfilled all the requirements for the assignment. A more detailed description of "errors in programming related to variable scope" would be useful as it is important to evaluate the practical usability of the provided tool, but is sufficient to consider the assignment fulfilled.

Methodology — **correct**

Comment on the correctness of the approach and/or the solution methods.

The student has defined variable scope at a very coarse level (whole blocks as opposed to range from the declaration statement to the end of the block), which significantly limits the usage of the program for practical usage and leads to paradoxical results, such as reporting optimal scope larger than the actual scope. However, this is not in fundamental conflict with the current design, and the program could be extended to handle a more granular definition of scope without significant redesign. There are other limitations of the current analysis precision. However, those are very well documented and explained in the thesis, and I consider them reasonable for the scope of the bachelor's thesis.
Used tools and libraries are appropriate.
Visualization is usable and provides very interesting tools for visual examination of a C program. It would benefit from some highlighting of potentially erroneous cases. In the current state, the user has to examine all nodes or guess from geometrical distribution.

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Technical level	**B - very good.**
Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?	
The student has covered very advanced topis and clearly showed good understanding of those. The description of the creation and usage of interference graphs and their relation to variable scope, as well as the analysis of scope itself, is very brief and does not provide a sufficient overview of the analysis design without reading the source code.	

Formal and language level, scope of thesis	**B - very good.**
Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?	
The thesis is clearly written and mostly easy to follow, except for some parts of chapter 4, which require increased effort and multiple reading to understand. It provides graphical ilustrations at appropriate places. I have noticed no problems with language.	

Selection of sources, citation correctness	**A - excellent.**
Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?	
I have noticed no problems regarding citations and sources.	

Additional commentary and evaluation (optional)
Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

The student implemented an interesting tool in a field that required an extraordinary level of self-study. The tool can find mistakes that I have marked in the manual evaluation of PRP homework within the constraints described above.

Have you considered using more complex tools, such as LLVM, which can perform CFG creating and liveness analysis on their own?
Do you consider graph coloring to be a good tool to assess the quality of C code?

The grade that I award for the thesis is **A - excellent.**

Date: 1.6.2024 Signature: