Brno University of Technology
Faculty of Information Technology

Review of Bachelor's Thesis

Student: Šmahlíková Barbora
Title: Next Generation of Rank-Based Algorithms for Omega Automata (id 24442)
Reviewer: Holík Lukáš, doc. Mgr., Ph.D., DITS FIT BUT

1. Assignment complexity · more demanding assignment
Complementation of Buchi automata is a notoriously complex problem and the related problematic is very difficult, especially for an undergrad student.

2. Completeness of assignment requirements · assignment fulfilled with enhancements
The student carried out the work in a way that led to two publications, at TACAS'22 and CAV'22 (two top conferences on verification and formal methods). I have personally never seen this, I think it is a record at lest at UITS. The work goes far beyond the minimum requirements of the assignment also by its actual content.

3. Length of technical report · in usual extent

4. Presentation level of technical report · 100 p. (A)
The presentation is mostly at the level of the international conferences where the work was partially published.

5. Formal aspects of technical report · 100 p. (A)
As the previous point.

6. Literature usage · 100 p. (A)
As the previous point.

7. Implementation results · 100 p. (A)
The student participated in implementing a tool that could be used to compare the proposed algorithms against the state of the art in Buchi complementation including numerous actively developed tools, could hold its own and could sometimes be notably better.

8. Utilizability of results
The results notably advance the state of the art in Buchi complementation, a long standing problem which many researchers have been working on for many years. As far as I know, the team is continuing the research and more of similar results can be expected.

9. Questions for defence
1) The comparison focuses on sizes, the gains are visible. Although the gains in numbers of timeouts are also notable and very nice, time is not in the focus of the comparison. Are there arguments that sizes are more important than times? Are there plans to compare times?

2) In section 6.3.1., the end, you talk about 485 elevator automata. How much of these are random/LTL? Are the following experiments done only with these 485 formulas?

3) How much of the tool is your work?

10. Total assessment · 100 p. excellent (A)
Again, I must say that this work is very extraordinary in its publication outcome. It deserves to be priced for this alone.
The work is very nice also by its content. The presentation meets the level of international conferences,
the improvements of algorithms for Buchi complementation are numerous, non-trivial, smart, and are working well.
The experimental evaluation is very good also.
Of course the advisor and the specialist played a role,
but I understood that the student's own contribution is very substantial.

In Brno 2 June 2022

 Holík Lukáš, doc. Mgr., Ph.D.
reviewer