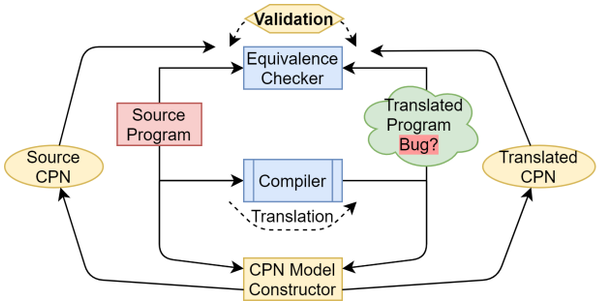
SamaTulyataII: Validation of Code-Optimizing Transformations Involving Loops for Petri Net Based Models of Programs

Rakshit Mittal (Birla Institute of Technology and Science, Pilani, India)

PROBLEM STATEMENT



- SamaTulyata (equivalence checking tool)

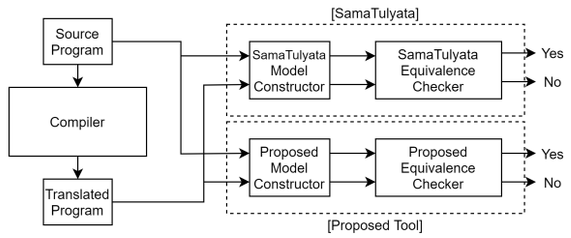
- cannot handle loop-involved code optimizing transformations.

- **SamaTulyataII** - *"To devise a new behavorial equivalence checking tool for validating several code-optimizing transformations involving loop, using Petri net based models of programs."*

EQUIVALENCE CHECKING

Notion of Equivalence: *For all path in the source CPN model, there exists a path in the translated CPN model such that the condition of execution along the path are equivalent and the data transformation along the paths are equal.*

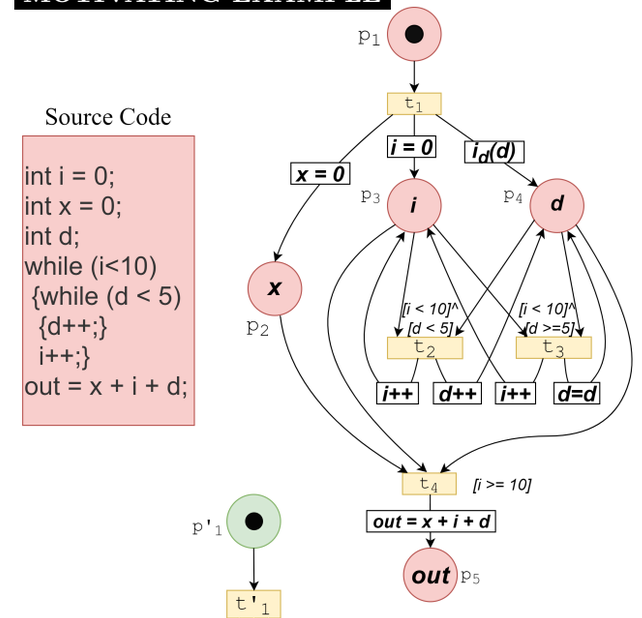
EXPERIMENTAL SETUP

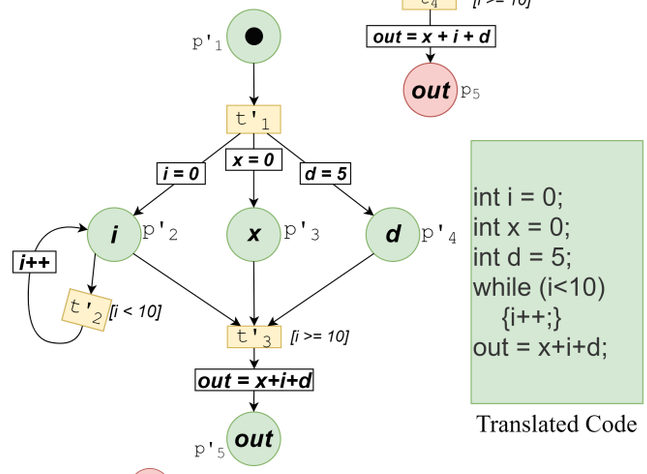


MOTIVATING EXAMPLE

Source Code

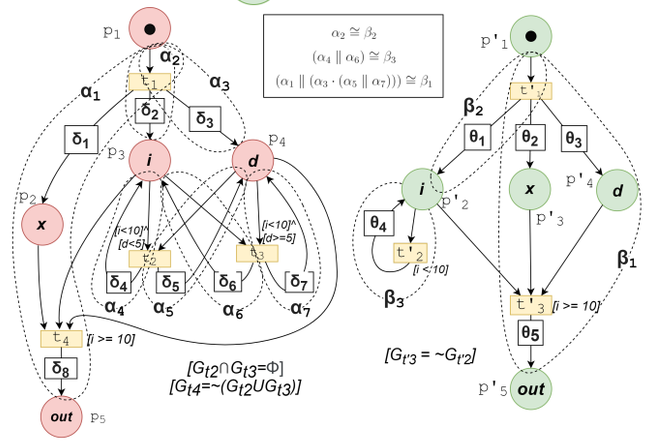
```
int i = 0;
int x = 0;
int d;
while (i<10)
 {while (d < 5)
  {d++;}
  i++;}
out = x + i + d;
```



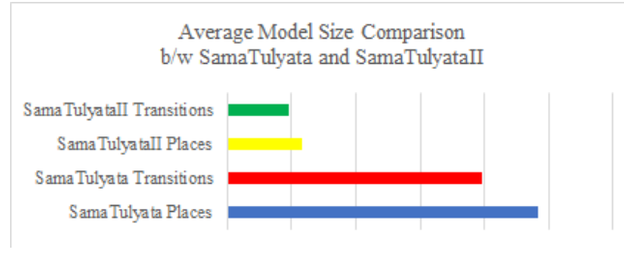



```
int i = 0;
int x = 0;
int d = 5;
while (i<10)
   {i++;}
out = x+i+d;
```

Translated Code



RESULTS



- Reduced model size, increased efficiency

CAPABILITIES AND LIMITATIONS

- Able to handle several loop involved code-optimizations like code motion across loop, loop swapping, boosting up/down, duplicating up/down

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- Works only for integer type variables
- Cannot handle loop shifting, loop reversal, software pipe-lining

FURTHER WORK

Further work aimed at overcoming limitations and extension of method to capture arrays.

REFERENCES

- Bandyopadhyay, S., Sarkar, D., and Mandal, C. Equivalence checking of Petri Net models of programs using static and dynamic cut-points. Acta Inf. 56, 4 (2019),321–383.
- Bandyopadhyay, S., Sarkar, S., Sarkar, D., and Mandal, C. Samatulyata: An efficient path based equivalence checking tool. ATVA (2017) pp. 109–116.

ping me on Slack: @Rakshit Mittal
or e-mail: raks0009@gmail.com