Model Transformation with Triple Graph Grammars and Non-terminal Symbols

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Introduction

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Background

- Model-driven software development as a technique to enhance quality of software

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- Models as formal specifications of safety-critical systems

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- Models as formal specifications of safety-critical systems
- Transformation between models (e.g. from a formal specification to high-level source-code and vice-versa)
- **Goal:** Comprehensible and reliable transformations
  - Efficient representation of abstract concepts
  - Small size

The Model Transformation Problem

The Triple Graph Grammar Approach

- Models are graphs

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- Two correctly-transformed graphs G and T are in a triple graph $G \leftarrow C \rightarrow T$
- A triple graph grammar TGG is a generator of a set of triple graphs $L(TGG)$
- The correctly-transformed relation $\sim$ between graphs is described in terms of a triple graph grammar TGG
  - $G \sim T$ iff $(G \leftarrow C \rightarrow T) \in L(TGG)$

Triple Graph Grammars with Non-terminal Symbols

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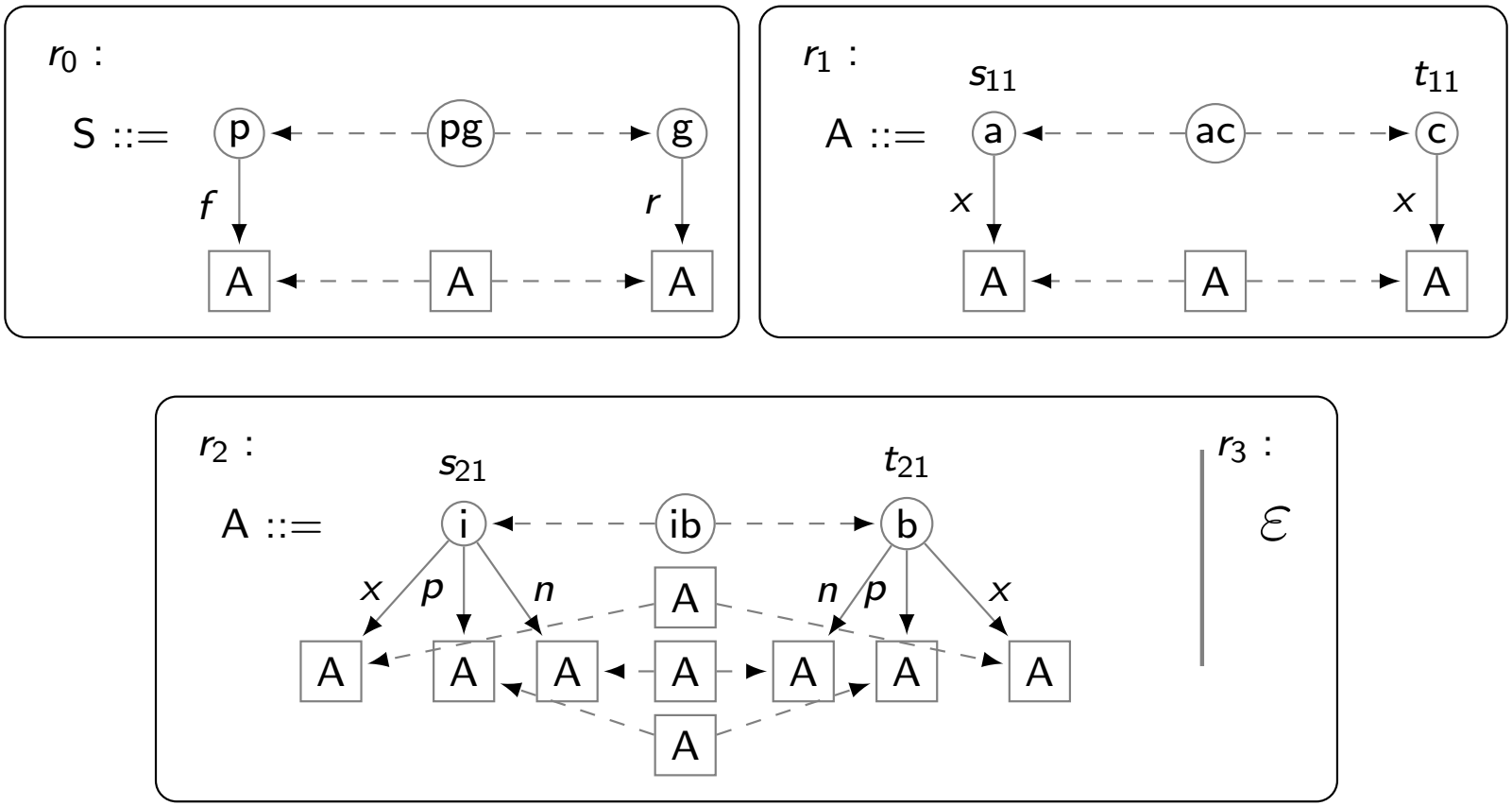
Our contribution – NCE TGG

- New formalism: NCE TGG
  - *Graph Grammar with Neighborhood-controlled Embedding* (NCE) [Janssens and Rozenberg(1982)]
  - *Triple Graph Grammar* (TGG) [Schürr(1994)]
- Non-terminal symbols
- Context-free

NCE TGG – An example

- *Pseudocode* to *Controlflow*



Evaluation

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Usability Evaluation

	Standard TGG		BNCE TGG	
Transformation	Rules	Elements	Rules	Elements
Pseudocode2Controlflow	45	1061	**7**	**185**
BTree2XBTree	**4**	**50**	5	80
Star2Wheel	-	-	**6**	**89**
Class2Database	**5**	**80**	-	-

Table: Results of the usability evaluation of the BNCE TGG formalism in comparison with the standard TGG for the model transformation problem

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Conclusion

- New context-free TGG formalism
  - Used to specify model transformations
  - Outperforms standard TGG in 2 evaluated cases
  - Special potential for code-generation
  - Cannot model important transformations (e.g. Class Diagrams)

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- New context-free TGG formalism
  - Used to specify model transformations
  - Outperforms standard TGG in 2 evaluated cases
  - Special potential for code-generation
  - Cannot model important transformations (e.g. Class Diagrams)
- Future Work:
  - Application conditions: Positive experimental results
  - Broader evaluation including empirical assessment with engineers and performance reports
  - Model synchronization

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References

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