

Extending the Overture code generator towards Isabelle syntax

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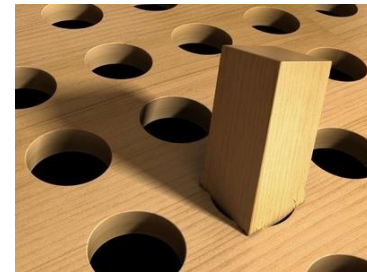
Agenda

- Motivation
- Background
- Contributions
- Conclusion and future plans
- Demo



Motivation

- Validation: *Are you building the right thing?* 😊
- Verification: *Are you building it right?* 😐
- **Improve verification support in Overture**
- Is code generation platform really extensible?
- **Test extensibility of code generation platform**

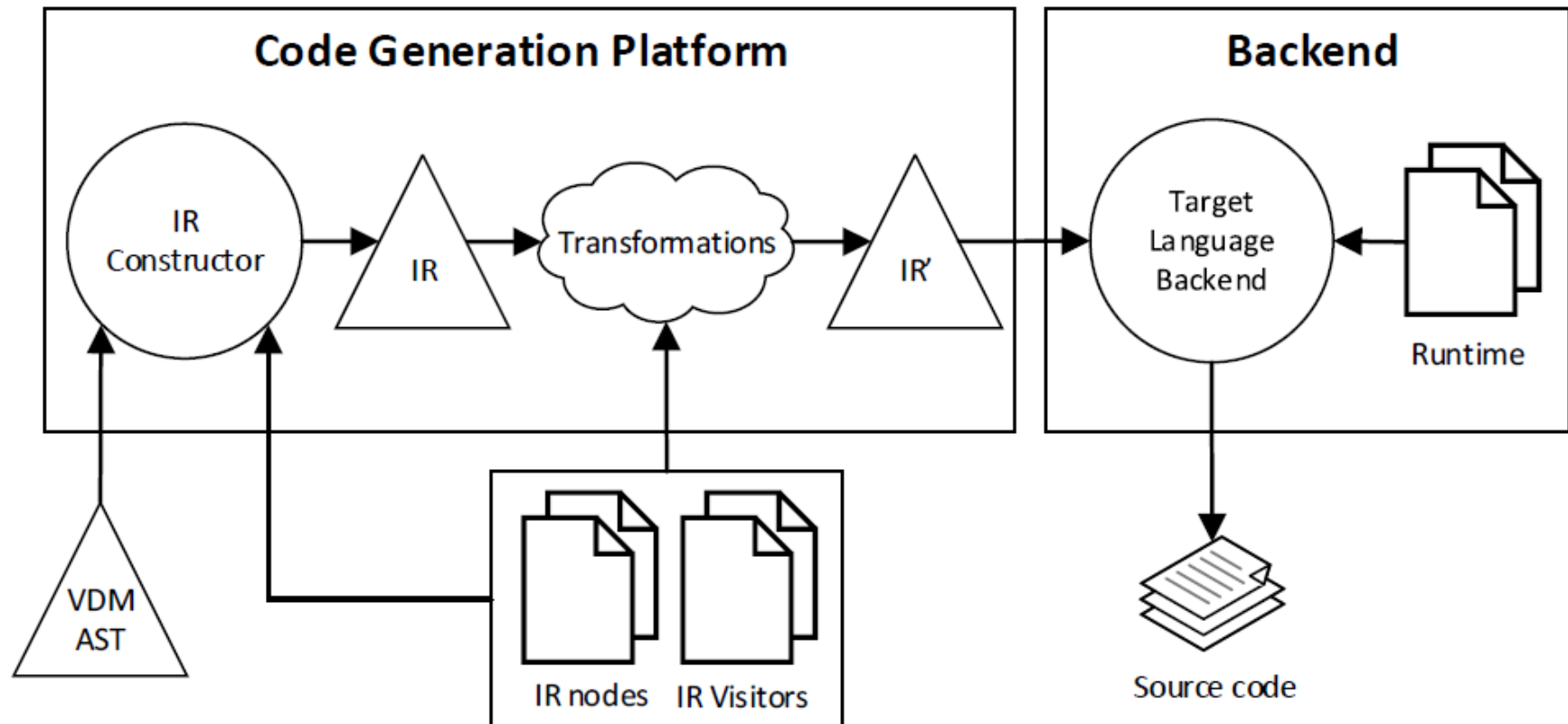


Background: Isabelle Embedding

- Isabelle
 - Framework for implementing logical formalisms
- HOL-UTP-VDM
 - Isabelle embedding of VDM
 - Originally developed for CML
 - Only supports single module VDM-SL
 - One-to-one correspondance between source and target constructs



Background: Code Generation Platform (CGP)



Contributions

- Methodology for developing CGP extensions
 - Isabelle translation
 - Extensibility improvements to CGP



Isabelle translation

```
odd: nat -> bool
odd (x) ==
  if x = 0
  then false
  else even(x-1);
```

```
even : nat -> bool
even (x) ==
  if x = 0
  then true
  else odd(x-1);
```

VDM-SL to Isabelle

```
begin_mutrec

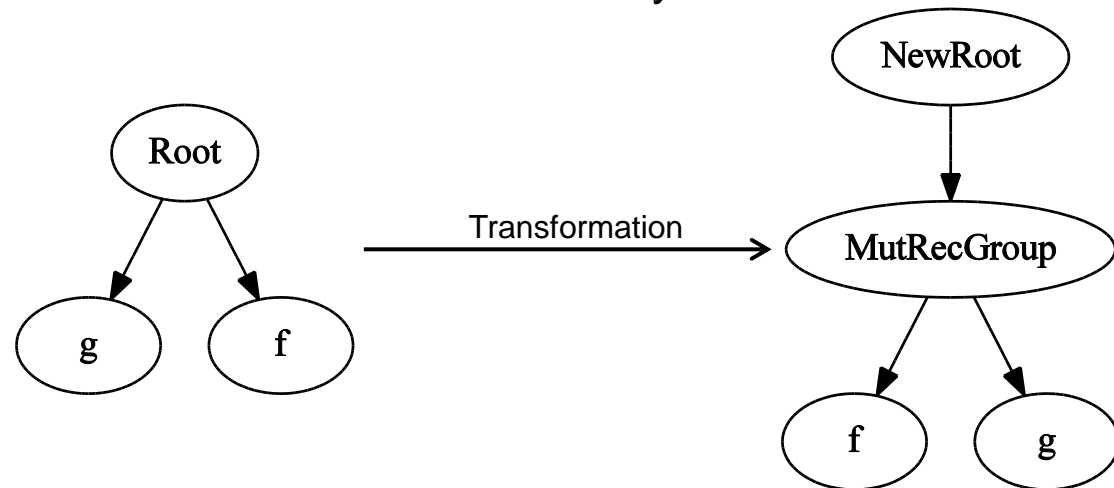
vdmefun odd
inp x :: "@nat"
out "@bool"
is "if (^x^ = 0)
    then false
    else even((^x^ - 1))"

vdmefun even
inp x :: "@nat"
out "@bool"
is "if (^x^ = 0)
    then true
    else odd((^x^ - 1))"

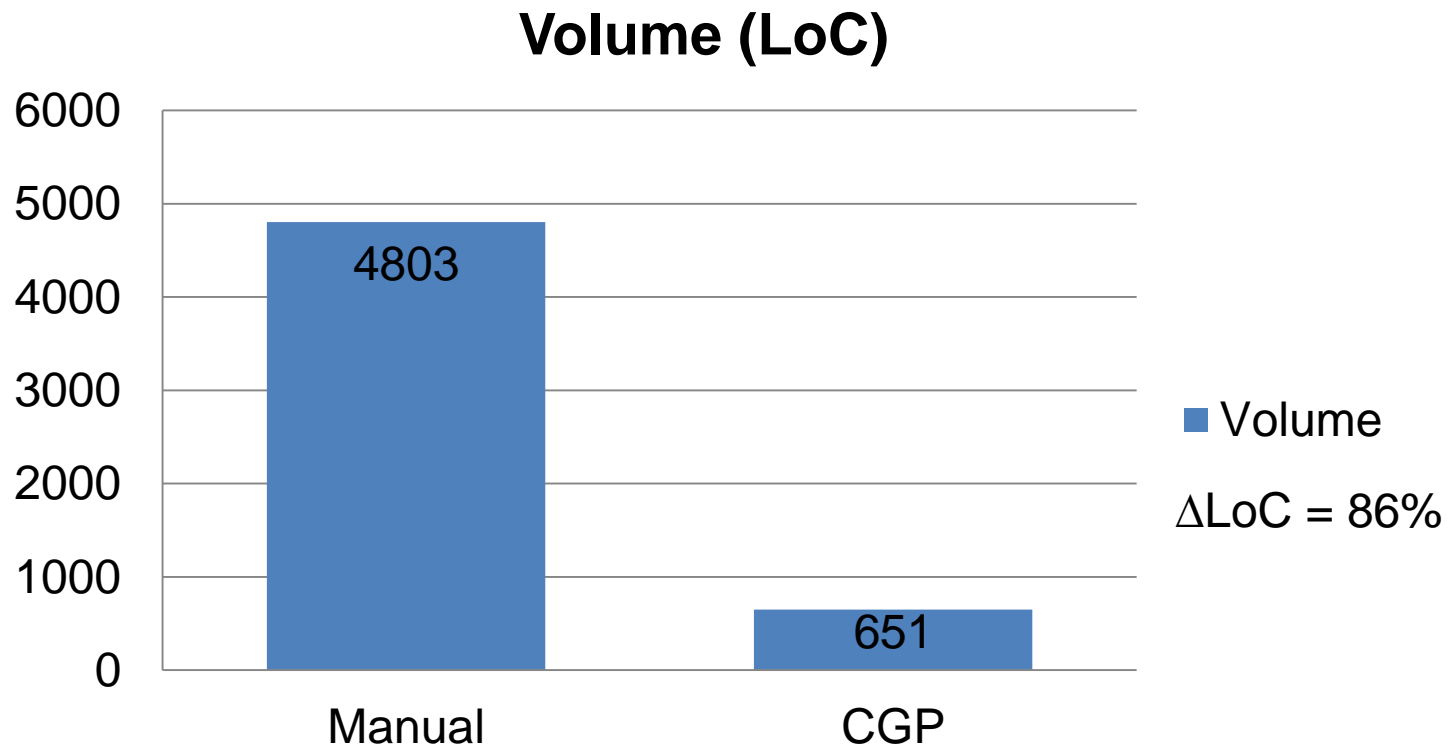
end_mutrec
```

Extensibility improvements

- Better template management configuration
- Redefining transformations
 - **Partial** and **total**
 - Base classes for defining both transformations
 - Functionality to apply the transformations automatically



Evaluation



Conclusion and future plans

- Worthwhile to use CGP for syntax translations
- CGP extensibility has been improved
- Future work
 - ✓ Move to dedicated VDM embedding
 - ✓ Architectural refactoring of CGP
 - Implement translations to other languages

Demo



SPECIAL request slide

Progress of the Overture community

1 year:

- verification support
- connect with others

10 years:

- continuous verification

5 years:

- semantics of VDM++
- 1000 downloads
- broaden developer base