

Porting Mizar to InformatH

Göteborg CHAIR Workshop AI4Math

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Outline

- ① An introduction to Informath
- ② Porting Mizar to Informath
 - Mizar
 - The Mizar to Informath pipeline
 - Example

What is InformatH ?

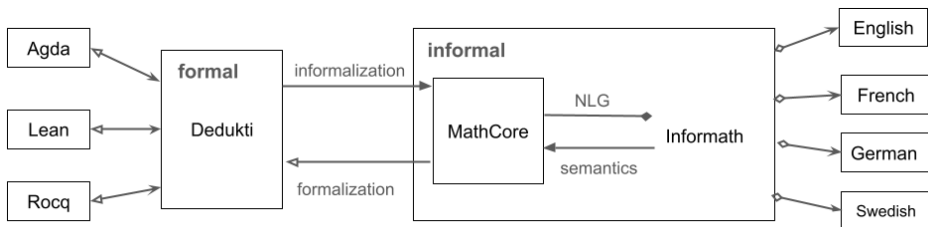


Figure – Structure of InformatH

Quick focus on Dedukti

Dedukti in a few words :

- $\lambda\Pi$ -calculus
 - rewrite rules
- conceived as an *interlingua* between proof assistants

Larger focus on GF

Grammatical Framework (GF) in a few more words :

- Abstract syntax tree
 - Linearization to multiple languages
 - Can be specialized to Controlled Natural Language
- conceived as an *interlingua*

What did we already have ?

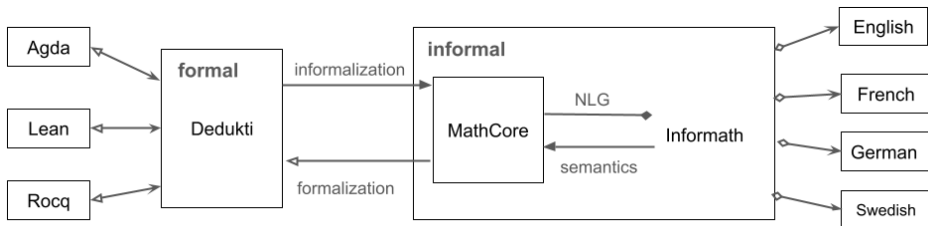


Figure – Structure of InformatH

Focus on Mizar

Mizar in a few words :

- "attempt to reconstruct mathematical vernacular in a computer-oriented environment"
- based on set theory and classical logic
- a huuuuge library

The Mizar to InformatH pipeline

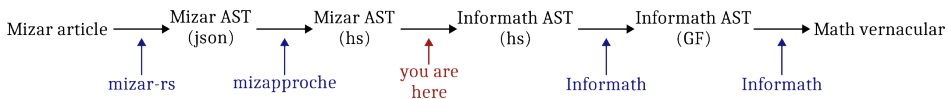


Figure – From a Mizar article to natural language

Focus on Mizapproche

Le Miz s'approche: Informalization and Autoformalization with Mizar and Naproche

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1 Introduction

Mizar is an influential interactive theorem proving system with a rich history dating back to 1973 [18, 16]. Its main library, the Mizar Mathematical Library (MML) [11], is one of the largest repositories of formalized mathematics. Mizar uses a quasinatural input language, familiar foundations in set theory and classical logic, and a declarative proof format based on natural deduction. Mizar's emphasis on naturalness, which allows its users to approximate informal mathematical writing to a certain extent, along with the large scale of the MML, makes it a compelling subject for research into proof automation, informalization, and autoformalization.

Naproche is an experimental interactive theorem prover that places even greater emphasis on naturalness [2, 9]. Naproche uses a controlled natural language (a sublanguage of ordinary

Figure – Mizapproche

Example

A toy example

A very small Mizar article :

```
environ  
begin  
theorem Ax1:  
    for x being object holds x is set;
```

Example

Converting abstract syntax trees

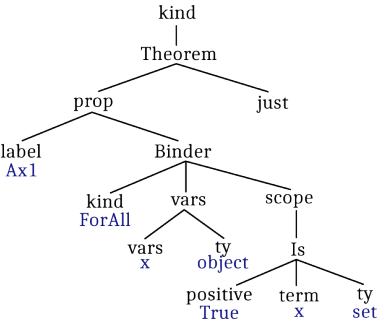


Figure – Mizar AST

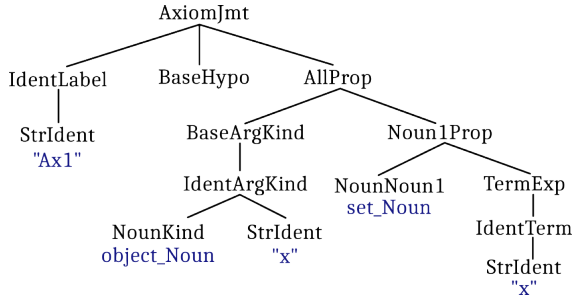
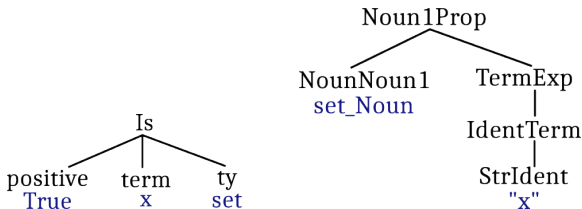


Figure – Informat AST

Example

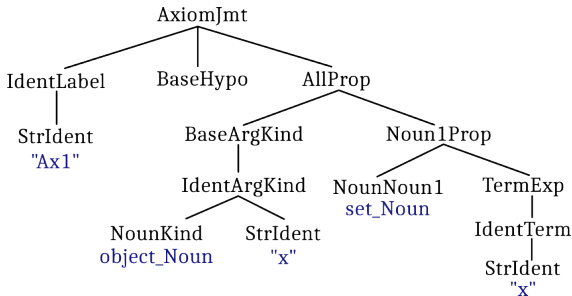
Conversion example



1	set	mode 0	Noun	set_Noun
2	object	mode 0	Noun	object_Noun
3	Element	mode 1	Noun2	element_Noun2
4	+	infix 1 1	Oper2	plus_Oper2
5	+	infix 1 1	Func	plus_Func
6	*	infix 1 1	Oper2	times_Oper2
7	-	infix 1 1	Oper2	minus_Oper2
8	Complex	mode 0	Noun	complex_Noun
9	Real	mode 0	Noun	real_Noun
10	0	infix 0 0	Const	0

Example

Linearization



[en] Ax1. For all objects x , x is a set.

[fr] Ax1. Pour tout objet x , x est un ensemble.

Conclusion

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