

The Development of a Computer Application that Identifies Reusable Components through Formal Specifications

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The Problem

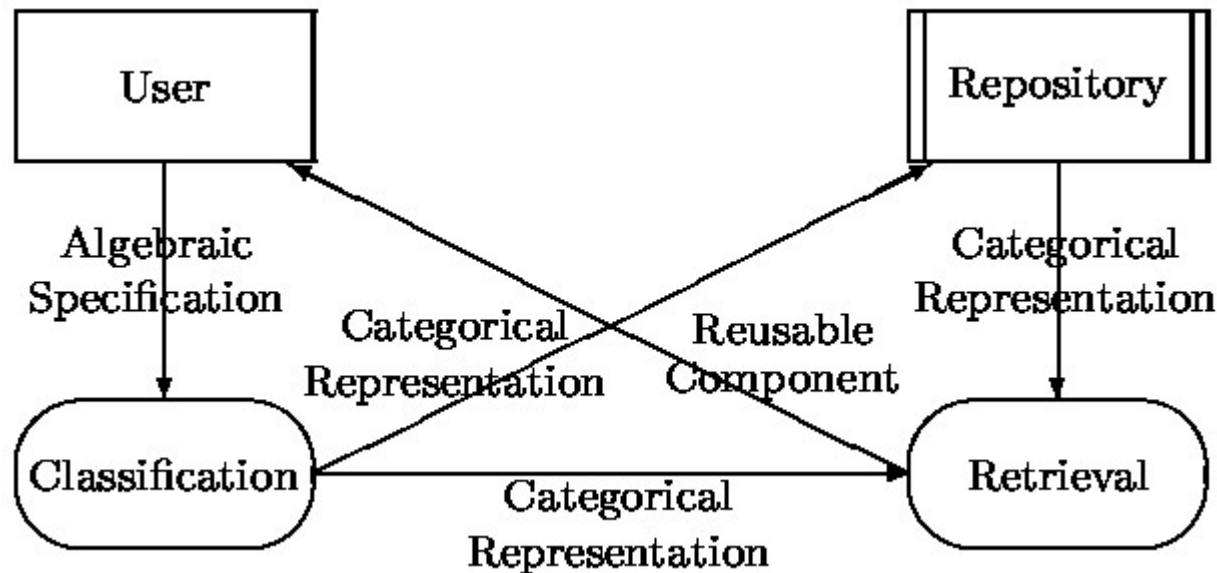
- Software Reuse
- Process of Reuse
 - Component Classification, Retrieval and Adaptation
- Types of Formal Reuse
 - Isomorphic
 - Compositional

Proposed Solution

- Formal Specifications
- Classification through Single Sort Algebraic Specification
- Retrieval through Category Theory
- Why Category Theory?

Computer Application

- Implementation of a Computer Application that Automates the Process of Reuse



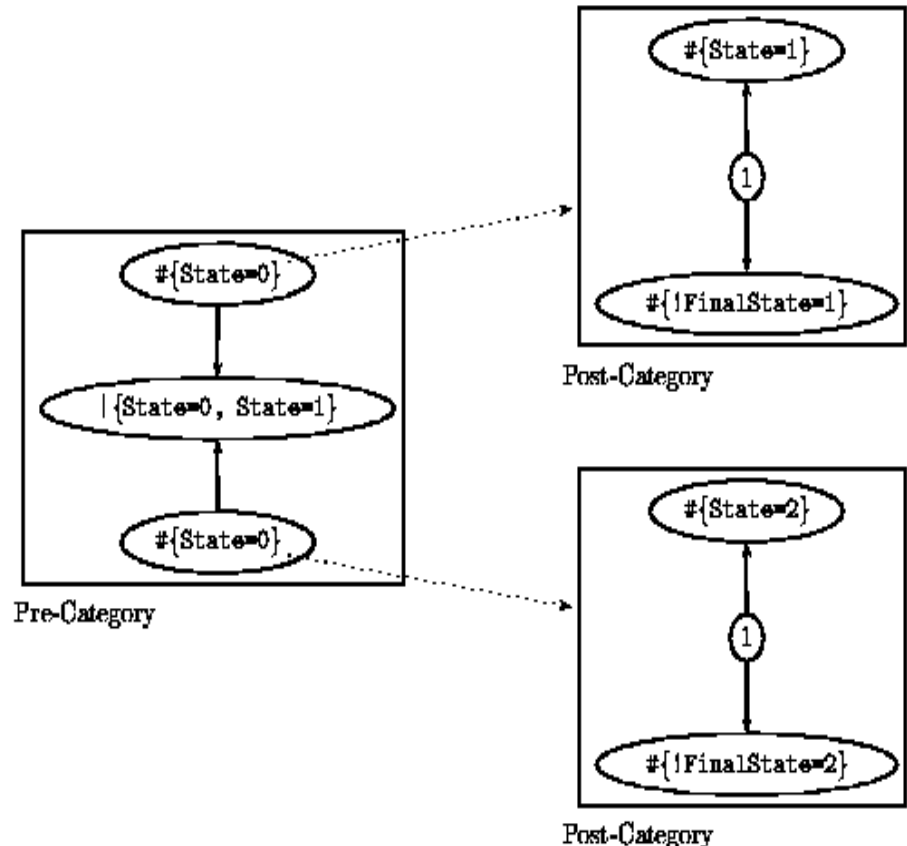
Classification

- Translate an Algebraic Specification into a Categorical Representation
- Pre-category and Post-categories
- Objects are propositions and arrows are their logic implication
- Modifications made to the proposed methods:
 - Quantifiers representation
 - Semantics of equality
 - Represent implicit information
 - Normal forms

Classification (sample)

Component: Counter
Sort: {0, 1, 2}
Variables: State
Invariant: false \Rightarrow true

Method: Increment
Interface: !FinalState
Requires: State=0 \vee State=1
Ensures: State=0 \rightarrow true \Rightarrow State=1,
true \Rightarrow !FinalState=1
State=1 \rightarrow true \Rightarrow State=2,
true \Rightarrow !FinalState=2



Retrieval

- Isomorphic Matching
 - Between the user method and one library method
 - Identify all the functors by progressive construction
 - And/Or Graphs
 - Complexity
 - Heuristics

Retrieval (cont. 1)

- Compositional Matching
 - Between the user method and a sequence of library methods
 - Links in the sequence by progressive construction
 - Category matching by Isomorphic Matching

Extensions

- Representing quantifiers without any limitations
- Implications in the pre-conditions
- Sort members could be infinite

Conclusions

- The classification process and the isomorphic matching had already been implemented (in ML)
- Future work:
 - Implementation of the compositional matching
 - Complexity analysis
 - Implementation of the extensions
 - Develop new extensions (predicate arity)
 - Applying the application to a case of study