I229 Categories and CommUnity, Spring 2003

— Pensum —

Book

pages 7–46, 49–55, 61–91, 133-174

Article

pages 1–29 (corresponds to pages 141–174 in the book)

— Concepts and Results —

1 Categories

Basics

- graphs and graph morphisms
  - definitions and examples
  - path in a graph, sets G_n
- category
  - definition
  - examples: SET, GRAPH, LOGI, pre-orders as categories
  - category generated by a graph
- commutative diagrams
  - definition and examples
- special morphisms
  - definitions of isomorphism, (split) monomorphism, (split) epimorphism
  - examples in SET, GRAPH
  - properties w.r.t. composition

Building Categories

- dual category
- discrete category
- product category
- category $\mathrm{SET}_\perp$ of pointed sets

  $\Rightarrow$ slice categories as generalization
- subcategories, reflective and co-reflective subcategories

Temporal Specifications

- signatures and signature morphisms
- temporal propositions and translation maps
- interpretation structures and satisfaction of propositions
- theories and theory presentations
- reducts and model functor, satisfaction condition
- theory and presentation morphims
- generalized model functor
- definition of institution

Universal Constructions

- initial and terminal objects with examples in SET, $\mathrm{SET}_\perp$,GRAPH, LOGI
- sums with examples in SET, $\mathrm{SET}_\perp$, LOGI
- products with examples in SET, $\mathrm{SET}_\perp$, LOGI
- equalizer and co-equalizer with examples in SET, $\mathrm{SET}_\perp$
- pushouts and pullbacks with examples in SET, $\mathrm{SET}_\perp$, general construction
- co-cones and colimits, cones and limits
- examples of limits and colimits
- stepwise construction of limits and colimits

Functors and Natural Transformations

- definition and examples of functors, the category CAT
- properties: preservation of iso's (commutative diagrams), injective , surjective, full, faithful, preservation and lifting of colimits
- reflectors and co-reflectors (adjoint functors)
- definition and examples of natural transformations
- functor categories

2 CommUnity

System configuration

- signatures and designs, definitions and examples
- idea of name bindings
- signature and design morphisms with examples
- categories SIG and c-DSGN and the functor sig:c-DSGN $\rightarrow$ SIG
- properties of the functor sig (faithful, lifts colimits of well-formed configurations, has discrete structures)
- (well-formed) configuration, semantics (colimit) and example

Architectural Connectors

- definition of architectural connectors in CommUnity
- refinement morphisms with examples
- instantiation of connectors, definition and semantics
- informal discussion of compositionality
- an ADL-independent notion of connector