Static Semantics of VDM-SL
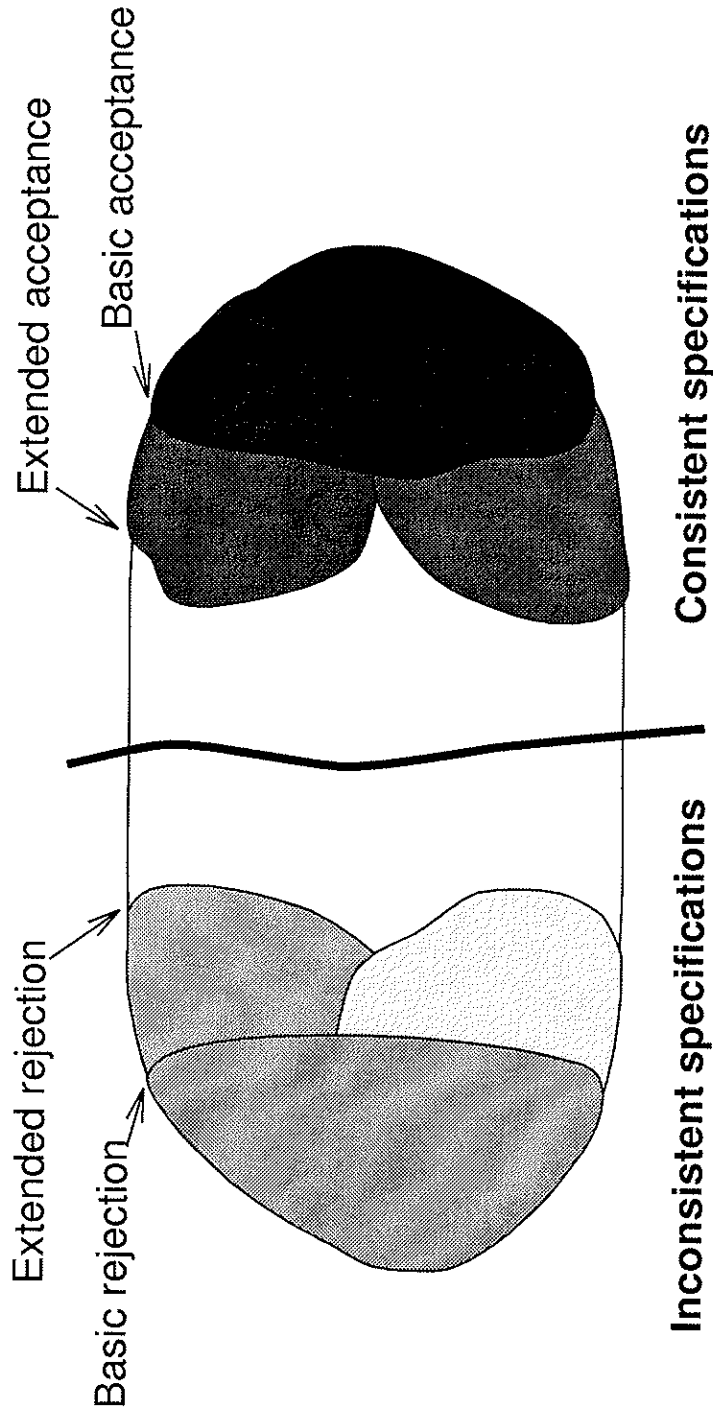
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Rejectance and Acceptance

Extended acceptance

Basic acceptance

Extended rejection

Basic rejection

Consistent specifications

Inconsistent specifications

Static Semantics of VDM-SL

2

Error Classes

1. Missing definitions of identifiers

2. Ambiguous tags

3. Recursion "through" function types

4. Non-flat types in sets or maps

5. Basic type errors

6. Violation of specified types for defined values

7. Violation of specified types for explicit function definitions

8. Violation of specified types for explicit operation definitions

9. Type errors in assignments

10. Unsuccessfull attempts to match patterns with values

11. Multiple incompatible definitions

12. Type invariants which are loose

13. Unsatisfiability of function and operation specifications

14. Unsatisfiability of mutually recursive type and function definitions

15. Unsatisfiability of a state initialisation predicate

Type Representations

$$TypeR = BasicTypeR \mid SetTypeR \mid ProductTypeR \mid$$
$$FnTypeR \mid TypeRId \mid UnionTypeR;$$

$$BasicTypeR = \text{BOOL} \mid \text{NAT};$$

$$SetTypeR :: elemtp : Type0R;$$

$$Type0R = TypeR \mid \text{EMPTYTYPE};$$

$$ProductTypeR :: \quad TypeR^{+};$$

$$FnTypeR :: dom : TypeR$$
$$rng : TypeR;$$

$$TypeRId :: \quad Id;$$

$$UnionTypeR :: \quad TypeR\text{-set}$$

$$\text{inv } \text{mk-}UnionTypeR\,(ts) \triangleq \text{card } ts \geq 1$$

Static Semantics of VDM-SL

The Environment

$$Env :: tenv : TypeREnv$$
$$venv : ValEnv;$$

$$TypeREnv = Id \xrightarrow{m} TypeR;$$

$$ValEnv = Id \xrightarrow{m} TypeR$$

Subtypes

$$IsSubtype : Type0R \times Type0R \to Env \to \mathbb{B}$$

$$IsSubtype\,(t_1, t_2)(\text{mk-}Env\,(tenv, \text{-})) \triangleq$$
$$\exists\, strel : (Type0R \times Type0R)\text{-set} \cdot$$
$$IsSubTypeRel\,(strel)\,(tenv) \wedge$$
$$\text{mk-}(t_1, t_2) \in strel$$

Further Information

- On Type Checking in VDM and Related Consistency Issues (VDM'91)

- An Approach to the Static Semantics of VDM-SL (VDM'91)

- On Type Systems with Set Theoretic Type Operators (Damm PhD thesis)

- The VDM Specification Language – Reading the Standard (Prentice-Hall'95)