Sessional Assignment

Software Verification and validation

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(Lecturure)

Question:

What is Z specification, why it is use for, also give Example.

Ans:

The Z language is a model oriented, formal specification language that was proposed by Jean-Raymond Abrail, Steve Schuman and Betrand Meyer in 1977 and it was later further developed at the programming research group at Oxford University. It is based on Zermelo Fränkel axiomatic set theory and first order predicate logic. The Z notation, is a strongly typed, mathematical, specification language. It has robust commercially available tool support for checking Z texts for syntax and type errors in much the same way that a compiler checks code in an executable programming language. It cannot be executed, interpreted or compiled into a running program. It allows specification to be decomposed into small pieces called schemas. The schema is the main feature that distinguishes Z from other formal notations. In Z, both static and dynamic aspects of a system can be described using schemas. The Z specification describes the data model, system state and operations of the system. Z specification is useful for those who find the requirements, those who implement programs to meet those requirements, those who test the consequences, and those who write instruction manuals for the system.

Z is based on the standard mathematical notation used in axiomatic set theory, lambda calculus, and first-order predicate logic. All expressions in Z notation are typed, thereby avoiding some of the paradoxes of naive set theory. Z contains a standardized catalogue (called the mathematical toolkit) of commonly used mathematical functions and predicates, defined using Z itself.

Although Z notation (just like the APL language, long before it) uses many non-ASCII symbols, the specification includes suggestions for rendering the Z notation symbols in ASCII and in LaTeX. There are also Unicode encodings for all standard Z symbols.

Example: Banking System

```
┌─ WithdrawMoney ────────────────────────────────
│ ΔBankAccount
│ dollarAmount? : ℕ
│ centAmount? : ℕ
├────────────────────────────────────────────────
│ dollarAmount? ≤ dollars
│ dollarAmount? = dollars ⇒ centAmount? ≤ cents
│ centAmount? > cents
│    ⇒ (    dollars'  = dollars − dollarAmount? − 1
│       ∧  cents'     = cents − centAmount? + 100 )
│
└────────────────────────────────────────────────
```