DEPENDABILITY MODELS

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Extended abstract

In my lecture I would like to introduce listeners into the issue of system dependability. Dependability is an important parameter for all systems we encounter in everyday life. Very high reliability is particularly important for systems whose failure could cause great material damage, in the worst case up to endanger human health. Typical examples are industrial systems, control systems of modern automobiles or airplanes.

Dependability cannot be represented as a single property, which includes several different aspects. The dependability analysis of systems is based on several attributes that express the dependability of systems. The main attributes are *reliability*, *maintainability* and *availability*. In the context of dependability we use terms like *fault*, *error* and *failure*. Each element of the investigated system can be in failure-free or failure states. If this element can be repaired, we are talking about *renewal* object, otherwise about *non-renewal*. Currently, there are two approaches to increase the reliability: *preventing faults* and *fault tolerance*.

Graphical or mathematical representations of relationships between elements of the system are dependability models. Conversion to the mathematical model allows the numerical calculation of reliability indicators. In the presentation I will introduce three types of reliability models: *block dependability models*, *fault trees* and *Markov models*. Selection of the appropriate model depends on the system. It is necessary to model renewal systems using Markov models.

A Markov chain is a mathematical system that undergoes transitions from one state to another, among a finite or countable number of possible states. It is a random process usually characterized as memory less: the next state depends only on the current state and not on the sequence of events that preceded it. This specific kind of "memorylessness" is called the *Markov property*. This property allows us to represent Markov models using finite-state automaton.

References

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[2] KOREN, I. a C. M. KRISHNA. *Fault-tolerant systems*. San Francisco: Morgan Kaufmann Publishers, 2007, 378 s. ISBN 978-0-12-088525-1.