

BayRAM: A Package for Bayesian Assessment of System Reliability, Availability and Maintainability

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Abstract

HW/SW systems are present in many fields of human activity. Estimating the reliability, availability and maintainability (RAM) of complex HW/SW systems is therefore becoming increasingly important, specially for safety critical systems in areas such as finance, aerospace and energy, among others. Although there are several software packages available to support reasonably complex reliability analyses, they have several limitations, being possibly the most important one, the fact that they provide little support to Bayesian analysis.

With this drawback in mind, we are developing BayRAM, a JAVA package to support Bayesian RAM analysis of complex HW/SW systems, based on three key ideas:

- Description of complex systems, in terms of series and parallel RBDs with pending blocks, and forecasting their reliabilities. Some of the blocks will refer to software components; the other to hardware components.
- Software block reliability modeling is based on model selection over mixtures of Software Reliability Growth models.
- Hardware block RAM modeling is based on Continuous Time Markov Chains, with some ON states and some OFF states and the use of phase-type distributions.

The system includes a graphical interface to describe the system, input data routines, some exploratory data analysis routines, prior specification modules and modules to undertake inference and prediction tasks.

We illustrate the basic features of our system, with an exhaustive example, consisting of the analysis of a schematic version of our university resource planner.