PROJECT PLAN

A Survey and Analysis on Metric Temporal Logic

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Abstract

Temporal logics have been successfully used in specification, verification and validation of reactive systems. However, real-time systems cannot be well modeled by classic temporal logic because of its weak expressiveness on timing properties. Metric Temporal Logic (MTL) extends the classic temporal logic model by turning qualitative temporal operators into quantitative temporal operators. This paper examines a decent survey on MTL and its role in specifying properties by different verification methods outside of model checking, such as runtime monitoring, performance analysis and theorem proving. A sample system as a case study will be further presented to show how the timing properties in real-time systems can be expressed by MTL and verified by a MTL model checker.

Introduction

Temporal logics have been successfully used in specification, verification and validation of reactive systems. However, classic temporal logics have limitation on modeling real-time systems. Since the quantitative properties could not be expressed by qualitative temporal operators. Metric Temporal Logic (MTL) as a timed temporal logic is an extension of Linear Temporal Logic (LTL) with time-constrained modalities that includes quantitative requirement on the elapse of time. This project examines a decent survey on MTL and its role in specifying properties by different verification methods outside of model checking, such as runtime monitoring, performance analysis and theorem proving. In addition, a system, which is modeled by MTL and is verified by a model checker, would be given as a case study.

This paper will start from an overview of classic temporal logic and then claim the two ways of achieving the quantitative timing extension. In the following part, I will introduce and analyze the syntax and semantics of the basic and derived construction in MTL. The comparison and analyze of expressiveness between MTL and other timed temporal logics will be further proposed.

MTL as a timed temporal logic is not only used in model checking but also plays an important role in some other verification methods. The second section of my project will survey MTL’ role in different verification methods rather than model checking. I intend to gather and summarize the different research jobs, which utilize MTL to be the model logic. The possible area would be runtime monitoring, performance analysis and theorem proving.

In the third section, I will do a case study, which model and verify a time sensitive system by MTL. A special model checker would be chosen later. The result of model checking will be presented at last.
Reference.


Project Schedule

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<td>LTL, MTL and other TTL</td>
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