A Tableau Method for Interval Temporal Logic *

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1 Introduction

Interval Temporal Logic (ITL) is an important class of temporal logic. Early work on the topic was performed by Moskowski [13] with a number of researchers progressing the topic since then, e.g. Hale [8], Kono [9], Duan [6], Cau et al [5], Bowman et al [3] and Thompson [16].

Standard temporal logics are defined over infinite state models, for example, the models for Manna and Pnueli Linear Time Temporal Logic [11] are infinite state sequences. However, in interval temporal logic the model theory is restricted to finite state sequences, called *intervals*.

There are a number of reasons for being interested in such logics. One reason is that interval temporal logic lends itself to execution. This is apparent from Moskowski's work [13]. In addition, a number of interesting and powerful operators arise naturally from ITL. In fact, it is straightforward to derive operators very like the constructs of imperative programming (e.g. assignment, conditionals, iteration etc). This then yields the possibility that abstract specifications and concrete implementations can be realised in the same notation, with refinement mappings between.

An additional aspect of interval temporal logic is that it provides a very simple real-time model in which one unit of time is past when moving from state to state. Consequently, timings can be obtained by measuring interval lengths. The ITL operator $\mathbf{len}(n)$ is used for this purpose. This operator is satisfied by any interval with $n + 1$ states (transitions between states are counted rather than numbers of states).

Two operators which are characteristic of interval temporal logic are the Chop operator **;** and the projection operator **proj** . The former of these implements a form of sequential composition; an interval will satisfy,

$$P \,;\, Q$$

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