VIS : Technology Transfer Course

University of California, Berkeley

Lab # 6 : Model Checking

Sriram Rajamani

5/15/96

1 Introduction

In this lab we will learn how to use **VIS** to check if your model satisfies a property. We will use the bus arbiter example that was introduced in the earlier labs. We will first specify the property in English. The objective is to translate the English specification to **CTL** and use **VIS** to check the property. In some cases, the property might fail. In such cases, we will use **VIS**'s debug trace and try to figure out the bug in the model.

Before we start, just one technical detail...The properties we will be dealing with are called *Safety Properties*. Informally, safety properties have the form "Nothing bad ever happens", as opposed to "Something good will eventually happen". The latter kind of properties are called *Liveness Properties*.

Please consult the web page at:
http://www-cad.eecs.berkeley.edu/Respep/Research/vis/doc/ctl/ctl/ctl.html for CTL syntax. Remember to terminate every formula with a ";".

Useful commands in this lab are:

- init_verify - prepares the design for doing verification.
- mc - do CTL model checking

If you are having difficulty bringing up **VIS**, or do not have the sample files for this lab, or have any other problem, please ask for help.

2 Hands on Experience

Problem #1 Compile the verilog example ex1.v to ex1.mv using vl2mv.

Problem #2 We wish to specify "No two processes can access the bus at one time". This property is called *Mutual Exclusion*. Write down the property in **CTL** below:

Problem #3 Start **VIS**. Read in the blif-mv description, use the command **mc** and check the invariant *Mutual Exclusion*. The property will fail. What does the trace say? Use the space below for analyzing the trace.

Problem #4 Fix the bug and verify if the invariant passes now.

Problem #5 Specify the property "If client A is requesting for the bus, it will not drop the request until it gets an acknowledgment" in **CTL**. This is called *Persistence of Request.* Check this property using **VIS**. First, write down the **CTL** formula below:

Problem #6 Specify the property "if A is holding the bus and B is requesting, then it is not possible for A to release control of the bus and get it back, before B gets control of the bus " in **CTL**. This is called *Equal Opportunity.* Do you think that the model satisfies this property? First, write down the **CTL** formula below. WARNING: The **CTL** specification of this property is non-trivial.

Problem #7 Verify *Equal Opportunity* using **VIS**. Do you get an error trace? Use the space below and the next page for analyzing the debug trace.

Problem #8 Fix the bug and check *Equal Opportunity*.