15-820-a
Assignment 4
Partial Order Reduction

Due Mar. 19, 2003

1 LTL and Stuttering Equivalence

An LTL formula $\mathbf{A}\,f$ is invariant under stuttering if and only if for each pair of paths π and π' such that $\pi \sim_{st} \pi'$,

$$\pi \models f \text{ if and only if } \pi' \models f.$$

We denote the subset of the logic LTL without the next time operator by LTL_{-X}.

Show the theorem on page 21 of the handouts:

Any LTL_{-X} property is invariant under stuttering.

2 Stuttering Equivalent Structures

Without loss of generality, assume that M has initial state s_0 and that M' has initial state s_0'.

Then the two structures M and M' are stuttering equivalent if and only if

- For each path σ of M that starts in s_0 there is a path σ' of M' starting in s_0' such that $\sigma \sim_{st} \sigma'$.

- For each path σ' of M' that starts in s_0' there is a path σ of M starting in s_0 such that $\sigma' \sim_{st} \sigma$.

Show the theorem on page 22 of the handouts:

Let M and M' be two stuttering equivalent structures. Then, for every LTL$_{-X}$ property $\mathbf{A}\,f$

$$M,\, s_0 \models \mathbf{A}\,f \ \text{ if and only if } \ M',\, s_0' \models \mathbf{A}\,f.$$