Lecture 22 - Nov. 26

Bridge Controller

Relative Deadlock Freedom 2nd Refinement: Variables & Invariants Exam Info

Announcements/Reminders

- Lab5 released (due on Tuesday, December 3)
- WrittenTest2 results to be released tomorrow
- Exam review sessions polling



PO of Relative Deadlock Freedom



Discharging POs of m1: Relative Deadlock Freedom

Part 1	$\frac{H1 \vdash G}{H1, H2 \vdash G} MON$	$H(F), E = F \vdash P(F)$ $H(E), E = F \vdash P(E)$	EQ_LR	$\frac{H, \neg P \vdash Q}{H \vdash P \lor Q}$	OR_R
$d \in \mathbb{N} \\ d > 0 \\ n \in \mathbb{N} \\ n \le d \\ a \in \mathbb{N} \\ b \in \mathbb{N} \\ c \in \mathbb{N} \\ a + b + c = n \\ a = 0 \lor c = 0 \\ n < d \lor n > 0 \\ \vdash \\ a + b < d \land c = 0 \\ \lor c > 0 \\ \lor a > 0 \\ \lor b > 0 \land a = 0$					

Discharging POs of m1: Relative Deadlock Freedom



Initial Model and 1st Refinement: Provably Correct MI out when Abstract mO n < dthen constants: d variables: n n := n + 1init end begin invariants: n := 0axioms: axm0 1 : $d \in \mathbb{N}$ **inv0_1** : *n* ∈ ℕ ML in end axm0 2: d > 0inv0 2 : n < d when n > 0then n := n - 1end Concrete m1 IL_in ML_out when variables: a.b.c a > 0when **Correctness** Criteria: a+b < dthen c = 0a := a - 1+ Guard Strengthening b := b + 1invariants: then init constants: d inv1 1: $a \in \mathbb{N}$ a := a + 1end + Invariant Establishment begin **inv1_2** : *b* ∈ ℕ end a := 0inv1 3: $c \in \mathbb{N}$ + Invariant Preservation b := 0axioms: **inv1 4**: a+b+c=nIL₋out axm0 1 : $d \in \mathbb{N}$ c := 0**inv1_5**: $a = 0 \lor c = 0$ ML_in when axm0 2: d > 0end + Convergence when b > 0ariants: 2·a+b 3 2 POs; NAR& NAT c > 0a = 0+ Relative Deadlock Freedom then then b := b - 1c := c - 1end c := c + 1end

Bridge Controller: Abstraction in the 2nd Refinement



Bridge Controller: State Space of the 2nd Refinement



Dynamic Part of Model



Exam Info

- When: 7pm to 10pm, Sunday, December 15
- Where: TC Sobeys
- Coverage: Everything (lecture materials & labs)
 - + slides, iPad notes
- Format: Mostly Written
 - + explanations/justifications
 - + write math expressions -
 - + calculations, proofs
- Restrictions:
 - + One-sided, computer-typed, min 10pt data sheet

= ASCII US. Math.

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- + No sketch paper (Exam booklet includes it) Ly - Question booklet ng: - answer booklet
- + No calculator
- What you should bring:
 - + Valid, Physical Photo ID (strict)
 - + Water/Snack