Concurrency: Theory, Languages and Programming – Proofs in CCS – Session 12 – January 22, 2003

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The Scheduler Problem

informal specification

specification as sequential process expression

implementation as *concurrent* process expression

comparison between specification and implementaton

proofs using ABC proofs "by hand" (very close to [§ 7.3])

Scheduler, Informally [Mil99, § 3.6]

- a set of processes is to be scheduled starts by syncing on with the scheduler completes by syncing on with the scheduler
- (1) each *must not* run two tasks at a time
- (2) tasks of different may run at the same time
- are required to occur cyclically (initially, starts) for each , and must occur cyclically
- (3) maximal "progress":

the scheduling must permit any of the "buttons" to be pressed at any time provided (1) and (2) are not violated.

Formal Specification [Mil99, § 3.6]

S	schedule	r, where	is next and every	is running
	(* we omit the parameters in the following *)			
S	$\int \sum$	S		
	$\int \sum$	S	S	
Scheduler	S			

draw the transition graph for show that the scheduler is never deadlocked what is the difference when dropping the case for ?

Formal "Implementation" [§ 7.3]

Formal "Implementation" (II) [§ 7.3]

Scheduler

Proofs Using ABC

model the specification for

model the wrong (!) implementation for

run the ABC

analyze the transitions systems (using step)

understand the problem

w.r.t. the formal & informal specification

model now the correct implementation for

run the ABC

understand the bisimulation relation that ABC has generated

if time left, try out for .

Proofs "by Hand" (I)

means: "guessing" a bisimulation relation !

draw the transition graph of for

generalize for greater ...

Observe: every reachable state is of the form

where is one of

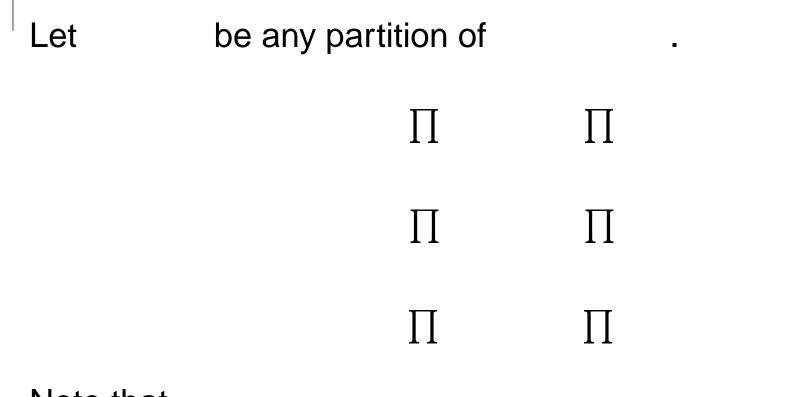
Observe that in any state reachable from only one of the is one of , while all other are either of .

analyze the "meaning" of the those states

Proofs "by Hand" (II)

analyze the "meaning" of the following states for

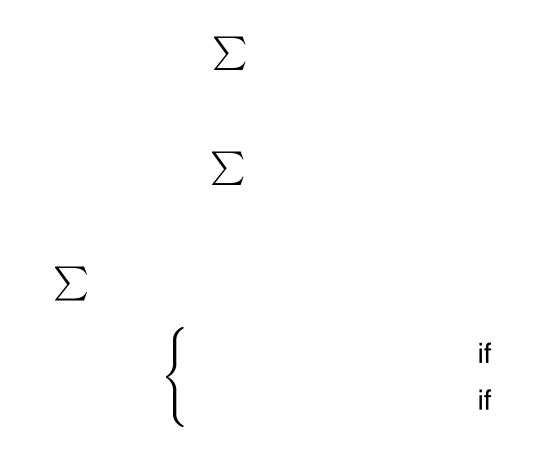
Proofs "by Hand" (III)



Note that

Proofs "by Hand" (IV)

Using the Expansion Law, we show that:



Proofs "by Hand" (V)

Let be the relation containing the following pairs:



is a weak bisimulation (up to). contains the pair Scheduler . Q.E.D.