

Modelling and Validation of Concurrent System

Lab 1: exercises on CCS

1. Check, attempting to build derivation trees using the grammar rules, if the following terms are syntactically correct processes.

- (a) $a + b.\mathbf{0}$
- (b) $a.\mathbf{0} \mid b.\mathbf{0}$
- (c) $(a.\mathbf{0} \mid b.\mathbf{0}).\mathbf{0}$
- (d) $(\mathbf{new} \tau)\tau.\mathbf{0}$
- (e) $(\tau.\mathbf{0})\{a/\tau\}$
- (f) $a.\mathbf{0} \mid (b.\mathbf{0} + \mathbf{0})$

2. Consider a subway ticket vending machine. Buyers may choose between three kinds of tickets: single, return, or ten tickets carnets.

Clients may pay either with cash or card. Encode the values to pay as the actions `singleV`, `returnV`, or `carnetV`.

The machine allows the client to go back one step, return to the beginning, or terminate the purchase, at any moment.

Implement in CCS:

- (a) Customers Alice and Bob, who purchase, respectively, a return ticket with cash and 10 tickets with card. Bob starts by asking for a single ticket but changes his mind before paying.
 - (b) a “generic” client that buys some ticket with a given payment method.
 - (c) A generic client that buys a ticket with card.
 - (d) The vending machine.
3. Build derivations of two possible evolutions of the system composed by the parallel composition of the vending machine and the clients Alice and Bob.