

ICOM 4009-070

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Homework 2: Algebra and Mathematical Logic

Exercise 8.1

Transportation Net Algebra: Air Traffic Corridors

- Entities:
 - o Net (commercial_zone, military_zone)
 - o Segments (passengers, airline, aircraft, air_corridor, gate, lanes)
 - o Connections (Airport, heliport, landing_pad)
- An Air traffic algebra: The Air traffic corridor algebra has, as carrier, the union of the set of all corridor element values with the set of all corridor values and createNewCorridor,

Scheme: Air Traffic Corridor

class

type

Net = commercial_zone, military_zone.

Segment = air_corridor, gate, lanes.

Connections = Airport, heliport, landing_pad.

value

Airport.insert(newGate)

Gate.remove(aircraft1)

Airline.insert(passengers)

Airport.insert(aircraft2)

Axiom

An airport can create (insert) a new gate for an airline to use.

A gate can detach (remove) an aircraft attached to it if any. If no aircraft1 attached will return "chaos".

An airline will board (insert) passengers onto aircraft.

An Airport will receive (insert) an incoming aircraft2.

Exercise 8.2

Scheme: Container Logistics

class

type:

ContShip, Cont, Quay, CSA, Bay, Row, Stack

Identifiers:

Bay – b1, b2, b3.

Row – r1, r2, r3.

Stack – s1, s2, s3.

Values:

Load: Cont x ContShip x Quay \rightarrow b1 x r2 x s1

Unload: Cont x ContShip x b2 x r1 x s3 \rightarrow Quay

Load: Cont x CSA x Quay \rightarrow b3 x r3 x s1

Unload: Cont x CSA x b1 x r2 x s3 \rightarrow Quay

Axioms:

A crane can load a container located at quay onto a contShip if and only if there is a ContShip available returning the value of location identifier.

A crane can unload a container from location identifier of ContShip to Quay if the container is there.

A container truck will take (load) a Container to the CSA coming from Quay if there is a container available and put it in location identifier.

A container truck will unload a container from CSA with location identifier and take it to Quay if there is a container at that location.

Exercise 8.3

Scheme: Financial Service Industry

Class

Type: custmr, bankAcc, funds, loans, broker

Values:

Open: bankAcc x custmr x funds \rightarrow funds

shareAcc: custmr x custmr \rightarrow funds

withdraw: bankAcc x funds \rightarrow funds

transfer: bankAcc x bankAcc x funds \rightarrow funds

Axioms:

Customer opens a new Bank Account with certain amount of funds if customer brings proper info.

An account can be share between two customers if there are both customers.

A customer can withdraw funds if and only if there are funds left.

A customer can transfer funds if and only if there are funds left and secondary bankAcc is valid.