ECE 321: Software Requirements Engineering Assignment 3

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algebra QueueOfCars

imports Integer, Boolean;
introduces

sorts Queue, Car;

operations

New: → Queue;
CarArrives: Car x Queue → Queue;
CarDeparts: Queue → Queue;
IsEmpty: Queue → Boolean;
NumberOfCars: Queue → Integer;
Longer: Queue x Integer → Boolean;
FirstCar: Queue → Car;
Equal: Queue x Queue → Boolean;
WhichQueue: Queue x Queue x Car → Integer;
Position: Car x Queue → Integer;

constrains New, CarArrives, CarDeparts, IsEmpty, NumberOfCars, Longer, FirstCar, Equal, WhichQueue, Position, so that Queue generated by [New, CarArrives]

for all [q:Queue, q1:Queue, c:Car, c1:Car i:Integer]

CarDeparts(New) = error;
CarDeparts(CarArrives(c,q)) =

if (IsEmpty(q)) then q;
else CarArrives(c,CarDeparts(q));

IsEmpty(New) = true;
IsEmpty(CarArrives(q,c)) = false;
NumberOfCars(New) = 0;
NumberOfCars(CarArrives(c,q)) =

if (IsEmpty(q)) then 0;
else NumberOfCars(CarDeparts(q)) + 1;

Longer(New, i) = false;
Longer(CarArrives(c,q), i) =

if (i > NumberOfCars(q)) then true;
else false;

FirstCar(New) = error;
FirstCar(CarArrives(c,q)) =

if IsEmpty(q) then c;
else FirstCar(q);

Equal(New, New) = true;
Equal(CarArrives(c,q), New) = false;
Equal(New, CarArrives(c,q)) = false;
Equal(CarArrives(c,q), CarArrives(c1,q1)) =

if (NumberOfCars(q) == NumberOfCars(q1)) then true;
else false;

WhichQueue(New, New, c) = 0;
WhichQueue(New, CarArrives(c,q), c1) =

if (Position(c1,q > -1) then 2;
else 0;

WhichQueue(CarArrives(c,q), New, c1) =

if (Position(c1,q > -1) then 1;
else 0;

WhichQueue(CarArrives(c,q), CarArrives(c1,q1), c2) =

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        if Position(c2,q) > -1 then 1;
        else if Positon(c2, q2) > -1 then 2;
        else 0;

    Position(c, New) = -1;
    Position(c1, CarArrives(c,q)) =

        if IsEmpty(q) then -1;
        else if FirstCar(q) == c1 then 0;
        else Position(c, CarDeparts(q)) + 1;

end QueueOfCars
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