

ECE 321: Software Requirements Engineering

Assignment 3

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October 30, 2018

algebra QueueOfCars

imports Integer, Boolean;
introduces

 sorts Queue, Car;

operations

 New: \rightarrow Queue;
 CarArrives: $\text{Car} \times \text{Queue} \rightarrow \text{Queue}$;
 CarDeparts: $\text{Queue} \rightarrow \text{Queue}$;
 IsEmpty: $\text{Queue} \rightarrow \text{Boolean}$;
 NumberOfCars: $\text{Queue} \rightarrow \text{Integer}$;
 Longer: $\text{Queue} \times \text{Integer} \rightarrow \text{Boolean}$;
 FirstCar: $\text{Queue} \rightarrow \text{Car}$;
 Equal: $\text{Queue} \times \text{Queue} \rightarrow \text{Boolean}$;
 WhichQueue: $\text{Queue} \times \text{Queue} \times \text{Car} \rightarrow \text{Integer}$;
 Position: $\text{Car} \times \text{Queue} \rightarrow \text{Integer}$;

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

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

    CarDeparts(New) = error;
    CarDeparts(CarArrives(q,c)) = q;
    FirstCar(New) = error;
    FirstCar(CarArrives(q,c)) = c;
    IsEmpty(New) = true;
    IsEmpty(CarArrives(q,c)) = false;
    NumberOfCars(q) =
        if (IsEmpty(q) == true) then 0;
        else NumberOfCars(CarDeparts(q)) + 1;
    Longer(q, i) =
        if (i > NumberOfCars(q)) then true;
        else false;
    Equal(q,q1) =
        if (NumberOfCars(q) == NumberOfCars(q1)) then true;
        else false;
    Position(c, q) =
        if IsEmpty(q) then -1;
        else if FirstCar(q) == c then 0;
        else Position(c, CarDeparts(q)) + 1;
    WhichQueue(q,q1,c) =
        if Position(c,q) > -1 then 1;
        else if Positon(c, q2) > -1 then 2;
        else 0;

end QueueOfCars

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