

Car Parking System - Verilog

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Specifications:

Inputs: Weight[3:0], Entry_Exit, Enable, cap_enable

Outputs: Level[1:0], Reject

Intermediate Variables: Capacity0, Capacity1, Capacity2, Capacity3, Threshold[3:0][3:0]

Module definition:

```
module car_park (Weight, Entry_Exit, Enable, Level, Reject, Capacity0, Capacity1, Capacity2,
Capacity3, cap_enable);
```

Definition/Significance:

Enable - Only after Enable is 1, the input will be processed by the system.

Entry_Exit - If 1, vehicle will be entered and a Tag will be generated which will be displayed. If 0, based on the Tag inputted, that vehicle will be exited from the system.

Weight - Input the weight of the vehicle that enters the parking system.

Threshold - Based on the threshold, the weight will be judged and accordingly the level will be allotted.

Level - Level allotted to the vehicle.

cap_enable - Variable used to initialize Capacity for each level

Capacity - It will keep track of how many vehicles are there in the system. We can Increase it by 1, when exited and Decrease it by 1, when entered. Capacity0, Capacity1, Capacity2 and Capacity3 variables storing space for each level.

Reject - If a spot cannot be allotted, then Reject becomes 1. While exiting if the level capacity is full (floor has no vehicles) then Reject is 1.

Functionality:

First, we will initialize the Capacity of each level to the maximum, by setting cap_enable to 1.

We will input the Weight, Entry_Exit and set the Enable. Based on the Threshold, the Level will be decided. If the capacity is full, then no vehicle can enter the system as it will be rejected, but the vehicles can exit at that moment. If the Capacity is zero, then vehicles are unavailable to exit at that moment.

Validation Approach:

- Entered vehicles for all levels uniformly of all weight classes. As the capacity is restricted to maximum 15 vehicles per level, the last vehicle in each level will be rejected as we are entering 16 vehicles per level.
- So in total, we will have 4 rejected entries, one for each level.
Level Classification:
Level 0 - 4 vehicles of weight class 0, 4 vehicles of weight class 1, 4 vehicles of weight class 2, 3 vehicles of weight class 3 = 15 total vehicles.
Level 1 - 4 vehicles of weight class 4, 4 vehicles of weight class 5, 4 vehicles of weight class 6, 3 vehicles of weight class 7 = 15 total vehicles.
Level 2 - 4 vehicles of weight class 8, 4 vehicles of weight class 9, 4 vehicles of weight class 10, 3 vehicles of weight class 11 = 15 total vehicles.
Level 3 - 4 vehicles of weight class 12, 4 vehicles of weight class 13, 4 vehicles of weight class 14, 3 vehicles of weight class 15 = 15 total vehicles.
- Exit: For each level, we are exiting 16 vehicles. As each level holds a total of 15 vehicles, those 15 vehicles will be exited successfully. But, the last vehicle demanded to be exited does not exist in the system. Hence, a message of unavailability is displayed.

Result:

This Car Parking System designed takes input of the vehicles weight and efficiently assigns an appropriate level for parking, if available otherwise displays suitable message. It also keeps track of the vehicles which are exited from the system and manages the capacity accordingly for each level.