

Exam projects

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PIE Factory

Pie Factory

- Pie Factory: pies are made from three components: filling, flavor and topping, each dispensed from a respective hopper with one of these three ingredients.
- Robot Lucy
 - Adds the three ingredients to empty crusts that move on a conveyor belt.
 - Can pause the conveyor belt if a ingredient is depleted.
- Robot Joe:
 - Fills the hoppers with the respective ingredient.
 - Makes sure hoppers are not overfull.
 - Makes sure hoppers do not go empty.
- Lucy and Joe as separate threads.

Pie Factory – Process

- Belt speed: one pie crust every 50 ms.
- One pie takes:
 - 250 gr filling.
 - 10 gr flavor.
 - 100 gr topping.
- Every dispensing takes 10 ms.
- Hoppers contain 2 kg material max.
- Each hopper is filled at speed 100 gr / 10 ms.
- Hopper filling start / stop happens immediately.

Pie Factory - Robots

- Robot Lucy:
 - 1st – adds filling.
 - 2nd – adds flavor.
 - 3rd – adds topping.
 - Pauses the conveyor belt, if a hopper does not contain enough ingredient for a successful dispense.
 - Resumes the conveyor belt once the missing ingredient is available.
- Robot Joe:
 - Fills one hopper at a time.
 - Can fill a hopper only partially.

Your Task

- Implement the factory as a C# program and test it
 - Model the hoppers, the robots, and the conveyor belt
 - Robots and the belt are serviced by separate threads

Elevator for Base Area 51

Elevator for Base Area 51

- The base has four floors:
 - G – ground floor
 - S – secret floor with nuclear weapons
 - T1 – secret floor with experimental weapons
 - T2 – top-secret floor that stores alien remains
- Agents
 - Three security levels: Confidential, Secret, Top-secret
 - Confidential can access only G floor
 - Secret can access G and S
 - Top-secret can access G, S, T1 and T2

Functional Requirements for the Elevator

- On each floor there is a button to call the elevator
- Inside elevator: four buttons for each floor
 - When a button is pressed, all others are disabled until the elevator arrives
- When the elevator reaches the floor, the door opens only if the agent inside has the required security credentials.
 - If the agent doesn't have the required credentials, he can press another button to go to another level
- The speed of the elevator is 1 floor per 1 sec.

Your Task

- Implement the elevator system as a C# program and test it by letting agents of different security levels use the elevator repeatedly
 - Model the elevator, agents, the elevator door (security check) and the buttons of the elevator.
 - Implement the movement of the elevator and button functionality as required
 - Implement the security check before opening the door and letting the agent out

Explanatory Notes

- Each agent is serviced by a separate thread
 - Moving around is randomly generated
- Elevator is serviced by a separate thread
- It is enough to allow one agent in the elevator at a time
 - Bonus points if you support more; however, in this case door decides how to open based on the agent with lowest security credentials