Earthquake Rescue Robot Coordinator using Data Structures

Name: [RATHOD JAISH] Roll Number: [ME24B1041] ## **//** *Objective*: To simulate a *Rescue Robot Coordination System* during an earthquake disaster using various data structures like Queue, Stack, Arrays, Singly & Doubly Linked Lists, and Circular Linked Lists. The aim is to manage rescue task assignment, mission logging, robot damage tracking, and urgent redeployment. ## *** *System Components and Implementation* ### *a) Mission and Urgency Handling* - *Queue* stores six predefined rescue tasks: {"Scanner", "Digger", "Lift", "Light", "Drone", "Cutter"} - These tasks are dequeued and pushed into a *Stack* to simulate *LIFO* urgent task execution. - *Output:* Tasks are handled in reverse order — showing urgency handling in *Last-In-First-Out* order. ★ *Why LIFO?*

In real-time rescue, the most recently added task (like "Cutter") might be the *most urgent*, such as clearing life-threatening debris. LIFO ensures immediate attention to the most critical situations.

b) Rescue Log Unit

- A *fixed-size array* with 6 slots is used to log completed missions.
- When 8 missions (Mis1 to Mis8) are logged, the oldest entries are removed as needed.
- *Overflow Handling:*

When the array is full, the first element (Mis1, Mis2) is deleted to make space for new ones.

Logging is crucial for *tracking progress, **reporting survivor rescues, and **maintaining transparency* in rescue operations. Deleting the oldest keeps the log current.

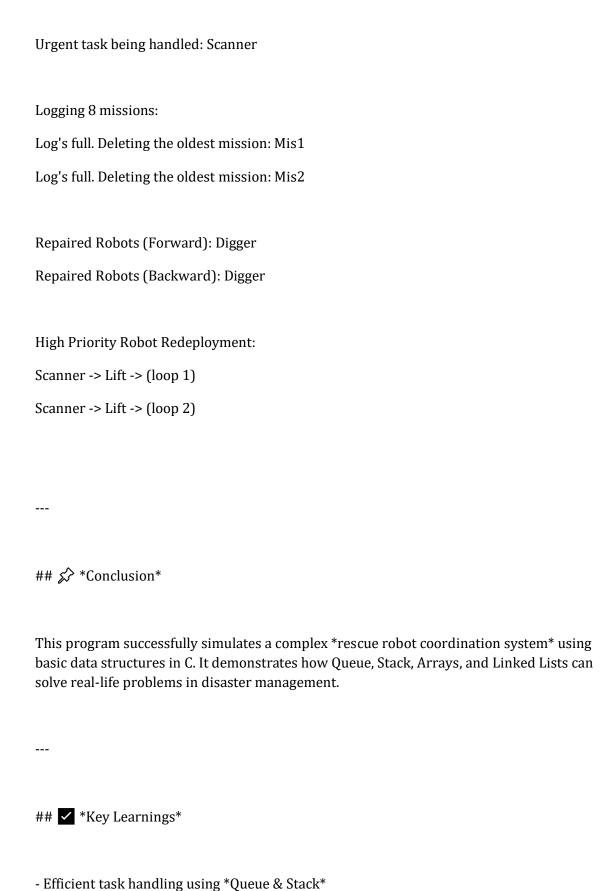
c) Damaged & Repaired Robot Tracking

- *Singly Linked List* tracks *damaged robots* like "Digger" and "Drone".
- "Digger" is repaired and moved to a *Doubly Linked List* to support *forward and backward inspection*.
- *Traversal*:
- Forward and backward traversal of repaired robots is shown in output.

☆ *Damage and Fix Example:* "Digger"'s arm was *crushed by falling debris* and later rebuilt with *reinforced hydraulics*, making it ready for reuse. ### *d) Priority Redeployment* - *Circular Linked List* stores high-priority robots like "Scanner" and "Lift" for *urgent redeployment*. - *Circular traversal* is repeated twice to simulate 24/7 patrol or re-checks. ☆ *Upgrade for Priority Bots:* - "Lift" is equipped with a *thermal camera* to locate survivors. - "Scanner" now includes *air quality sensors* to detect breath signatures or toxic gas. ## 🖹 *Sample Output Overview* Let's add the 6 tasks to the queue: Urgent task being handled: Cutter Urgent task being handled: Drone Urgent task being handled: Light

Urgent task being handled: Lift

Urgent task being handled: Digger



- Managing memory-limited logs using *Array overflow logic*
- Robot status tracking using *Singly & Doubly Linked Lists*
- Circular robot redeployment for *continuous mission loops*

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