1. **Main Features**
2. Schedule Management
3. Meal Planning and Monitoring
4. Sleep Pattern Analysis
5. Mental Health Tracking
6. Task Automation
7. Interactive User Interface
8. Movement Mechanism for Task Assistance

**2. Types of Users & Requirements**

1. Primary User (Client)

1.1. Will be able to register for the service via an application interface.

1.2. Will be able to log in using their registered credentials.

1.3. Will be able to recover a forgotten password.

1.4. Will be able to input personal preferences (e.g., meal type, sleep goals, daily schedule).

1.5. Will be able to receive task reminders and notifications.

1.6. Will be able to interact with the device via voice or touch.

1.7. Will be able to view and analyze daily reports generated by Alex.

2. Caregiver (Family Member or Health Assistant)

2.1. Will be able to monitor reports on health, sleep, and activity.

2.2. Will be able to receive alerts for critical health or safety concerns.

2.3. Will be able to set goals or tasks for the Primary User.

2.4. Will be able to access logs of Alex's activities and user interactions.

3. Administrator (System Manager)

3.1. Will be able to oversee device performance and troubleshoot issues.

3.2. Will be able to update AI algorithms and maintain user data.

3.3. Will be able to push software updates remotely.

3.4. Will be able to reset device settings for the users when required.

3.5. Will be able to track hardware malfunctions and arrange repairs.

**3. Requirements Breakdown**

Feature #1: User Registration and Login

1.1. Display the front screen with options to log in or create a new account.

1.2. Save new user details securely in a database.

1.3. Match login credentials against stored data for authentication.

1.4. Allow password recovery through email or a security question.

Feature #2: Daily Schedule Management

2.1. Allow users to input and save schedules (tasks, appointments).

2.2. Generate reminders and alerts based on the entered schedule.

2.3. Provide real-time updates if the schedule is disrupted.

Feature #3: Meal Planning

3.1. Allow users to select dietary preferences and goals.

3.2. Generate meal plans based on preferences and user input.

3.3. Provide alerts for mealtimes and ensure tracking of nutritional intake.

Feature #4: Sleep Pattern Monitoring

4.1. Track the user’s sleep patterns using motion and sound sensors.

4.2. Generate insights and recommendations for better sleep quality.

4.3. Alert the user if sleep goals are not met.

Feature #5: Device Movement and Interaction

5.1. Enable movement of the device using pre-programmed motion logic.

5.2. Detect obstacles and adjust movement to avoid collisions.

5.3. Respond to user interaction through lights, sound, or movement.

Feature #6: Data Reporting and Alerts

6.1. Generate and display daily health, activity, and schedule reports.

6.2. Send alerts to caregivers in case of emergencies.

6.3. Provide a summary of performance insights to the user.

1. **Features to Coding Matrix**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sr #** | **Feature Name** | **DSA Concept Used** | **Operation Performed** | **Complexity Analysis (Approximate)** | **No. of Variables & Objects Created** | **Functions Created** | **Line of Code Written** |
| 1 | User Registration & Login | Hash Maps, Trees | Insertion + Lookup | O(log n) | 5 | 3 | 120 |
| 2 | Daily Schedule Management | Priority Queues, Stacks | Scheduling + Task Sorting | O(n log n) | 6 | 4 | 150 |
| 3 | Meal Planning | Graphs, Dynamic Programming | Pathfinding + Optimization | O(n^2) | 7 | 3 | 170 |
| 4 | Sleep Pattern Monitoring | Arrays, Sliding Window | Pattern Matching | O(n) | 4 | 2 | 90 |
| 5 | Device Movement & Interaction | Trees, BFS/DFS | Navigation + Obstacle Avoidance | O(n log n) | 8 | 5 | 200 |
| 6 | Data Reporting & Alerts | Linked Lists, Sorting | Aggregation + Analysis | O(n log n) | 6 | 3 | 130 |
| 7 | Generative AI-Based Responses | Neural Networks, Dynamic Arrays | Data Processing + Response Generation | O(n^3) | 10 | 4 | 250 |
| 8 | Health Tracking & Alerting | Heaps, Priority Queues | Monitoring + Real-Time Alerting | O(n log n) | 6 | 3 | 140 |
| 9 | Personalized User Interaction | Hash Maps, Tries | Command Parsing + Execution | O(log n) | 5 | 4 | 160 |
| 10 | Smart Resource Management | Greedy Algorithms, Trees | Optimization + Scheduling | O(n log n) | 7 | 3 | 180 |
| 11 | Integration with Smart Devices | Graphs, DFS | Connectivity Mapping | O(V + E) | 8 | 3 | 150 |
| 12 | AI Model Updates | Dynamic Programming, Stacks | Model Training + Update Scheduling | O(n^2) | 9 | 4 | 220 |