Thought Locker

“Unlock Your Memories”

CS410 Team Green
Prototype Presentation

Spring 2023
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Dementia: A growing problem

- 1 in 10 Americans ages 65 and older have some form of dementia
- The rate of dementia increases with age
  - 3% of adults ages 70 to 74
  - 22% of adults aged 85 to 89
  - 33% of adults 90 and up
- Characterized by distinct stages
  - 50.4 percent of cases are mild
  - 30.3 percent are moderate
  - 19.3 percent are severe

Fig 1

Fig 2

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Stages of Dementia

**Mild**[^4]

Individual largely independent and only needs some assistance with daily living.

**Moderate**[^5]

Symptoms become more noticeable and the person will need more support in managing daily life while still living independently. The person may now need frequent reminders and some help to wash and dress.

**Severe**[^6]

The person will need full-time care and support with daily living and personal care, such as eating, washing and dressing.
Living with Dementia

Mild

- Memory problems
- Difficulties in thinking things through and planning
- Language and communication
- Poor orientation
- Visual-perceptual difficulties
- Changes in mood or emotion

Moderate

- Memory problems worsen
- Increased speaking and language difficulties
- Orientation becomes more difficult to interpret
- More intense symptoms of anxiety and depression
- Development of paranoia
- Auditory and visual hallucinations
The Problem

Individuals with mild to moderate dementia are frequently unable to remember the locations of personal items, organize their schedules, and recall ways to contact their loved ones.
Caregivers and patients struggle with locating misplaced items.

Difficulties with planning and organizing daily activities causes patients to feel less independent.

Caregivers do not have the resources necessary to effectively care for their patients.

Patients forget how to contact loved-ones in the event of an emergency.
The Solution

Thought Locker is an application that will enhance the ability for those with dementia to retain control of their daily lives. The application will ensure patients maintain a degree of personal freedom despite the mental challenges they face.
Solution Characteristics

- Keep track of and locate important items
- Provide caregivers with an effective tool to manage patient independence
- Provide caregivers with a mechanism to monitor patient activity
- Provide patients with a simple and effective method to contact loved-ones
# RWP vs. Prototype Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Patient</th>
<th>Caregiver</th>
<th>RWP</th>
<th>Prototype</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACCOUNT MANAGEMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Account Creation</td>
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<td>User Location Information</td>
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<td><strong>USER INTERFACE</strong></td>
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<td>Event Viewer</td>
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<td>Emergency Contacts</td>
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<td>Notifications</td>
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<td>Reports</td>
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<td>Item Tagging</td>
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# Development Tools

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<tr>
<th>Category</th>
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<tbody>
<tr>
<td>Platforms</td>
<td>Android / iOS</td>
</tr>
<tr>
<td>Languages</td>
<td>JavaScript (React / Node.js)</td>
</tr>
<tr>
<td>Databases</td>
<td>PostgreSQL / MongoDB</td>
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<tr>
<td>Back-End Server</td>
<td>Amazon Web Services</td>
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<tr>
<td>APIs</td>
<td>React-native (Contacts, BLE Manager)</td>
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<tr>
<td></td>
<td>Google Maps Geolocation API</td>
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<tr>
<td>Testing</td>
<td>Jest</td>
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<td>Containerization</td>
<td>Docker</td>
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<td>GitHub</td>
</tr>
<tr>
<td>Issue Tracking</td>
<td>GitHub</td>
</tr>
<tr>
<td>Continuous Integration</td>
<td>GitHub</td>
</tr>
</tbody>
</table>
Database Schema
Data Management

FULLY IMPLEMENTED

- **Data Sources:**
  - Patient Input
  - Caregiver/Family Member Input

- **Data Collected:**
  - User Account information
  - Low Energy Bluetooth information
  - Task Information

- **Data Outputs:**
  - Location of lost item
  - Reminder notifications
  - Call alert for caregivers

PARTIALLY IMPLEMENTED/SIMULATED DATA

- **Data Storage**
  - AWS utilizing MongoDB and PostgreSQL

- **Availability:**
  - Cache available for Contact List (for emergencies)
  - Cloud access to the database for the rest

- **Authentication:**
  - Option of standard login with password or face recognition for caregiver and patient

ELIMINATED

- **Encryption**
  - SHA-256

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Sprint Structure

Thought Locker development approach:

Agile Sprints
Sprints will last 3 Weeks

15-30 minute scrums
Individual GitHub contributions will be viewed

5 Sprints Overall
Hold 6 scrums per sprint

Twice per week
Conducted on Discord

---

Sprint 0

- Setup and configure databases
- Setup and configure APIs
- Setup development environment

Sprint 1

- Implement UI Features
- Implement Account Management
- Test Database Setup and Configuration
- Unit Testing

Sprint 2

- Connect Front-end to Back-end
- Implement Item Finder Algorithm
- Implement Contact Center Algorithm
- Implement monitoring algorithm
- Unit and Integration Testing

Sprint 3

- Implement Customer Feedback Features
- Implement Task Manager Algorithm
- Ensure all data is being logged in the databases
- Continuation of Integration testing

Sprint 4

- Implement system testing
- Implement Patient Assistance algorithm
User Stories for the Patient

**FULLY IMPLEMENTED**

1. As a patient, I want to be able to manage my user profile and determine what features are useful to me, so that I can customize my experience on the platform.
2. As a patient, I want to be able to clarify if I have completed a task or not, so that my caregiver can track my progress.
3. As a patient, I want to be able to view events on the platform, so that I can stay up-to-date on my care and support.
4. As a patient, I want to be able to find an item when I need it, so that I can attempt to find an item independent of my caregiver.
5. As a patient, I want to be able to contact loved-ones in the event that there is an emergency, so that I can easily resolve an important issue when I need to.

**PARTIALLY IMPLEMENTED**
# User Stories for the Caregiver

<table>
<thead>
<tr>
<th>FULLY IMPLEMENTED</th>
<th>PARTIALLY IMPLEMENTED</th>
<th>ELIMINATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. As a caregiver, I want to verify patient account deletion to prevent frustration or misunderstanding.</td>
<td>2. As a caregiver, I want to be able to remotely connect to the patient’s user profile, so that I can set up and provide assistance for them when needed.</td>
<td></td>
</tr>
<tr>
<td>3. As a caregiver, I want to be able to track the patient’s location based on the severity of their condition, so that I can provide assistance when needed.</td>
<td>4. As a caregiver, I want to determine if a task is necessary to delete or not, so that the patient’s care and support is not compromised.</td>
<td></td>
</tr>
<tr>
<td>5. As a caregiver, I want to be able to view and schedule events on the calendar, so that I can stay informed about the patient’s care and support.</td>
<td>6. As a caregiver, I want to be able to import emergency contacts for the patient, so that they can get help when needed.</td>
<td></td>
</tr>
</tbody>
</table>
User Stories for the Tester

**FULLY IMPLEMENTED**

1. As a tester, I need to be able to authenticate into the application by fingerprint or username/password.
2. As a tester, I need to verify that I can change the permissions and features of a test patient account.
3. As a tester, I need to simulate the capability to find an item.
4. As a tester, I need to be able to add and remove items in the item finder feature.
5. As a tester, I need to ensure that a contact list has been imported into the application.
6. As a tester, I need to verify that I can adjust the priority queue of emergency contacts based off the available contact list.

**PARTIALLY IMPLEMENTED**

7. As a tester, I need to add, remove, and view tasks in the task scheduler feature.
8. As a tester, I need to see the list of completed tasks in the event viewer.
9. As a tester, I need to be able to view analytic reports generated by the item finder and task completion features when requested.
10. As a tester, I need to be able to simulate a sensor being triggered and being properly reflected in the database.
## Risk Matrix

### FULLY IMPLEMENTED

**Customer Risk**
- E1: Patient no longer engaged in the application
- E2: Patient unable to utilize application’s functions
- E3: Patient unable to remember their login information

### ELIMINATED

**Customer Risk Mitigation**
- E1: Send reminders to patient’s phone to utilize the installed software
- E2: Hints will be provided after user input has not been received in a timely manner
- E3: Biometric sign in feature and forget password capability

<table>
<thead>
<tr>
<th>Impact</th>
<th>Probability</th>
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<tbody>
<tr>
<td>Very Low 1</td>
<td>Low 2</td>
</tr>
<tr>
<td>Very High 5</td>
<td></td>
</tr>
<tr>
<td>High 4</td>
<td></td>
</tr>
<tr>
<td>Moderate 3</td>
<td></td>
</tr>
<tr>
<td>Low 2</td>
<td></td>
</tr>
<tr>
<td>Very Low 1</td>
<td></td>
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</tbody>
</table>
Risk Matrix

<table>
<thead>
<tr>
<th>Impact</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low  1</td>
<td></td>
</tr>
<tr>
<td>Low        2</td>
<td></td>
</tr>
<tr>
<td>Moderate   3</td>
<td></td>
</tr>
<tr>
<td>High       4</td>
<td></td>
</tr>
<tr>
<td>Very High  5</td>
<td></td>
</tr>
</tbody>
</table>

**FULLY IMPLEMENTED**

**SECURITY RISK**
- S1: User information breach
- S2: HIPAA violations due to storing information about medical condition
- S3: Anyone can access customer’s account because password has to be set

**SECURITY RISK MITIGATION**
- S1: Modern Security Protocols, encryption based technology
- S2: User License Agreement that information will only be shared with organizations that have the need to know
- S3: Biometric Two-Factor Authentication, only the customer, family member, or caregiver can access

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## Risk Matrix

### Technical Risk
- T1: Server is unable to authenticate that the item has been found
- T2: Loses connection to calendar for appointments
- T3: Item that has been queried cannot be located

### Technical Risk Mitigation
- T1: Bypass photo identification by tapping geolocation device to phone
- T2: Cache important calendar information, locally store data on phone or tablet
- T3: Report item cannot be found to caregiver/family member option

### FULLY IMPLEMENTED

<table>
<thead>
<tr>
<th>Impact</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low 1</td>
<td>T2</td>
</tr>
<tr>
<td>Low 2</td>
<td>T1, T2, T3</td>
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<tr>
<td>Moderate 3</td>
<td>T3</td>
</tr>
<tr>
<td>High 4</td>
<td></td>
</tr>
<tr>
<td>Very High 5</td>
<td></td>
</tr>
</tbody>
</table>

- **T1**: Server is unable to authenticate that the item has been found
- **T2**: Loses connection to calendar for appointments
- **T3**: Item that has been queried cannot be located
References