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**Care Home - A smart home system that promotes your welfare**

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## *Table of Contents*

1	Introduction.....	3
2	Main Features.....	3
2.1	Emotional state registration and ambient configuration. ....	3
2.2	Contextual activities for emotional management .....	3
2.3	Emotional history logging .....	4
2.4	Personalized habit recommendations .....	4
2.5	Progress tracking and reporting .....	4
2.6	Custom configuration.....	4
3	Use cases.....	4
3.1	UC-01: Register Emotional State.....	4
3.2	UC-02: Send Wellness Notifications.....	6
3.3	UC-03: Configure Emotional Preferences.....	6
3.4	UC-04: Analyze Emotional Records.....	8
3.5	UC-05: Export Emotional Report .....	9
3.6	UC-06: Connect Smart Devices.....	10
3.7	UC-07: Test Light Connection .....	12

# Care Home- A smart home system that promotes your welfare

## 1 Introduction

It is well known that emotional well-being is one of the most important factors for maintaining a healthy, prosperous and successful life, as well as for achieving inner peace. Even more importantly, the state of the home often reflects the soul and current mental state of the resident.

For this reason, the idea of creating a care home was born. Care Home is a smart home system that is designed not only to monitor, but also to actively involve the user in achieving emotional balance. Unlike conventional smart home applications that focus primarily on security, energy saving or comfort, Care Home prioritizes emotional health by encouraging active interaction with the system and adapting the home environment to the psychological needs of its users.

The project will include a basic but functional interface through which the user will interact in a few steps. For example, the system will ask the user about their emotional state and which room they are in. Based on this information, Care Home will set the mood by adjusting the lighting and playing one of the songs the user has previously selected, or, if preferred, by selecting silence. It will also monitor emotional records, suggest healthy habits, and provide simple summaries of mood development over time.

A distinctive feature of the nursing home is the ability to share emotional history with external agents, such as a psychologist, which allows for the integration of professional support into the system. This approach enriches the project by going beyond automation and including meaningful interaction, personalization, and external collaboration.

## 2 Main Features

### 2.1 Emotional state registration and ambient configuration.

The user reports their current emotional state (e.g., stress, sadness, calm, motivation, happiness) and specifies the room they are in. For each emotional state, the user can predefine up to three favourite songs that match the mood. When the state is selected, the system offers the user a choice between one of the songs or “No music.”

Once the input is confirmed, the system configures the environment by adjusting lighting and music through external systems. This ensures that the user experiences a personalized and context-aware atmosphere.

### 2.2 Contextual activities for emotional management

Depending on whether the mood is negative or positive, the system presents a panel with meaningful activities:

**Negative moods** → options like writing, meditating, or breathing exercises to process emotions.

**Positive moods** → options like studying, exercising, drawing, or dancing, to channel energy into enjoyable or productive activities.

## 2.3 Emotional history logging

The system records every interaction (emotional state, chosen song, selected activity, room, and lighting changes) in a history that the user can later review.

## 2.4 Personalized habit recommendations

The system suggests or reminds the user of small actions (hydration, breaks, stretching, meditation). These recommendations can be configured by the user.

## 2.5 Progress tracking and reporting

The system summarizes emotional trends and generates simple reports. These can be visualized by the user or shared with an external actor (such as a psychologist) for professional follow-up.

## 2.6 Custom configuration

The user can personalize system responses by linking emotional states with lighting preferences, playlists, and suggested activities.

# 3 *Use cases*

## 3.1 UC-01: Register Emotional State

**Primary Actor:** Home Resident

**Goal in Context:**

The user reports their current emotional state, room and allows the system to adjust the home environment (lighting and music) accordingly, based on predefined preferences.

**Level:** User-goal

**Stakeholders and Interests:**

- **Home Resident:** Wants an easy way to express their current mood and receive an environment that matches their emotional needs.
- **Psychologist:** Wants accurate emotional data for trend analysis.

**Preconditions:**

- The system contains predefined emotional states and related configurations (songs, lighting).
- The system is connected to all home devices (smart lights, speakers).

**Minimal Guarantees:**

- The system logs the attempt to register emotional data.
- No environment changes occur if configuration fails.

**Postconditions:**

- The emotional state, intensity of emotion and activity are logged in the user's emotional history.
- The environment is successfully adjusted based on the selected emotion.

**Trigger:**

The home resident decides to report their emotional state to the system

**Main Success Scenario:**

1. **Home resident** wants to register current mood.
2. **System** displays a form asking for the current emotional state (e.g., calm, stressed, sad, motivated, happy) and level of feeling.
3. **Home resident** selects their current emotional state.
4. **System** displays a form asking in which room home resident is
5. **Home resident** selects the current room where he/she is.
6. **System** displays up to three pre-configured song options by the home resident for that emotion and a "No music" option.
7. **Home resident** chooses one of the songs or silence option.
8. **System** sends the request to the audio device in the room to play music (or not).
9. **System** use UC7.
10. **System** displays contextual activity suggestions based on the emotion (e.g., "Meditate" for sadness, "Draw" for happiness).
11. **Home resident** selects one activity.
12. **System** logs information (emotion, level, activity) in the user's emotional history.
13. **System** confirms the environment setup is complete.

**Extensions:****5a. Home resident skips room selection and remains inactive**

5a1. System starts a timer of 1 minute.

5a2. When the timer is finished, use cases continue to step 12 due to inactivity.

**6a. System does not have the resident's favourite songs.**

6a1. System offers default playlist and "No music" option.

**7a. Home resident skips song selection and remains inactive**

7a1. System starts a timer of 1 minute.

7a2. When the timer is finished, use cases continue to step 12 due to inactivity.

**8a. Music playback fails (external device not connected)**

8a1. System displays a message "Music playback unavailable; adjusting lighting only."

8a2. Use case continues in the step 8.

**9a. Lights Test works**

9a1. Set the preference lights.

9a2. Use Case continues with the flow

**11a. Home resident skips activity selection and remains inactive**

11a1. System starts a timer of 1 minute.

11a1. When the timer is finished, use cases continue in the step 12.

**11b. Home resident selects activity and selected emotion was positive.**

11b1. System will evoke the UC-02

11b2. Use continues with the step 12.

**12a. Connection to the emotional history database fails**

12a1. System stores the data locally and retries syncing later.

**Extends:**

- UC-02: Send Wellness Notifications

**Includes:**

- UC-07: Testing Lights
- 

## 3.2 UC-02: Send Wellness Notifications

**Primary Actor:** Home Resident

**Goal in Context:**

The system sends notifications to remind the resident to take breaks stretching breaks, to hydrate and maintain well-being and productivity after choosing a positive feeling and selects a productivity activity.

**Preconditions:**

- Emotional state and activity have been successfully registered.
- Notifications are enabled in the system/app settings.

**Postconditions:**

- Resident receives scheduled notifications or reminders for wellness breaks.
- Notification logs are saved in the system.

**Trigger:**

The resident registers a positive emotional state and selects an activity in UC-01.

**Main Flow:**

1. **System** detects that the registered emotional state is positive and an activity has been selected.
2. **System** displays a “Notification Settings” menu:
  - Frequency (e.g., every 10 min, 15 min, 30 min)
  - Type (popup, sound, vibration, visual only)
3. **Home resident** selects preferences.
4. **System** calculates the optimal schedule for wellness notifications based on preferences.
5. **System** schedules notifications in the app.
6. **Home resident** receives reminders according to the schedule.

**Extensions (Alternative Flows):**

**3a. Preferences partially missing**

- 3a1. System applies default notification settings (e.g., 1 reminder every 20 minutes).
- 3a2. Flow continues at step 4.

**5a. Notification delivery fails**

- 5a1. System retries delivery at the next available opportunity.
- 5a2. System logs failure for review.

**Extends:**

- UC-01: Register Emotional State

**Includes:** -

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## 3.3 UC-03: Configure Emotional Preferences

**Primary Actor:** Home resident

**Goal in Context:**

The user customizes how each emotional state should affect the home environment (lighting colour, brightness, and music preferences).

**Level:** User-goal

**Stakeholders and Interests:**

- **Home Resident:** Wants full control over how the system reacts to emotions, ensuring comfort and personalization.
- **Psychologist:** Interested in accurate emotional-environment associations for better behaviour understanding.

**Preconditions:**

- The system is operational and connected to smart home devices (lights and speakers).

**Minimal Guarantees:**

- The system preserves existing or predetermined configurations if new preferences are not successfully saved.
- Any incomplete configuration is ignored safely.

**Postconditions:**

- The system stores all selected preferences (colour, intensity, songs) linked to each emotion.
- The new preferences are available for future mood registrations.

**Trigger:**

The home resident decides to update or personalize emotional environment settings in the Care Home app.

**Main Success Scenario:**

1. **Home Resident** opens the “Emotional Preferences” section in the app.
2. **System** displays the list of predefined emotional states.
3. **Home Resident** selects an emotion.
4. **System** displays configuration options for lighting colour, brightness, and music.
5. **Home Resident** selects preferred lighting colour, intensity and 3 preferred songs.
6. **System** use UC7.
7. **System** displays confirmation pop up.
8. **Home Resident** saves the configuration.
9. **System** stores the preferences.
10. **System** confirms that emotional preferences were successfully saved

**Extensions:**

5a. Resident left partially music selection missing

- 5a1. System keeps the pre-determined songs.
- 5a2. Case use continues at Step 6.

5b. Resident left partially lightning selection missing

- 5b1. System keeps the pre-determined options for light.

5b2. Case use continues at step 6.

**6a. Test works well**

6a1. System test preferences

6a2. Use case continues with the flow.

**8a. Resident cancels configuration before saving**

8a1. Preferences remain unchanged.

8a2. Case Use ends.

**10a. System fails to save preferences**

10a1. System notifies user: "Unable to save preferences now. They will be stored later."

10a2. Preferences remain the same.

10a3. System creates a asynchrony update in the DB and it will try later

**Extends:** -

**Includes:**

- UC-07: Testing Lights
- 

## 3.4 UC-04: Analyze Emotional Records

**Primary actor:** Home resident or Psychologist

**Goal in Context:**

The actor reviews and analyses emotional data stored by the system, including past moods, activities, and environment configurations, to identify emotional trends or patterns over time.

**Level:** User goal

**Stakeholders and Interests:**

- **Home Resident:** Wants to understand their emotional patterns and how environmental factors influence their mood.
- **Psychologist:** Wants to analyze the emotional records for therapy support and behaviour tracking.

**Preconditions:**

- Data already exists in the system database.

**Minimal Guarantees:**

- The system preserves existing emotional records even if analysis or visualization fails.

**Postconditions:**

- Emotional history is displayed according to selected filters (dates, emotions, intensity, activities).
- The actor may optionally export the data (UC-03a).

**Trigger:**

The actor decides to view emotional history.

**Main Success Scenario:**



1. **Actor** opens the “Emotional Record” section in the app.
2. **System** retrieves stored emotional data from the database.
3. **System** displays last registers and data filters.
4. **Actor** selects a date range or emotion filter (e.g., “last 30 days,” “stressful moments”).
5. **System** verifies filters.
6. **System** retrieves information from Database and display it.
7. **Actor** reviews the data.

**Extensions:**

**2a. No data stored.**

- 2a1. System displays: “No emotional records found yet.
- 2a2. Use case ends.

**3a. Actor wants to export directly the last records.**

- 3a1. Use case jumps to 7a.

**5a. Filters partially missing.**

- 5a1. System will use default values for missing attributes in filters.
- 5a2. Use case continues with the flow.

**5b. User cancels visualization.**

- 5b1. Use case ends.

**6a. Data not available with the parameters inserted by the user.**

- 6a1. System displays: “No data found for the selected filters. Try another combination”
- 6a2. Use case returns to step 3.

**7a. Actor decides to export data**

- 6a1. Case use continues in UC-05

**Extends:**

- UC-05: Export Emotional Report

**Includes: -**

## 3.5 UC-05: Export Emotional Report

**Primary Actor:** Home Resident or Psychologist

**Goal in Context:**

The actor exports the analyzed emotional data into a customizable report file (PDF or CSV) for therapy, data tracking, or self-assessment

**Preconditions:**

- Emotional data is successfully displayed.

**Postconditions:**

- The emotional report file is generated and saved.

**Trigger:**

The actor chooses the “Export” option in the Emotional History section

#### Main Flow:

1. **Actor** selects "Export Emotional Report."
2. **System** displays the "Export Options" menu:
  - Report format (PDF / CSV).
  - Report content options: include activity suggestions, environment settings, or emotional intensity chart.
3. **Actor** selects desired export settings.
4. **System** validates inputs and confirms configuration.
5. **System** generates the report based on current filters and chosen options.
6. **System** displays save/share locations.
7. **Actor** selects where to save or share the file.
8. **System** confirms that the export is complete and shows file details.

#### Extensions:

##### 2a. No export format selected.

- 2a1. System prompts: "Please select a file format before proceeding."
- 2a2. Flow returns to step 2.

##### 5a. Report generation fails.

- 5a1. System displays "Export failed. Please try again later."
- 5a2. Flow ends and logs the error.

##### 7a. Invalid or inaccessible save path.

- 7a1. System displays "The specified path is unavailable."
- 7a2. Flow returns to step 6.

#### Extends:

UC-04: Analyze Emotional History

Includes: -

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## 3.6 UC-06: Connect Smart Devices

**Primary Actor:** Home Resident

#### Goal in Context:

The home resident connects compatible smart devices to the system so they can be controlled and react to detected emotions or preferences.

**Level:** User goal

#### Stakeholders and Interests

- **Home Resident:** Wants to link personal smart devices quickly and ensure they respond to emotional states.
- **Device Manufacturer (External system):** Expects proper authentication or connection via standard protocol (Bluetooth, Wi-Fi, or simulated).

### Preconditions

- At least one smart device is available or detectable (physically or via simulation).

### Minimal Guarantees

- The system preserves the list of already connected devices even if a new connection fails.

### Postconditions

- The selected smart device is linked to the system and ready to receive environment commands.

### Trigger:

The resident chooses the “Connect Smart Devices” option in the app to add or manage devices.

### Main Success Scenario

1. **Home resident** opens the “Connect Smart Devices” section in the app.
2. **System** displays a menu allowing the resident to choose which kind of device to connect.
3. **Home resident** selects type (e.g. Lightning, audio devices).
4. **System** scans the environment for available compatible devices.
5. **System** displays a list of detected devices with type, name, and status.
6. **Home resident** selects one device to connect.
7. **System** verifies compatibility and connection status.
8. **System** establishes the connection and registers the device in the user’s profile.
9. **System** displays “Device successfully connected. Would you like to pair another device? Yes/No”
10. **Home resident** decides what to do in previous question.

### Extension:

#### 4a. No devices found.

4a1. System displays: “No compatible devices detected. Make sure your devices are on and discoverable.”

4a2. Use case returns to step 2.

#### 7a. Device incompatible or connection error.

7a1. System displays: “Device not compatible or connection failed. Try again or select another device.”

7a2. Use case ends.

#### 7b. Connection successful and type lights

7b1. Flow goes to UC7

#### 10a. Home resident wants to connect another device from the same category.

10a1. System close the Alert.

10a2. Use case returns to step 4.

#### 10b. Home resident does not want to connect another device

10b1. System close the Alert.

10b2. Use case ends.

**Extends: -**

**Includes:**

- UC-07: Testing Lights
- 

### 3.7 UC-07: Test Light Connection

**Primary Actor:** System

**Goal in Context:**

The System connects to compatible smart devices and test them in order to check if the connection is okay.

**Stakeholders and Interests**

- Home Resident wants the lights to work properly, especially when adjusting settings or registering emotional states.

**Preconditions:**

- The system is connected to the home network.

**Minimal Guarantees:**

- Notify if there is a connection or not

**Postconditions:**

- generates a notification to the user.

**Main Success Scenario:**

1. The system initiates the connection test to the lighting devices.
2. The system sends a brief power-on signal.
3. The device responds by confirming the action.
4. The system marks the test as successful.

**Extensions:**

2a. The device does not respond within the timeout period.

2a2. The system notifies: "Lighting control unavailable; please check your connections."

**Extends: -**

**Includes: -**