Software Requirements Document for Smart Home Notification and Calendering System

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Contents

1 Introduction

1.1 Purpose

This document details both the functional and nonfunctional requirements for the Smart Home Notification and Calendering System (NCS).

The purpose of this document is to serve as a contract between the team members of the Smart Home project to ensure fulfillment of project requirements and enumerate the interfaces and inner workings of the NCS with the rest of the Smart Home system.

1.2 Scope

The scope of this document covers the functional and non-functional requirements of the NCS including the physical description of the system as well as the behavioral and other factors necessary to provide a complete and comprehensive description of the NCS.

1.3 Definitions, acronyms, abbreviations

Term	Description
Smart Home (SH)	
Notification System	
Calendering System	
NCS	Notification and calendering System
ADLs	Active Daily Lives
SRS	Software Requirement Specification Document
RFID	Radio Frequency Identification Device

1.4 References

ADD ME LATER

1.5 Overview

The user demographic for the Smart Home is primarily elderly and disabled people. This particular demographic is often scared by a myriad of different software tools for CNS systems. These pre-existing software solutions are often far too complex and not specifically suited to the unique needs of our user demographic. At the same time our users are faced with potential decline in cognitive function and an ever increasing set of appointments to doctors and other senior activities as well as new dietary needs (such as low cholesterol diets, diabetic concerns, etc.). These increasing needs coupled with a desire to continue to be independent underlay the requirements and design of the entire Smart Home as well as the CNS specifically.

Currently the state of products for calendering systems mainly focus on businuess scheduling and are targeted at a younger more technicaly proficiant demographic. Examples of this include Microsoft's Outlook, the Google Calander, and "smart phone" scheduleing. These applications do not have the required level of simplicity nor the desired integration to the Smart Home System.

Notification Systems...

2 Overall description

This section seeks to clarify and describe the requirements of Smart Home NCS. Basically the system provides schedule management, notification and planning. Since the target system is Smart Home and the target user is eldery or disability people, it has design constratins and specfic features rather than general NCS. For example, a user interface should not to be difficult. It should be simple and easy to understand. Moreover, features need to be related to safety and health of users and provide useful information for the target user.

The NCS of the Smart Home has a number of crucial functionalities. Calendarging functions give specific schudeling plan for eldery people such as appoinments for a doctor, nurse, community event, and medecine and meal plan. Notification fucntions provides information of safety, emergency situation, health status,and security.

- Calendaring - Functional features

    - Scheduling transportation to community events
    - Scheduling a visit to doctor
    - Consulting with a nurse (virtual consultation)
    - Dispensing medications and taking pills
    - Recording exercise activities
    - Refilling prescriptions
    - Nutrition and Meal Planning

- Notification - Functional features

    - Monitoring health status (glucometer, blood pressure, spirometer, pulse oximeter, weight scales, and etc.)
    - Calling for help after a fall
    - Turning off the range automatically when it gets too hot or stays on too long
    - Looking to see who is at the front door (without opening the door)
    - Providing long-distance monitoring for safety
    - Requesting house cleaning or home maintenance services Checking security system Schedule for house work (When did I clean, when should I change a purifier filter, air filter, and so on) Making shopping list automatically Checking bank statements Paying bills via Internet
    - Requesting house cleaning or home maintenance services
    - Checking security system
    - Schedule for house work (When did I clean, when should I change a purifier filter, air filter, and so on)
    - Making shopping list automatically
    - Checking bank statements
    - Paying bills via Internet

- Non-functional features

    - Universal Design for elderly people
    - Safety constrains
    - Reconfigurable System

2.1 Product Perspective

This section quoted from the vision document by Chad Kilgore, Matt Peitz, Kendra Schmid.

Assisted Living Facilities: Assisted living facilities are for persons that need assistance with ADLs but wish to live as independently as possible. Most assisted living facilities create a detailed service plan for individual residents upon admission, which is updated regularly to assure that the resident receives the appropriate care as his or her condition changes. These services include help preparing meals, bathing, dressing, performing household chores, and aid for persons confused or experience memory problems. Other common terms for assisted living are residential care, personal care, adult congregate living care and supported care.

Nursing Homes: Nursing homes provide skilled nursing care and rehabilitation services to people with illnesses, injuries or functional disabilities. Even though most facilities serve the elderly, some facilities provide services to younger individuals with special needs, such as the developmentally disabled, mentally ill, and those needing drug and alcohol rehabilitation. Nursing homes are generally stand-alone facilities, focusing their attention on rehabilitation, so that their residents can return to their own homes as soon as possible. Some of the services provided by nursing homes include therapies, pharmacy services, and specialty care, such as Alzheimer's treatment, neuromuscular diseases, stroke recovery.

University of Florida: "The RERC-Tech-Aging is testing currently available home monitoring products relative to their effectiveness in relation to independence, quality of life and health related costs. The RERC-Tech-Aging is also identifying needs and barriers to home monitoring and communication technology, and addressing needs of special populations including rural-living elders, and people aging with disability. The results of this research will be relevant to health policy makers, device developers, and other investigators. The RERC-Tech-Aging works with companies on pre-product testing, including Honeywell's very promising Independent LifeStyle Assistant (ILSA). We are advancing very new consumer products such as Motorola's Smart Phone, to provide applications useful for older people with disabilities. We are also studying the requirements for, and development of a device / system for elders with cognitive impairment. We are applying the concept of pervasive computing to the needs of older persons through our work with smart phones and smart homes."

Niagara Framework: The Niagara Framework, developed by Tridium Software, is a Java-based framework that allows development of smart homes using different components from different manufactures. Niagara was developed using JavaBeans that allows every component to be treated as an object. Niagara uses an adapter development pattern so that every object, regardless of manufacture, communication standard, or software can run from a standard web browser. The framework can then dictate to each device what needs to be done its own protocol, thus saving time that would be used to program all devices. The framework operates on a wide variety of hardware platforms and operating systems due to Java development. The Niagara Framework differs from the project vision since the framework is designed primarily for an electronic house, not necessarily a smart home.

Concept of Operations

The system will not only help users in daily tasks such as scheduling, shopping, it also protect an user inside the house with health care and nutrion system and security of the house. The system has an easy-to-use interface and is configurable. The system is fault tolerant i.e in the worst case the system does not do any harm to users. With an interactive interface, the system can visualize concepts and communicate with users in friendly and understandable ways.

2.2   Product functions
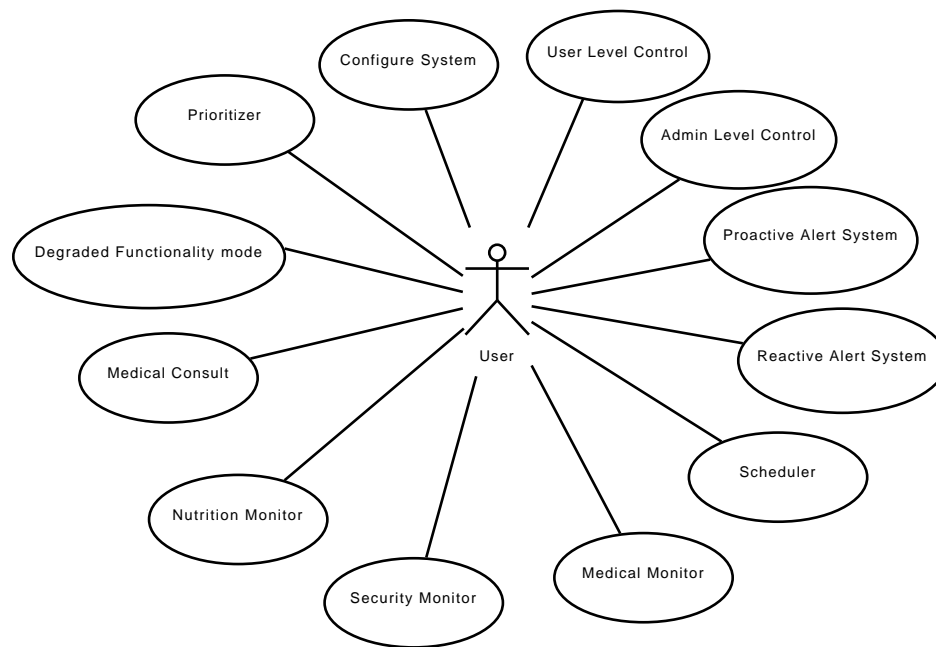
2.2.1   Scheduler

Tittle:Scheduler

Description:User needs to make or modify a schedule

Actor:user

Preconditions: The system is on and the user wants to make/modify a schedule

Postconditions: The user has made/modify a schedule and the system records changes in scheduling database.

Basicflow:

1. The user informs the system to make a schedule with given preference like date, time or place.

2. The system identifies which time and place is available and suitable (e.g wheather conditions, traffic)for user's normal schedule

3. The system visualize available times and suitable places for the user to choose

4. The user decides which time is suitable

5. The system get confirmation from user and store in the database

Alternate flow:

The user wants to modify a schedule given name,date or time of meeting

The system searches through the database for possible matched schedules and visualize them for user

The user chooses the right one

The system displays options: correct the meeting time, cancel an appointment, change the meeting place.

The User choose one option

The system follows the user's choice and continue until the user finishes modification

The system get confirmation about the modifications and store in the database

2.2.2 Medical Monitor

Titile:Medical Monitor
    Description: The system monitor the health status of the user
    Actor: The system
    Preconditions: The system is on and all sensors are in working condition
    Postconditions: The information about health status of users is obtained.
    Basicflow:
    The system receive medical information from all sensors such as blood pressure, glucometer level,spirometer, pulse oximeter, weight scale, etc
    The system checking the consistent with the information in previous period.
    Notify user immediately when the obtained information is abnormal.
    If there is no response from user in specific amount of time, the system raises an alarm and call hospital for emergency case.

2.2.3 Security/Fire monitor

Titile: Security/Fire monitor
    Description:The system provide a security for users and the house
    Actor: The system and the user
    Preconditions: The system is on.
    Postconditions: The house and the customer are safe.
    Basicflow:

1. The system receive information from medical monitor and sensors like temperature sensor, smoke sensor, etc around the house.

2. Anything abnormal happens, the system give warnings to user via communication devices like cell phone,email, etc.

3. After a specific of time without any confirm from user, the system raise an alarm, close all the doors and call 911.

Alternate:
    3(a). The user turns off the alarm.
    4. The system verify the user's identity
    5.The system turns off the alarm when the identity is clear

2.2.4 Nutrion Monitor/Planner

Titile:Nutrion Monitor/Planner
    Description:Monitor the food and help the user choose right food plan
    Actor: The system and the user
    Preconditions: The system is in working mode and the user's privilege is clear
    Post conditions: The nutrition level in user's meal is acceptable.
    Basic flow:
    The system gets information from medical monitor to get health status of the user.
    The system suggests the user which food is good for current status of user.
    The user chooses specific food from suggestions.
    The system send the food order to the market.
    Alternate:
    The user choose a nutrition mode: normal or diet.
    The system compare the health status of user and the mode.
    If something conflicts, the system give a warning to the user.
    If everything is fine, the system schedule and order suitable food for user's nutrition mode.

2.2.5   Configuration System

Title: Configuration System

Description: Configuration system provides an interface to configure system.

Actor: User, system engineer, service provider

Pre conditions: System is on and configuration system is available for use.

Post conditions: System has been configured.

Basic flow:

1. The customer instructs the system to be configured.

2. The system provides an interface to configure system.

3. The customer configure system through the provided interface.

4. The system notifies the customer that the system has been configured.

Alternate flow:

1a) The system engineer instructs the system to be configured.

1. The system provides a richer interface to configure system.

2.2.6   Medical consult

Title: Medical consult

Description: Consult with a doctor or a nurse about the customer's heal condition.

Actor: Customer

Pre conditions: System is on and phone connection is available.

Post conditions: phone connection has been disconnected.

Basic flow:

1. The customer instructs the system to connect a medical service center.

2. The system call a medical service center.

3. The customer consults with a doctor or a nurse about his/her condition.

4. The system disconnect a phone call.

Alternate flow:

2a) If the system has a camera and network connection, use a video conference.
   3a) If the system has a network connection, the system sends user's health status.

2.2.7 Degrade function mode

Title: Degrade function mode

Description: Degrade mode keeps system working correctly although there is possibility that can make system hazard. Possible hazards could be blackout, network disconnection, sensor or device malfunctioning and etc.

Actor: System

Pre conditions: The system detects hazard.

Post conditions: The system keeps working.

Basic flow:

1. The system detects hazard.

2. The system change its mode to degrade mode.

3. Depends on a type of hazard, it does proper actions to keep working.

Alternate flow:

3a) If it is not possible to keep working, a customer service can detect system down by using heart-beat technique.

2.2.8 Priortizer

Title: Prioritizer

Description: Prioritizer gives a function that prioritize notifications and alarms.

Actor: System

Pre conditions: System has notifications and alarms in queue to be processed.

Post conditions: Notify the notifications and alarms based on priority.

Basic flow:

1. The system detects notifications and alarms to be notified.

2. The system check the rules to prioritize notifications and alarms.

3. Reorder the notifications and alarms based on priority.

4. Notify the notifications and alarms based on priority.

2.2.9 User Level Control

Title User Level Control

Description The user desires to make a modification to a setting, create a new event or some other setting.

Actor Customer

Pre condition The user is a properly authenticated user and the system is on

Post condition The system is updated with the change to the user's preference

Basic Flow:

1. User Selects the Control menu from listed options

2. System displays Control options for the User

3. User selects option to be changed

4. System displays data associated with option

5. User provides updated data

6. System saves configuration

Alternate Flow:

1. User leaves control before saving configuration

2. System disregards changes and returns to previous state

2.2.10 Caretaker Control

Title Caretaker Control

Description The caretaker desires to make a modification to a Users

Actor Caretaker

Pre condition The user is a properly authenticated Caretaker and the system is in caretaker mode

Post condition The system is updated with the change to the user's preference

Basic Flow:

1. Caretaker Selects the Control menu from listed options

2. System displays list of Users the Caretaker

3. Caretaker selects specific user to preform actions

4. System displays a list of options associated with user

5. Caretaker selects specific option to modify

6. System displays data associated with option

7. Caretaker provides updated data

8. System saves configuration

Alternate Flow:

1. User leaves control before saving configuration

    (a) System disregards changes and returns to previous state

2. a. Caretaker selects multiple users to modify at once

2.2.11 Proactive Alert/Notify System

Title Proactive Alert/Notify System

Description The CNS notifies/alerts user/caretaker of a pre-scheduled event. An example of this would be notification of the need to take medicine or of an appointment

Actor Customer, Caretaker

Pre condition A pre scheduled event is about to occur and the system is in a ready state

Post condition The user/caretaker has been notified and acknowledges the event or alert

Basic Flow:

1. An event has been previously scheduled with the CNS system and is about to occur (as defined in user preferences, i.e. user specified that they desire notification 20 minutes before scheduled Medical Consult

2. System determines location of user through proximity sensors and RFID tagging

3. System sends notification to device near user

4. User acknowledges alert

Alternate Flow:

1. System can not find user

    (a) System sends notification via Cellphone Text Message to user's phone
    (b) User acknowledges via a text message

2. User does not respond to alert

    (a) System re-sends alert to a wider display set near user (as determined by RFID and proximity sensors)
    (b) User acknowledges request

3. User still does not respond

    (a) Caretaker is notified of potential issue

2.2.12 Reactive Alert/Notify System

Title Reactive Alert/Notify System

Description The user desires to make a modification to a setting, create a new event or some other setting

Actor User, Caretaker, Emergency Personnel

Pre condition An event has accrued that requires intervention from the user, caretaker, or emergency personnel depending on level of severity

Post condition Proper actors notified of issue and activated

Basic Flow:

1. Some unplanned event occurs. Examples of events include:

    (a) Medical: stopped heart, low blood sugar, user fall, or other medical issue
    (b) Safety: Break in, fire, or pipe burst detected
    (c) User error: stove left on, refrigerator door left open

    (d) Maintenance: sensor battery dead, not responding, equipment failure

2. The level of severity of the issue is rated by the system using predefined templates

3. The system notifies the necessary actors based on severity level of the event.

Alternate Flow:

    1. Actor does not respond to notification

    2. System escelates notification to the next higher level of notification.

2.3   User characteristics

2.4   Constraints

3 Specific Requirements

3.1 External Interface Requirements

3.2 Classes

3.3 Performance requirements

3.4 Design Constraints

3.5 Software System Attributes

3.6 Other Requirements