Emergency Response Officer Assistant Final Summary

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Description

In this project tools for **Emergency Response Officers** - police and firefighters – are created to help identify their potential dangers. The goal is to protect them by introducing a smartwatch and a smart heads-up display (HUD). The wrist smartwatch, which an officer wears, detects the presence of hazardous gases; and the locations of dangerous neighborhoods, such as neighborhoods that have high recorded crime rates. In such neighborhoods, the watch alerts a Control Center Operator if the officer's heart rate has changed. The HUD can detect whether the car in front of it is speeding, photograph license plates and return driver records, and use GPS data to determine the best routes.

Overall, measurement of success would rely on comparing time spent on critical tasks, such as time to detect dangerous gases, while using the system; as well as money saved on expenses such as emergency health care bills due to faster detection of health risks while on call.

Requirements

Functional: The system shall wirelessly detect whether the wearer of the watch is in a dangerous neighborhood based on information in a database. The watch must be able to read a user's heart rate. The watch must be able to detect dangerous gases tracked by a database. The HUD must display textual and graphical data.
Reliability: Network connection failure that affects multiple devices in a geographical district must occur less than once every half year.
Performance: The smartwatch shall commit no errors when analyzing the toxic gas in the air. The system must support 60,000 simultaneous users.
Usability: The smartwatch and HUD shall be a valuable resource for the Emergency Response Officers. The HUD shall be easy to use one week after a one-day training session. The smartwatch and HUD shall present information in a way that an Emergency Response Officer will not be overwhelmed.
Look and Feel: The smartwatch shall not draw attention. The smartwatch shall be sleek and professional.
Environmental: The smartwatch and HUD must be bright enough to see in all sorts of weather and lighting conditions.

Design Goals

Reliability: The graphics should not be so complicated that the system makes strenuous demands on the network that cause connection failure more than once every half year. Because the goal of the project is to quicken the response time to officers' risks, and because failure will significantly increase that response time, reliability is a more important design goal than usability and look and feel.
High privacy and compliance*:* Watches may not transmit the location and vital statistics of a wearer without their consent. The product is for a government entity and contains personal health data. Privacy and compliance should be higher priorities than performance and space. Additional code that comes at the cost of the complexity, yet strengthens privacy guarantees, is appropriate to invest time on.
High adaptability*:* The product shall be adaptable to the custom hardware needs of different cities. Therefore, adaptability should be optimized. This lends its way to the *repository architectural style* for the Data Processing subsystem. Having one central repository for all data processing operations will keep the data processing loosely coupled from all hardware subsystems that rely on the data subsystem, so that specific cities can substitute alternative hardware subsystems and alternative databases. This goal also leads to the *facade design pattern*, so that if the system is extended to other hardware products the specific data operations do not have to be redesigned for every specific subsystem. Even though this layer of indirection between each subsystem and the data adds performance overhead, this design goal takes a higher priority than performance.

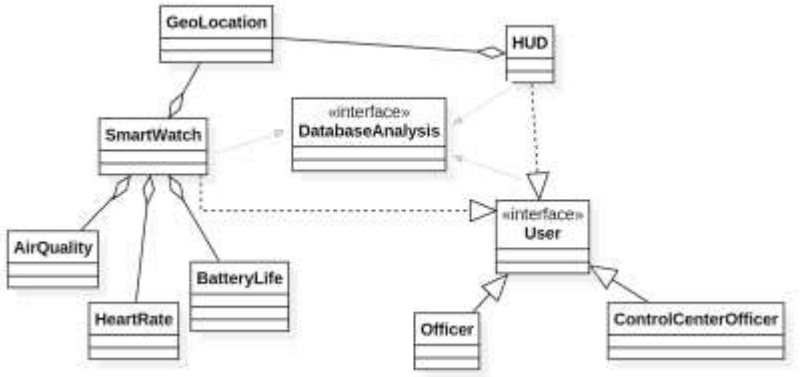
Subsystem Decomposition

The Data Storage subsystem features a unified relational database and can be directly accessed only by the Data Processing Analysis subsystem. The Data Processing Analysis subsystem is the central repository for all data processing operation. All hardware subsystems access the Data Processing Analysis subsystem using a uniform interface. These hardware subsystems are the HUD and the Watch. The Watch subsystem interfaces with the Heart Rate Monitor and Air Quality Analyzer. Both the HUD and Watch interface with Location Analyzer.

Global Software Control

Many of the initial requests to the software will be based off triggering external events, such as entering a high-crime neighborhood or pressing a button to request an air analysis. Thus, the global control flow is event-driven. Some subsystems depend on information provided by other subsystems, so they have to run synchronously opposed to asynchronously. The Heart Rate Monitor subsystem depends on the Location Analyzer subsystem because the heart rate isn't monitored until an Emergency Response Officer enters a high-crime neighborhood.

Class Diagram



Persistent Data Management

The persistent data management strategy is to use a relational database. This project defines four schemas for the database: Officer, ControlCenterOperator, ChemicalInfo, and TicketInformation. Both Officer and ControlCenterOperator have an “is-a” relationship with User schema, meaning that they can carry required unique information and share traits. The ChemicalInfo Schema will hold information for all known chemicals and the TicketInformation schema will hold data from any tickets given out.

User Interface

The software will prompt Emergency Response Officers to interact with the product interface to acknowledge when they need assistance. Emergency Response Officers also have the ability to start certain functionality, like finding the best route, via the user interface.

Test Plans

Unit:

GPSAccuracy: The test driver outputs a subject’s coordinates and compares this to the expected results.

LicensePlateTranslation: HUD scans license plate and compares returned driver results to oracle.

Acceptance:

Acceptance test plans include the accurate detection of 98% of toxic gases by the smartwatch.