Design Project
Stage 1

Overview

The design project is to be performed by teams of three to four people each. Team formation is left up to you. I recommend forming a team with an eye for completing both this project and the data analysis projects.

The project will have the following timeline:

No.	Activity/Assignment	Dates/Due Date	Comment
1.	Initial discussion	*October 18, 2010*	brief discussion during the lab
2.	Team formation	*by October 18, 2010*	
3.	Problem description released	*October 18, 2010*	
4.	Stage 0 (preparation)	*October 18-25, 2010*	
5.	Discussion	*October 25 or 27, 2010*	*tentative*
6.	Stage 1 (design)	*October 27 - December 1, 2010*	
7.	Report due	*December 3, 2010*	
8.	Presentation	*December 8, 2010*	final exam slot

We may use a full lab or part of a lab session some time in November to conduct more discussions on the project.

The Problem: Real-time Biometrics

Scenario.

It is only a matter of years before **everyone** carries a personal communication device with more processing power than your today's desktop computer. It is also only a matter of years before sensor technolgies progress to the point where a small, Bluetooth-enabled, non-intrusive sensor *collecting and transmitting all and any biometrics data* can be placed on a human for permanent wear and monitoring.

This project proposes a "what-if" scenario and asks you to design a software system for

1. real-time collection and monitoring of human biometrics data;
2. long-term management of personal biometrics and medical data, and
3. analysis of collected biometrics and medical data.

As part of the scenario, the following in formation is offered:

Sensors. A medical research company invents a small, wearable 24/7, unobtrusive sensor for collecting biometrics data. The sensor is placed on a human host, and uses a short-range wireless transmission protocal (e.g., BlueTooth) to transmit collected data to the host's mobile computing device (e.g., a cell phone running Android, iOS or Windows Phone operating system).

Any biometrics/medical data can be collected by the sensor (from measures like pulse and blood oxygen and sugar levels and body temperature, to more complex parameters). This is the one part of the assignment where you are asked to suspend belief and simply choose the specific parameters you want monitored.

Mobile Computing Device. The mobile computing device (a.k.a., a smartphone) runs a special-purpose application that recieves sensor transmissions, organizes them and provides real-time, or aggregated information to the device owner/host/"patient". It also prepares the collected data and submits it to the centralized server(s) which accumulate long-term individual biometrics/medical histories.

Servers. The large data warehouses with individual biometrics/medical histories stockpile the data, and have it ready and available for a wide range on analytical tasks.

Software to Design

The task of each team is to design the software system that supports the collection, storage, management and use of the accumulated data. KDD tasks should and will (see below) play a major role in the system, however, you are expected to provide a detailed overview of the system in its entirety, including the non-KDD components and aspects.

The role of KDD

At the heart of your system is a vast collection of highly detailed, and extremely important and sensitive data. This data can be used for a wide range of tasks, that make the life of individuals better, help detect and/or prevent individual diseases, and have the opportunity to detect, map, track and, perhaps, prevent the spread of diseases by analyzing the patterns of biometrical data from multiple individuals.

The collected data affords a **large array of possible uses** and it is the goal of each team to determine which data will be used and how.

Legal Issues

Personal biometrics data is very sensitive by its very nature and a 24/7 monitoring operation only increases its sensitivity. As such, the use of this data is highly regulated in the USA, and specific detailed policies exist. Your software system must abide by the laws, rules and regulations, guiding the use of medical data in the USA.

It is each team's responsibility to become acquainted with the appropriate laws and regulations.

Note: Your system will come with its own **End-User License Agreement** (EULA). Some data use issues may be stipulated in it. While no team needs to write a full EULA for this project, it might be a good idea for each team to decide, which data use policies must be covered by their EULA.

The Assignment

Stage 0. On the preliminary stage of the project, the following tasks shall be performed:

1. **Team Formation.** Teams shall be formed as soon as the assignment is released.
2. **Stakeholder determination.** Each team shall start the design of the project by coming up with a list of stakeholders for the software system. For the purposes of this assignment, a *system stakeholder* is a category of system users, whose interests will be coded as use cases for the system (and, eventually, implemented).
3. **Services determination.** For the selected stakeholders, each team needs to prepare a preliminary list of services the system will be providing.
4. **Dataset determination.** Each team shall determine what biometric information will be collected by the wearable sensors.

Stage 0 deadline is **Wednesday, October 27**. By this deadline, each team shall prepare the following deliverables:

1. **Team wiki page.** The wiki page shall, at the very least, contain the team name, list of team members, and links to all other required deliverables for all stages.

2. **An initial outline of the project.** A short document briefly outlining the direction in which the team plans to take the project. In particular, the document must specify

   - The stakeholders chosen for the project.
   - The interests/conflicts/desires of individual stakeholders.
   - The services to be provided by the software system.
   - The data you are planning to collect from the system, i.e., the list of biometrics collected from individuals, and any other metadata that your system will maintain.
   - The analytical tasks you are planning to perform.

3. **Initial Presentation.** Each team shall prepare an 7-10-minute presentation based on the initial outline of the project. The presentations shall be accompanied by some visuals (slides), which should also be posted to the teams' wiki pages.

We will conduct a discussion session on Monday, October 25 or on Wednesday, October 27, in which each team shall present their initial plan, and other teams will have a chance to ask questions and discuss the project.

Stage 1. Full stage 1 assignment will be released upon completion of Stage 0. On Stage 1 of the project, the teams will finalize the design of their systems and will prepare two major deliverables:

1. **Final design document.** The actual software system design, clarifying, expanding on and extending your initial outline. The exact specifications for the final design document will be made available to you around **October 27**. **The final design document is due last day of the classes.**

2. **Final presentation.** Each team will give a 15-20 min. presentation of their design in class during the finals week. The exam time is **Wednesday, December 8, 4:10pm.** We will use this time for presentations and followup discussion. The presentations are due **December 8**.