Designing An Anger Control Machine

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Abstract:- So far, there does not exist any electronic device that can manage one's anger. There is an opportunity to produce an electronic device for managing anger. The design of an electronic device for managing anger is presented with justification of the design decisions. A layered architecture is suggested to be ideal for the device. The device is designed to detect anger at an early phase and intervene immediately. The device should be wearable, concealable and lightweight.

Keywords: architecture, electronic device, design, management.

1. Introduction

Most of us have personal experience with the destructive power of anger. Sometimes we wished we could have controlled our negative emotions; often it was too late. Timely intervention would be one of the most important goals of any anger management machine.

Anger can be characterized as a harmful negative emotion that can cause injury or damage to life and property. Anger is a state of mind that may fluctuate from slight annoyance to extremely intense rage. People from all walks of life suffer from its harmful effects.

Anger has been studied from ancient times. Philosophers of ancient India have studied anger and suggested that diet and yoga exercises may be used for managing anger. Meichenbaum's early work [1] on self-talk strategies and Novaco's [2,3] anger management treatment are well-known cognitive-behavioral anger management studies. Their techniques were modified so that they could be used with children and adolescents [4,5,6,7]. These and other studies on anger, aggression, and disruptive behavior [8-15] suggest guidelines for teaching anger control skills. However, these attempts were only partially successful. Many critics [16-22] have raised the problem of skills generalization (transfer) beyond the therapeutic sessions and into the real life situations. The problem of anger in the real world is increasing rather than decreasing. According to a survey conducted in the U.S.A. in 1999 by the Scripps Howard News Service, 88% of the respondents believed that people are more likely to express anger these days than they used to [23]. Incidents of anger related problems seem to be increasing throughout the world. The possible destructive capacity of anger is enormous. Currently, there is no electronic device that can manage one's anger. There is strong potential for benefiting from an electronic device for managing anger. Viability of such as a device should be studied with the motivation of solving the problem. An analysis of anger suggests that there is an opportunity to use an electronic device to manage anger. Auditory implants for hearing,

pacemakers for the heart and other devices for various organs are becoming increasingly popular[24]. Why not a machine for managing anger. The design of an electronic device for managing anger is presented with justification of the design decisions. The device should be able to detect anger at an early phase and intervene immediately. An operational model of the device is described using the operational scenario template suggested by Humphrey [25] and its salient features are discussed. The device is designed to be wearable, concealable and lightweight.

The rest of the paper is organized as follows: In Section 2, requirements engineering aspect of the system is. Section 3 describes the design of the system with an operational scenario template. Section 4 makes some concluding remarks.

2. Requirements Engineering

Requirements engineering is a complex process of gathering requirements and producing a functional specification document out of them. In any engineering discipline requirements must be studied before the design because the requirements should guide the design. Requirements are usually gathered from stakeholders or potential users. At first user needs are determined and systematically specified in terms of capabilities or functionalities; then system features are determined based on these needs. One of the requirements of the electronic device we propose to build is that it should be light-weight and small such that it would be comfortably wearable. It should be extremely easy to use with minimal training so that the potential user is not irritated by its usability features or training cycles. It should also be concealable, durable and secure. An ordinary user may not want to reveal to public that he or she is using a device for controlling his or her emotional problems. If the device could be embedded in a watch or jewelry then it would meet this requirement for most users. The device should be completely safe with minimal side effects. It should not have any significant problem relating to electrostatic discharge (EDS) or electromagnetic interference (EMI). It should maintain retrievable history which is secure in the sense that in no way it violates privacy of the user. The device should be able to detect anger in an early phase in timely manner and respond in real-time such that it is effective for the user. The timing is extremely important, because if the detection of anger takes too long time it may not be able to intervene in time in order to prevent the damage. It should also provide emergency tracking facilities. An authorized doctor or nurse should be able to monitor the information of the system remotely. In some cases doctor should be able to override a procedure. There may be exceptional circumstances where immediate actions from doctor's office will be needed.

As a part of requirements analysis, one should create a system diagram that describes the system boundaries and identifies the actors of the system. There are many types system diagrams used in practice; they are notational variations of each other. The system diagram for the electronic device is presented in Figure 1 using the notation suggested by Leffingwell and Widgrid [26] which is adopted from UML (Unified Model language).

One can see that the system is used by a human user. It is also remotely monitored by a doctor or nurse from a doctor's office. There should be sensors to collect data from the human user in order to detect the onset of an anger state. The sensor data should include heart-rate, breathing, temperature and facial expressions. The intervention subsystem helps the user in the management of anger. The refill system is used to maintain the sedative level at a specific level.

Requirements engineering usually includes development of use case models. An use-case model for a system comprises of all of the actors of the system and all of the uses cases by which the actors interact with the system and thereby describing the totality of the system [26]. A use case describes a sequence of actions a system performs that yields an important result

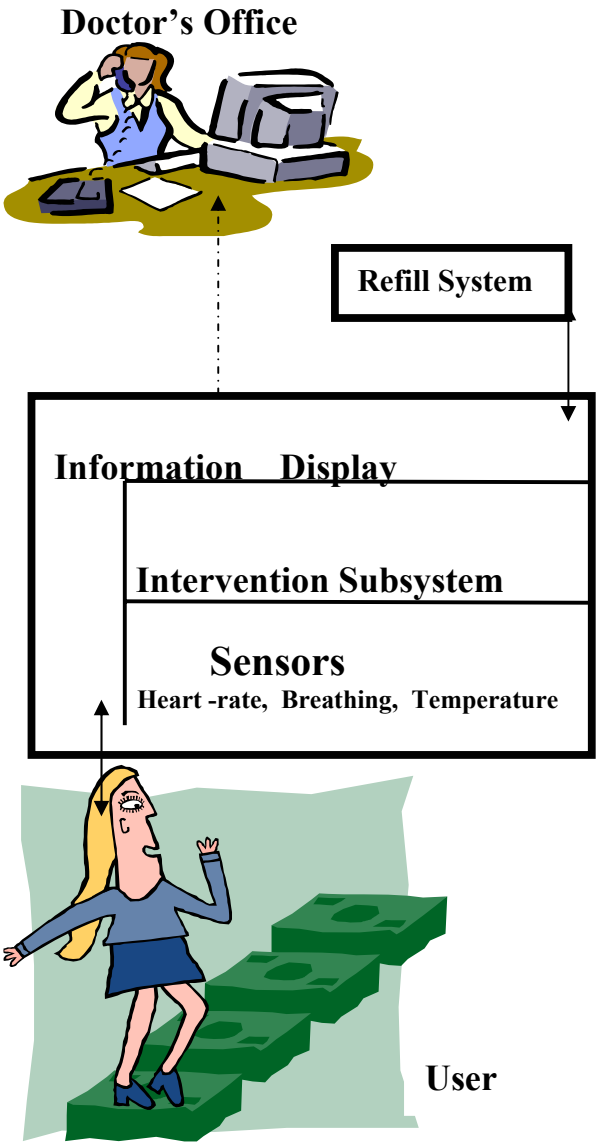

Figure 1: Anger Management System

to an identifiable actor. Use cases should be written using prospective user's natural language. The use-case method explores alternatives among the user-interface features and helps system specification utilizing early feedbacks from prospective users. A typical use case is presented in Figure 2 which elaborates the normal operational mode of the device. The device is supposed to run all the time unless it is switched off or it is out of power. The device can operate in various modes including training mode, normal operational mode, history mode and inspection mode needed by the doctor or nurse.

Use Case 1: A normal use by an effected user

1. The user resets the system
2. The system displays normal operation mode
3. The system detects the early phase of medium level anger and generates the message: "Slow down breathing, please"
4. No significant user response
5. The system responds loudly: "Slow down breathing, please"
6. User slows down breathing
7. The system starts playing a favorite tune for the user.
8. The user interrupts and resets the system.
9. The system displays normal mode

Figure 2: A typical use case specification of normal use.

In the training mode the system would function differently under the supervision of a trainer.

3. Design

Design is a highly creative process where designer finds the most appropriate solution in an innovative way. A good design transforms a requirements analysis into an implementable product design specification [24]. The quality of the design is important because it is difficult to produce a good quality product from a poor quality design. We present a high level architectural design of the system below.

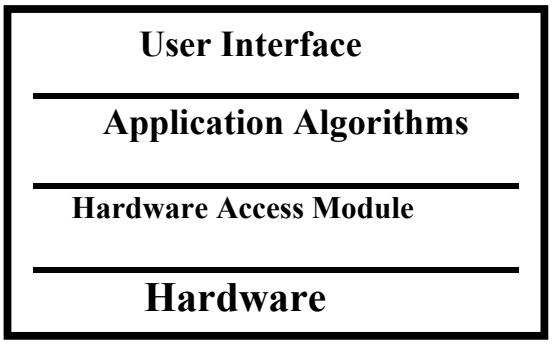

Figure 3. Layered Architecture

The most important part of the design of our proposed system is the user interface design. Since the user is a potentially irritable person, every effort should be made to produce an extremely friendly user interface. The user interface of the system is designed to be easily customizable. Initially, a trainer helps the user in the customization process. We will discus more about user interface at the end of this section when we discuss an operational scenario. Besides the user interface, there are three other main modules in the system. These modules are presented in Figure 3 in their natural abstraction hierarchy. The highest level of abstraction is achieved at the user interface level. At the second highest level of abstraction is the application algorithms module. This module specifies the algorithms that are responsible for running the system. The algorithms should include anger determination procedures for each level of anger depending on sensor data and intervention procedures for each level of anger.

Scenario # 1.
Scenario Objective: To identify system response to user actions

Source	Step	Action	Comment
User	1	Turns on	
System	2	Displays Mode selection Menu	Training Mode, User Mode Etc. are Available
User	3	Selects Doctor Mode	Improper Selection
System	4	Prompts for password	Secure Mode
User	5	Selects Cancel	Proper Selection
System	6	Displays Mode Selection Menu	Provides Another Opportunity
User	7	Selects Normal Use	Proper Selection
System	8	Displays Normal Use Mode	Normal Use
User	9	Performs Normal Work	
System	10	Detects Medium Level Anger	After any Amount of Time
System	11	Displays Message: "Slow down breathing"	
User	12	Slows down Breathing	
System	13	Plays music	
User	14	Interrupts and Resets	
System	15	Displays Normal Mode	

Scenario # 1. continued

Figure 4. An Operational Scenario Template for the anger management system.

The level of intensity of anger is important for making appropriate response. Currently, the system is designed to deal with three levels of anger: low, medium and high. The system response should match the level of anger the user has. At the next level of abstraction the hardware access module is placed. The next level is the hardware level; all hard components are placed at this level. The interaction between these levels are similar to those of an operating system levels.

The underlying user interface components are designed based on the operational scenario template suggested by Humphrey [24]. An operational scenario template for the electronic device is presented in Figure 4. For each operational scenario, the specific goals of the scenario should be identified. Some of the comments in the scenari explains the potential user's errors and possible recovery procedures by the system.

2.1 Hardware Design:
Emotional excitement or anger makes a significant change in human body system. The major physiological changes that occur due to anger are 1) blood pressure, 2) temperature and 3) heart beat. These physical properties are normally determined by using a thermometer, blood-pressure meter and pulse counter. It is well defined that the normal human body 1) temperature is 98.6°F, 2) blood pressures are: 80-90 mm Hg for systolic and 110-120 mm Hg diastolic and 3) pulse rate is 60-90 pulse/minute. These numbers may vary slightly from person to person.

There is no doubt that a person's temperature, blood pressure and pulse rate increase significantly from normal values to higher values due to emotion or anger. All these physiological changes can be monitored with a programmable digital meter that would be built with a thermometer, blood pressure meter, pulse counter, clock, memory storage and microprocessor. The size of this device will be small enough that a patient can wear it like a watch. This integrated electronic device can be named "angerometer" and might be programmed, monitored, operated and controlled from a remote site through a cellular phone connection. For remedy, it can also have an automated sedative injection and can be injected into patient's body as per need of the patient.

The angerometer can initially be set for a new patient by entering two type of information: 1) general information and 2) specific data. The general information should include the patient's name, age, weight, height, address, telephone, emergency contact and brief medical history and important remarks. And the specific data should have the values of the patient's normal temperature, blood pressure and pulse rate. All these values and information should be stored in a permanent memory location inside the device. Every time when this tiny device detects a new set of data, first it will compare these new values with the patient's normal temperature, blood pressure and pulse rate and then it will make a decision whether to take some action for managing anger. This angerometer also should have the capability to keep record the history of the patient's conditions for further evaluation and appropriate action taken by the certified professional or doctor.

4. Concluding Remarks

Earlier attempts to manage anger has produced unsatisfactory results. A more sophisticated approach will be needed to solve the problem. A machine for managing anger can be used in a comprehensive approach to manage anger. From the foregoing discussion of requirements analysis and design of the system it appears that there is a tremendous potential for a wearable electronic device for managing anger. In order to make further progress however, one has to study risks involved in producing such a device. Social, legal, medical, economic and technical risks must be thoroughly studied in details before commercial production is initiated.

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