
The Fitness Actuation Tool (FAT)

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Abstract

The Fitness Actuation Tool (FAT) is a partly wearable software agent-based system that helps people exercise. This paper describes how FAT serves essential training control, by supplying straight-forward and personalized voice commands. Unlike many other training devices, FAT has been designed especially to adapt to the user's current level of motivation, in order to improve the overall user experience. The user can choose from a set of eight different audio-based coach characters, depending on his or her preferences. In addition, the intensity of the voice-based feedback, provided by FAT, is strictly correlated with the user's physical activity pattern; if the user moves less, the feedback is automatically intensified.

Keywords

Wearable technology, persuasive technology, captology, exercise motivation, weight loss coaching, goal-focused applications, software agents.

Introduction and background

A drastic increase in the number of over-weight and obese individuals [11] has made research and production related to weight maintenance and exercise coaching popular in the last couple of years. Companies are starting to capitalize on the use of technology for exercising purposes, such as the Nike + iPod running system [8], Cyclescore Exercise Entertainment System

[2], and the robotic weight loss coach developed by Intuitive Automata Inc. [6][7]. Although some of these systems have proven to have positive short-term effects, there is still a lot to learn about their long-term usefulness. Many of these innovative systems introduce a *novelty effect*¹ that is likely to wear off after a while. Another long-term concern is *habituation*, an example of “non-associative learning in which there is a progressive diminution of behavioral response probability with repetition of a stimulus” [5]. In other words, once a user gets used to a certain system, he or she tends to respond differently (normally less) to the system’s alerts, commands, and inquiries. In the entertainment business, such as computer gaming, these long-term effects are normally taken into account. Game developers know that the key to developing persuasive games is to maintain a constant balance between satisfaction (control) and challenge [10]. The concept *flow (of mind)* [1], as proposed by psychologist Mihaly Csikszentmihalyi, describes this balance level as a “mental state of operation in which the person is fully immersed in what he or she is doing, characterized by a feeling of energized focus, full involvement, and success in the process of the activity” [3]. B. J. Fogg, head of the Stanford University Persuasive Technology Lab, describes the approach, which he refers to as *Persuasive Technology*, with the following words [4]:

Can computers persuade? Yes they can. And like the human persuaders in our lives, persuasive

¹ The **novelty effect**, in the context of Human Performance, is the tendency for performance to initially improve when new technology is instituted, not because of any actual improvement in learning or achievement, but in response to increased interest in the new technology. [9]

computing technologies can bring about constructive changes in many domains, including health, safety, and education. In the process, computers can help us improve ourselves, our communities, and our society. But persuasive computers can also be used for destructive purposes; the dark side of changing attitudes and behaviors leads toward manipulation and coercion.

This paper describes a wearable exercise coaching system, the Fitness Actuation Tool (FAT), which has been designed specifically to use the concept of persuasion to create more sustainable exercise effects.

System Implementation

The Fitness Actuation Tool, FAT, is a wearable exercise motivation system (see Figure 1) that is able to adapt its behavior to the user’s level of motivation and attentiveness. The hardware consists of a wireless accelerometer² that senses movement in two axes.



Figure 1. The wearable accelerometer.

² Currently, Bluetooth is being used to enable wireless transmission.

The computer-based software receives and analyzes the incoming accelerometer data in real-time, in order to determine which activity the user is currently involved in: sitting/standing, shaking foot, tapping foot, walking, or jumping. The system then gives the user regular spoken exercise commands based on this knowledge. An activation value is used to keep track of the user's activity pattern. More demanding activities, such as walking, running, and jumping, cause the activity level to decrease, whereas sitting or standing increases the level. The longer the activity lasts, the more the level is increased or decreased. If, for some reason, the user does not attend to the oral commands, the intensity of the commands is amplified. Currently, three different intensity levels are used. In addition, encouraging comments are used when the user is actually following the instructions.

I also decided to implement a variety of coach personas in order to improve the persuasive and sustainable aspects of the system. The user can choose from a set of eight coach characters, depending on their (current) personal preferences. The coaches all have unique personalities and tolerance levels. Figure 2 shows the complete set of characters.



Figure 2. The Eight Coach Personas: (top row) Teflon Don, Honey Monroe, Billy Bob Bob, Bad Mama Jama, (bottom row) Yiddish Kibitz, Darjeeling Unlimited, Gay Hooray, and Admirable Admiral.

Below are transcriptions of some of the verbal commands, used by FAT:

- "YOU – WILL –GET –UP- RIGHT – NOW. Do you hear me?!" (Admirable Admiral)
- "I am just thinking so happily for you right now." (Darjeeling Unlimited)
- "Let's do this whole thing. Let's get up and get out and get exercise and get into great shape. And we can go to disco clubs all night long. Come on." (Gay Hooray)
- "Hey all you listeners. It is time for you to get up!" (Billy Bob Bob)
- "I told you once, I told you a hundred times. You better get up and out!" (Bad Mama Jama)

- "Why, WHY would you do this to me?!" (Yiddish Kibitz)
- "If you don't leave right this second, you are going to really, really piss me off." (Teflon Don)
- "Your body is doing wonderful things, isn't it?" (Honey Monroe)

The complete set of commands can be downloaded at http://www.media.mit.edu/~paulina/FAT_audio.zip.

Future Work

Prospective work includes both conducting user studies and augmenting the system. The system will be tested in a long-term study, in order to generate feedback that can help me to improve the system. The main goal is to improve the algorithm in order to make it even more flexible and sustainable.

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