WalkMSU: An Intervention to Motivate Physical Activity in University Students

Abstract
In this paper, we describe an interface design whose application will motivate college students to increase their level of physical activity in daily life. The design idea is based on inducing a ‘just in time’ intervention when a user is in a decision making stage. The design described in this paper is a spatial intervention which is intended to increase awareness towards physical activity while students negotiate the urban landscape of a college campus.

Keywords
Interaction Design, Persuasive Computing, Obesity

ACM Classification Keywords
H.5.m Miscellaneous

Introduction
USA stands on top in the list of countries facing obesity as a primary health concern (percent of total population). Several studies show that obesity among youth is a larger area of concern which demands immediate attention from planners, designers, as well as computer and social scientists. According to the American Healthy People 2000 Project 16% of school going students in USA are overweight out of which 10% are obese [1]. Obesity thus is a rapidly growing
problem that will continue to haunt the American population for a long time if not curbed through appropriate interventions.

**Problem**
The primary problem that we intended to tackle with this design was that students in the Mississippi State University campus incorporated much less physical activity into their lifestyles than required by health objective studies. Studies routinely rank the state of Mississippi as having the most obese population in the country – a recent study presents 29.5% of the state’s population as obese [5].

The Healthy People Initiative [1] identifies that health objectives can only be met with interventions that lead to positive behavior changes. Physical activity is a mode of intervention that social scientists believe will prove to be the most effective method of countering childhood obesity. The problem however, in the United States (and specifically in southern states like Mississippi), lies in an intrinsically vehicular culture where activity based interventions seldom work. As health concerns start to take precedence in the American society, it is important that such interventions are designed through a careful analyses of daily living circumstances and that they are introduced into everyday lives of the target population.

We started this project with the claim that simple computational interfaces embedded into the fabric of the everyday working environment can influence behavior change in a selected population. Although people are often skeptical at first that a computer system might motivate them to change their behavior, researchers have convincingly demonstrated the power of point-of-decision messaging to motivate behavior change [3,4]. Embedding these systems within the environment in which people live, work and play as a persuasive social interface, will influence people more than singular products or messages.

**Design**
**Theoretical Precedents**
To tackle the primary problem, we worked with several theoretical precedents. The primary principle that governed the design of the interface is the *Trans-theoretical Model* proposed by Prochaska [2] which identifies four independent stages: pre-contemplation, contemplation, action and maintenance. The theory states that only an appropriate intervention in the contemplative stage can lead to a sustained behavior change through awareness and a change in intention. We also used Fishbein and Ajzen’s *Reasoned Theory* pointed out by Graeff, Elder and Booth [2] which “implies that behavior generally follows intention and will not occur without it”. Evans and McCoy [7] state that people like small amounts of change but do not adapt well to large amounts of variation. From similar design projects, we reviewed *incremental persuasion*, proposed by Mathew [6] who describes interventions where the persuasion is initiated by the persuasive elements but actual behavior change is a result of gradual but increasing consciousness of the importance of that change. As we present the design, it will become clear how these theoretical precedents were incorporated into the design and use of the interface.

**Questions to be addressed**
We set out to solve the problem by introducing interactive systems at strategic places around campus – interfaces that provide subtle information cues to
persuade behavior change. Our initial design schemes were based on prior work done in public spheres to influence people's decision making where interfaces were introduced into public environments with the explicit intention of positive behavior change among users [6].

As with these projects, we decided to address certain key questions before the design of the interface. In order to do so we approached the problem using a scenario based inquiry. Some of the key questions identified were:

'What is an appropriate location for such an interface?'

'How do we get students interested in the information that has been presented?'

'How do we sustain behavior change in a sample as large as a University population?'

**Thin layer of computing**

In the initial stages of design, it was decided that we would develop a design that introduced only a 'thin layer of computing' into the urban fabric of the campus. We call it a thin layer because the intention was to minimize the amount of technology intervention to a bare minimum; only what is needed to fulfill the task. A thin layer of computing when used within social contexts should allow users to easily interact and react to the information presented by the interface. Moreover because we wanted our design to rely on actual experience, the physical artifact – the interface - should also subside with use.

**Design solution: ‘Walkable Campus’**

For the purpose of design, walking was identified as a feasible form of regular physical activity in the college campus. We considered the fact that although the campus can be called a highly “walkable” campus, most students preferred to take the bus (or their personal vehicle) to reach even close locations. It was important thus to introduce an interface that could not only influence a behavior change but also allow for negotiating the walk within a large campus. After several design iterations, the interface that we decided to test was an in-situ GPS based interface that informed students of bus positions relative to that particular location. Once the information about bus times brought students to the interface, a secondary tier information scheme, using persuasive frameworks, would then try to influence positive behavior change among the users.

**Design solution: The display**

The final design was conceived in the form of an interactive display placed at various bus stops around...
When the user selects a destination by touching, a pop up information box presents information such as distance between locations, and comparison of time between bus traveling time and walking time, along with an approximate calorie value associated with the walk.

**Figure 2.** The prototype showing the information displayed. When a user approaches the interface to view this information, she has the choice of interacting with the system (see figure 2). Upon interaction the system tells her how much time the next bus would take to arrive, what the walking distance is between two buildings on campus, and a comparison of the time it would take to walk to the place if she chose not to take the bus. The interface also provides information about calories (based on a daily % value) that could be burned by walking and the percentage of average daily calories the walk accounted for.

When unused the interfaces would merely pick up GPS signals from the buses and show a location relative position of the buses with respect to that particular bus stand.

campus. A touch screen interactive interface allows the user to retrieve data in the form of
- distance to destination,
- time taken by bus,
- time taken by walking
- bus position (GPS based).

When the user selects a destination by touching, a pop up information box presents information such as distance between locations, and comparison of time between bus traveling time and walking time, along with an approximate calorie value associated with the walk.
Scenario of use
To explain how the system works, let us look at a specific scenario. The user upon interacting with the interface receives information that the bus will take 7 minutes to arrive, and it will take another 16-20 minutes (a total of 23-27 minutes) for her to reach the destination (if she chose to ride the bus). Meanwhile, the walk (a route for which is displayed on the screen) will only take 16-20 minutes.
In such or similar scenarios we found that users reconsidered taking the bus - a simple behavior change that would lead to increased physical activity amongst users of the interface. Moreover using incremental persuasion theory, as this information sets in on a regular basis; we believe that users will increasingly choose to walk smaller distances for which they would otherwise have used a vehicle.

Prototype and User Study
Several prototypes were developed during the course of this project. With each iteration, prototypes were evaluated both for design and functionality. For this paper, we will present the study conducted with the final design prototype.

Prototype
The final design prototype was developed on a tablet PC (substituting for a touch sensitive display) using Flash Action script and HTML code. Data was pulled from an existing database (output in HTML) that used GPS tracking within MSU buses. A sample set of student users were then asked to test the prototype and answer questions post use.

User Study
User study was performed in three steps. Two bus stops in the campus were selected and a total number of 41 users (n=41) were asked to use the interface. The users were then asked to answer a few simple questions. The studies were conducted at two different times at the two different bus stops to control for time or location based biases. We also studied a varied cross section of the student population to control for personal, cultural or health biases. It is important to note here that while obesity is what led to the study, the intervention was designed to increase overall physical activity on campus. Hence our study was conducted with a general student population.

Findings
In our studies we found that 78% of users liked the concept and said that this system will motivate them to walk more within the campus. About 65% of users testing the interface liked the concept of calorie value display while 22% liked the time comparison. Almost all our users liked the concept of real time information regarding the bus position and agreed that it helps the system to work better.

Conclusions
The paper describes a spatial intervention designed for a large University campus to encourage students to increase the amount of physical activity in their lives. Success of the design, from our perspective lies is in the fact that although persuasion is initiated by persuasive elements, actual behavior change is a result of gradual but increasing consciousness of the importance of that change. Because no explicit behavior change is expected from usage and no rewards are accorded to the user for changing
behavior, the interaction is largely dependent on user intention. It is our claim that interfaces (such as the one described) set in social circumstances will persuade people to remain fit and healthy better than singular interfaces disassociated from use or circumstance. We believe this is an important factor that will influence the design of future social systems that use interactive computing as a model for intervention.

Future Work
The project described in this paper is only a work in progress because of the limitations of implementation - a large scale functional module will require the involvement of various departments and synchronization of data. Because actual information about decisions to walk in lieu of taking a bus as well as data about sustained behavior change cannot be ascertained without implemented interfaces, we are working towards an implementation of the design within the MSU campus. The University has quite enthusiastically approved the concept of the design and we are working towards procuring funding for implementation. Critical evaluation of the design has also prompted us to think of interfaces that may be disassociated from public transportation information and based purely on walking data. This is an ongoing project at Mississippi State University’s Design Research & Informatics Lab.

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