Ambient Persuasive Guidance

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ABSTRACT

This study presents solutions for particular problems commuters encounter during the walking phase of their journey in public transport facilities, e.g. the London Underground. Commuters get obstructed or have collisions at bottleneck situations, making their walking inefficient and stressful. The notion presented here is to reinforce existing infrastructures with embedded *ambient persuasive technologies* (APT) acting as *psychological guiding measures* (PGM) to enhance pedestrians' situational awareness. The aim is to provide enhanced feedback to change commuters' behaviour to improve the flow and quality of walking. A set of novel analog and digital design interventions has been developed for various bottleneck situations. This study will yield insight into new forms of interactive, dynamic information to support commuters during the walking parts of their journey using PGM, rather than physical components.

Author Keywords

Ambient Persuasive Technologies, Psychological Guiding Measures, Situational Awareness, Dynamic guidance.

ACM Classification Keywords

H5.m. Information interfaces and presentation: Miscellaneous.

General Terms

Design, Experimentation

INTRODUCTION

London has an estimated population of 7.6 million (2008) [6], and is projected to increase to 8.8 million by 2029 [11]. This number of people imposes a great impact on the operational system of the London Underground.

An insufficient pedestrian flow, as people cause obstructions or evoke collisions, due to architectural or informational reasons, can have an impact on commuters flow and stress level. These areas are called bottlenecks, which together with other delays in the overall journey are trigger points for causing stress and frustration. It makes infrastructure and information design in transport facilities become more important, not just to improve the efficiency, but also the quality of travelling through the setting, i.e. with less stress and more comfort.

THE STUDY

The following study aims to develop *ambient persuasive technologies* [1, 7, 9], i.e. *"interactive computing systems designed to change people's attitudes and behaviors"* [3] embedded into the environment, which act *as psychological guiding measures* [5] for a more effective *self-organisation* by enhancing *situational awareness* [2], to improve the pedestrian flow and the quality of walking.

Psychological Guiding Measures

Helbing argues that, self-organisation means that pedestrian motion forms emergent patterns, which may not lead to optimal flow. Hence, the optimisation of new or modification of existing pedestrian facilities may often be required [5]. For example at a pedestrian crossroad, a roundabout traffic flow behaviour can emerge, which can be improved by placing an object in it's middle – suppressing the more straightforward, but ultimately more collision inducing walking route. Furthermore, in order to prevent unwanted direction changes, and to keep an efficient pedestrian flow *"psychological guiding measures"* (which Helbing only refers to as, an interesting poster to draw people towards it) or railings can be used to initiate the roundabout traffic flow (Figure 1), which according to Helbing can increase the efficiency up to 13% [5].

Rather than modifying the infrastructure, by using railings and other sort of physical objects, this research will focus on the notion of PGM, extending Helbing's vision further. In Helbing's example, an interesting poster is used to induce people to move towards the right side, altering their walking behaviour accordingly. It is assumed that dynamic, interactive cues, designed with the intention to nudge [10] pedestrian's walking behaviour in a subtle way, may produce more *psychological engagement* (i.e. attract attention and affect pedestrian behaviour), than merely using a static, non-interactive 'poster' or signage.
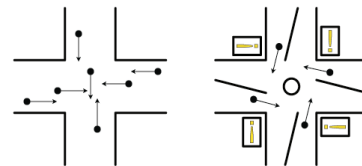

Figure 1. Psychological Guiding Measures illustrated by '!' to initiate roundabout traffic flow.

Intervention 1: Perspective guidance graphics

This is the notion of using perspective or anamorphic graphics, as PGM to assist pedestrians to organise themselves more efficiently at bottlenecks by strategically

placing illusions of physical barriers to change their walking behaviour.

These perspective graphics, although actually flat and static, appear to be dynamic as they morph into different 3D shapes, depending on the viewing angle (Figure 2). They are designed to morph into the intended form right at the moment and place the graphic is needed most. For example, an illusion of 3 triangular divider protruding from the wall, aiming to change commuters' behaviour to walk as close as possible around corners from one side – based on the notion of *cutting corners* [4] – to minimise collision avoidances.

Figure 2. Perspective guidance graphic

Intervention 2: Platform distribution
This APT is concerned with the distribution of commuters on a platform. Data about how many passengers are in the individual train carriages is collected, using video detection and sensors to estimate the capacity of each carriage of the in-coming train. This information will be displayed on the LED screens, currently used on the London Underground to indicate the time of the next arriving train, allowing commuters to distribute themselves on the platform accordingly to where the least crowed carriage will stop.

Intervention 3: Augmented self-organisation
This PGM is concerned with the potential of 'responsive', dynamic information at train doors, for faster boarding and alighting. The notion of responsive graphic is based on the principle of the zoetrope. This is a rotating cylinder with vertical slits and a series of images on its inside, which produce the illusion of motion, when viewed in quick succession through the slits. However, in this study the animation can be seen on a linear display, generated through body movement, rather than a rotating device. The hypothesis is that (H_1) motion displays, which are self-generated through body movement, draw more attention than static graphics. Also, due to its self-generated graphics, (H_2) it provides a certain kind of personal control, i.e. interactivity, which makes it more likely to be accepted and followed as guidance instructions, than static graphics.

Intervention 4: Enhanced Perception
This APT is concerned with the enhanced perception for collision avoidance around narrow corners or walls. It is based on the notion of a hagioscope, which is an architectural wall opening, mainly found in churches, allowing a direct view of the altar, if for example obstructed by a wall. The concept is, that instead of constructing an opening into the structure of a corner, which might affect the stability, two screens with cameras are applied showing the view of the opposite side, giving an illusion of transparency at the edge of the corner.

The aim is to provide people with an enhanced perception of their environment, allowing them to make trajectory changes earlier to avoid potential collisions, which is likely to occur around corners, due to the inherent phenomenon of cutting corners [4].

All experiments are designed to investigate how interactants perceive, comprehend and react on non-verbal signals. All studies will be conducted at the Pedestrian Accessibility and Movement Environment Laboratory (PAMELA), in collaboration with University College London (UCL) [8].

CONCLUSION
The initial study will investigate *Intervention 1,* providing data about the perception, reaction and effects of (analogue) PGM on pedestrian behaviour, which will provide viable data for the subsequent empirical studies of the remaining interventions. This paper yield an initial insight into the development of APT acting as PGM, exploring novel ways to support commuters during the walking stages of their journeys to improve the flow and quality of travelling in public transport facilities without coercion.

ACKNOWLEDGMENTS

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