Ambient Learning Displays
Distributed Mixed Reality Information Mash-ups to support Ubiquitous Learning

Dirk Börner
The adjective ambient is defined as “relating to the immediate surroundings of something” or “relating to or denoting advertising that makes use of sites or objects other than the established media” (Oxford Dictionaries, 2010), while the noun display is among others defined as “a collection of objects arranged for public viewing”, but also as “an electronic device for the visual presentation of data or images” (Oxford Dictionaries, 2010).
Wisneski et al. introduced ambient displays as “new approach to interfacing people with online digital information” (Wisneski et al., 1998). Inspired by Weiser’s vision of ubiquitous computing (Weiser, 1993) the “information is moved off the screen into the physical environment, manifesting itself as subtle changes in form, movement, sound, colour, smell, temperature, or light” (Wisneski et al., 1998).
地上150mまで、
600段の旅を
満喫してくれ！

階段はここから
スタート！
景色を楽しみながら
のぼってね！
だいぶのぼってきたね！
でもまだまだ！
がんばれ～！
ここは地上55m、
ピザの斜塔はこの高さだよ。
ちなみにゴジラの身長も
55mなんだ。

ここまでの消費カロリーは
約24kcalです。

ノッポン弟

ココでやっと半分だ！
最後までいけるのかあ？
そのオカンもう
がんばれよ！

ここまでの消費カロリーは
約35kcalです。

ノッポン兄
だいぶ高くなってきたでしょう。景色をたのしみながらゆっくりのぼってね！

やっとここまできたか。ここはお台場の観覧車と同じ高さだぞ。せっかくだから東京にむかってなにかさけんでみたらどうだ。

ここまでの消費カロリーは約48kcalです。

ここまでの消費カロリーは約62kcalです。
ただいま、地上140mです
ここは地上140m。
クフ王のピラミッドが
この高さだよ。
さあ、展望台はもうすぐそこ！
ラストスパート！
がんばれ！

おつかれさまでした。
消費カロリーは約90kcalです。
(消費カロリーは目安ですのでご了承ください。)

おつかれさま！
よくがんばったね！
このさきで
なかなかやるな。
おつかれさん。
明日はヒザが
笑ってるぞ。

おつかれさま！
よくがんばったね！
このさきで
「のぼり階段認定証」を
プレゼントするよ。
またチャレンジしてね！
ただいま、地上140mです
ここは地上140m。
クフ王のピラミッドが
この高さだよ。
さあ、展望台はもうすぐそこ！
ラストスパート！
がんばれ！
Information
Peripheral
Situated (Context)
Subtle changes
Information
Peripheral
Situated (Context)
Subtle changes

Awareness
Feedback
Motivation
Information
Peripheral
Situated (Context)
Subtle changes
Awareness
Feedback
Motivation
Digital
Context-aware
Various senses

Definition
Ambient Learning Display

>>> Type
Ambient Learning Display

>>> Type

01:00
Hello.Wall  

EyeStop  

Nuage	
Vert

Ambient  
Umbrella

Flower Lamp

Digital Retail

UbiGreen

Power Aware Cord

Orb

BBC
1 Evidence
The radar-equipped sign flashes a car's current speed.
First comes the data—quantifying a behavior and presenting that data back to the individual so they know where they stand. After all, you can’t change what you don’t measure.

2 Relevance
The sign also displays the legal speed limit—most people don’t want to be seen as bad drivers. Data is just digits unless it hits home. Through information design, social context, or some other proxy for meaning, the right incentive will transform rational information into an emotional imperative.

3 Consequences
People are reminded of the downside of speeding, including traffic tickets and the risk of accidents.
Even compelling information is useless unless it ties into some larger goal or purpose. People must have a sense of what to do with the information and any opportunities they will have to act on.
Theoretical Background

State of the Environment

Situational Awareness
- Perceive
- Comprehend
- Project

Decision
Perform
Situational Awareness (Endsley, 2000): “the perception of elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future”
**Situational Awareness (Endsley, 2000):** “the perception of elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future”

**Feedback (Mory, 2004):** research variables of interest are information content and load referred to as complexity, timing, error analysis, learning outcome, and motivation
Ambient Learning Display

>>> Scenario
Ambient Learning Display

>>> Scenario

01:30
A Day Made of Glass 2
Made Possible by Corning
A Day Made of Glass 2
Made Possible by Corning

http://www.youtube.com/watch?v=jZkHpNnXLB0
Pousman and Stasko (2006) introduced a taxonomy for ambient information systems describing four design dimensions [...] **information capacity** is determined by the amount of information represented by the system, **notification level** is the degree of user interruption, **representational fidelity** describes how the data is encoded, and **aesthetic emphasis** reflects the effort put into design and embedding (Pousman & Stasko, 2006).
Ambient Learning Display

>>> Design
Ambient Learning Display

>>> Design

02:00
Energy Awareness Displays
Experiment I: Design Dimensions
Energy Awareness Display

Knowledge \rightarrow Awareness

Attitude \rightarrow Intention

Ambient Information

Consumption/Conservation

Action

Attention

Experiment 1: Design Dimensions
Energy Awareness

Current Usage

Hot Desks

215 W

Total Usage Today

0.91 kWh

Select a room/group or appliance to relate its consumption.

3674 Campus²

548 Chiba²

6.7 Employee²

0.91 Hot Desks¹

¹ Total usage today in kWh.
² Total usage in kWh/day, based on the estimated total energy consumption February 2009 - February 2010, assuming 250 working days.
My energy consumption

Live consumption

Consumption per month

Display design #1
Experiment 3

Level 9

Display design #3
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