UbiComp
Games & Seams
• Ubicomp games

• **Augmented reality**
  - digital information added to the environment around us

• **Mixed reality**
  - any combination
    - e.g. a video screen in a virtual environment showing a TV program or hooked up to a live web cam showing live images of New York
Can You See Me Now?

- Mixed Reality Lab at Nottingham and Blast Theory (an art and design group)
- Online players
- Street players
- Online players used a web applet showing map and avatar. They had to move their avatar to avoid being caught by street players
- Street players used a PDA to see the positions of online players, and had to physically run to that location to catch the online players
CYSMN Equipment

• Street players carried:
  • PDA, showing a map of their location and their target online player's location
  • GPS unit to track their location
  • Camera to take pictures of where they caught online players
20 online players dropped onto a map of Sheffield
Play Techniques

• The best players were those that understood the technology, the ones that knew the weaknesses of GPS

• Understanding a technology is not just about knowing its capabilities, but also about knowing its limitations
GPS Shadows

- GPS, like most ubicomp infrastructure, is not perfect
- The GPS landscape can change from one minute to the next
GPS shadows in Glasgow, at 17:00 and 17:05

Grey shadows show areas where GPS coverage is likely to be poor
• Few technologies...
  • are available 100% of the time
  • perform at 100% efficiency all of the time
• Two solutions, ambiguity and seams...
Ambiguity

- **Ambiguity** as a *resource for design*
  - Ambiguity does not always have to be problematic
  - Ambiguity can be employed to give the user information that reflects the true nature of the information in the system
- It’s better to deliver ambiguous information rather than...
- incorrect information
- no information
- Obviously, not a solution in mission-critical or safety-critical systems
When information just stops it can be frustrating...

When information is incorrect it can be confusing...

Ambiguous information can often be a more appropriate choice...
By impelling people to interpret situations for themselves, it encourages them to start grappling conceptually with systems and their contexts, and thus to establish deeper and more personal relations with the meanings offered by those systems.

Gaver et al., 2003
Ambiguity as a resource for design

- Three types
  - Information ambiguity
  - Context ambiguity
  - Relationship ambiguity
Ambiguity of Information

- Compel people to make sense of a system
  - and through this gain a deeper understanding of the system
- Use imprecise representations to emphasise uncertainty
- Cast doubt on sources to provoke independent assessment
- Over-interpret data to encourage speculation
-Expose inconsistencies to create a space of interpretation
Ambiguity of Information

• GPS is inaccurate and often not available

• Could...
  • Try to ignore this, always display the position as a point on the map, when GPS is lost just show the last known location

• Or...
  • Rather than representing position as a set point on the map, draw attention to a region the user *may* be in
Ambiguity of Context

- Encourages users to approach systems with an open mind
- Implicate incompatible contexts to disrupt preconceptions
- Add incongruous functions to breach existing genres
- Block expected functionality to comment on familiar products
  - e.g. a phone that rings but that you can not answer
  - Sloganbenches...
Ambiguity of Context

- Sloganbenches
- Displayed slogans written by local people on a built-in display
- If you sit on them, you block the display
- So are they seats, or displays?
Ambiguity of Relationship

- Allows users to project their own values onto a design, and thus form a more personal relationship with the object or system
- Offer unaccustomed roles to encourage imagination
- Point out things without explaining why
- Introduce disturbing side effects to question responsibility
- History Tablecloth
  - Shows where items have been left over time
Ambiguity as a virtue

• NOT an excuse for poor design
• NOT an excuse for creating unaccountable systems
• But if ambiguity is applied in a thoughtful manner, it can create more engaging and thought-provoking systems
Seamful Design

- A seam is break, gap, or ‘loss in translation’ in a number of tools or media, designed for use together as a uniformly and unproblematically experienced whole

- Through revealing the seams - the limits and failings in the infrastructure - users can better understand the infrastructure

- Realise where problems are

- Understand how to workaround or overcome the problems
Phone Cells

• A phone that did not reveal signal strength information would be confusing (not accountable) when you could not make a call

• By revealing this infrastructure information users can better understand and work around the problem

• e.g. move to a high signal strength area before making an important call
Treasure Technology

- Players carry a GPS unit and PDA with 802.11 capabilities
- The GPS unit continually tracks the user’s position
- The PDA continually scans for, and samples, 802.11 networks and signal strength
- The PDA displays the game interface to the user, and the user can use this to pick up coins, upload coins for points, and steal coins from other players
Treasure

• A seamful game

• Players collect ‘coins’ that are dropped randomly into the world (both in network areas and outside)

• Players can ‘pick-pocket’ from one another whilst in network coverage to steal coins

• Uploading coins to gain points is not completely reliable, players should ensure they are in an area with good network strength to ensure their coins are not lost

• Players double their points if they upload coins simultaneously with a team-mate (this encourages collaboration)
Game play

• Team-mates who work together to ensure they upload their coins at the same time gain double points

• Players can ‘pick-pocket’ from opponents by moving close to an opponent while in network coverage and clicking a ‘pick-pocket’ button

• The game could be played at any location where there was 802.11 infrastructure networks
Team-mates collaborate to find network connections

Players pickpocket from opponents, then run away
Player hides behind tree while pickpocketing opponent

Player openly follows opponents whilst attempting to pickpocket
Treasure’s Seams

• Lack of network coverage is no longer a problem, it is an integral part of the game

• There are advantages in being in network coverage and in being outside coverage
  • When in network coverage players learn about new coins, and can upload coins for points
  • When outside network coverage players are safe from pick-pocket attacks, and can continue to collect coins
• Players learned that GPS was not completely accurate. They used this knowledge to both hide from others whilst in network range (e.g. under trees) and to improve positioning...

• One player attached their GPS antennae to a metal fence to increase the reception, gain an accurate location, and collect nearby coins

• By employing seamful design, an issue that is normally problematic (not having wireless coverage) can be made into a positive and useful element within the system
Players become aware of the seams

• Simply taking part in the game makes players aware of where 802.11 coverage in the area can be found

• As coins can be lost if uploaded in areas with weak signal strength, players learn where the strongest signals are

• Players learn the underlying characteristics of 802.11 and GPS, and how they can use these to their advantage

• Lack of network coverage is no longer a problem that halts the system, it is an integral part of the game
Games with by-products

• Whilst ubicomp games can be fun, they can also generate useful information

• As users run around playing the game their positions and the signal strength to their wireless cards are recorded

• Similar to the pollution monitoring we saw in a previous lecture

• After the game this information can be used to create a map of wireless signal strength
802.11 signal strength around the university
Seamful Design

- Developers’ normal inclinations are to hide the seams, and attempt to create systems that work “seamlessly”
- but often this does not work
- Problems in the infrastructure do not have to always lead to poor performance, system lockups, or other problems
- By revealing the characteristics of the underlying infrastructure, users will better understand it, and be able to work around problems when they occur
- Treasure demonstrated seams in hardware infrastructure, but seams can occur in data too...
Feeding Yoshi

- Players can find creatures called Yoshis dispersed all over the city
- Yoshis are always hungry for fruit
- Yoshis give out seeds for their favourite fruits
- Players can walk around to find plantations, where they can seed and grow fruit
- Players pick the grown fruit at plantations, and feed the fruit to Yoshis
- Players can trade fruit with other players
Yoshi Technical Details

• Actually...

• Yoshis and plantations are in fact access points. Unsecure APs are Yoshis, whilst secure APs are plantations

• The client device continually scans for access points

• The unique MAC address of each access point is used as seed to generate a pseudo-random number. This is then used to pick a name for the Yoshi or plantation from a large list of possible names
Yoshi Interface

A Yoshi whose favourite fruit is melon

Map showing plantation and Yoshi locations, as well as unexplored areas (question marks)
• Ubicomp games are not generally played over one long session (i.e. they are not like traditional computer games where you sit in front of a computer screen for hours)

• Ubicomp games can be designed to be played throughout the day. At different locations, different times, and with different players

• Design support for short game sessions as well as long

• Support as many locations as possible

• Support enjoyable collaboration with team-mates, and fun interaction with opponents in the P2P environment

• Ubicomp games can be played throughout the day, fitting with patterns of everyday life...
Maximum time spent playing the game in one session

Daily average of game sessions per player
• No data transmitted over detected 802.11 access points

• due to legal grey area

• When users scored points they were given a “voucher code” that could be redeemed on a website to add to the player’s score
Yoshi Seams

- Players become aware of where access points are, and whether or not they are secure
- Different players saw the same Yoshi and plantation names, and the Yoshis would have the same favourite on all devices
- However, data about what was planted at each plantation, and what fruit a Yoshi currently wanted was not shared
- These inconsistencies in data were easily visible to, and understood by, players
- By understanding these data seams, players could deliberately exploit them to work collaboratively to gain more points...
• Team members deliberately seeded different fruits at the same plantation.

• This allowed them to travel together but pick up different fruits along the same route.

• By carrying different fruits it was more likely they could satisfy more of a Yoshi’s desires simultaneously, and gain more points.
Seamful Design

• Take advantage of errors, gaps, limits, differences, translations

• In communications, positioning, user models, task models, system structure

• Selectively showing variation, imprecision, disconnection, categorisation, ownership, cost, past use...

• Accepting that these are essential characteristics of systems’ use

• Design to support users’ perception, adaptation, appropriation...

• Helping people find their way to use our systems
Summary

- UbiComp games
- Ambiguity as a resource for design
- Seamful design
- Ambiguous != Seamful
- Read the ‘Gaming on the Edge’ paper (Chalmers, 2005)
  - particularly the parts on seams
- Matthew will be taking lectures from Monday. I’ll be back for labs and workshops
- Have you used Visual Studio before?
References

