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# Seamful Design for Location-Based Mobile Games

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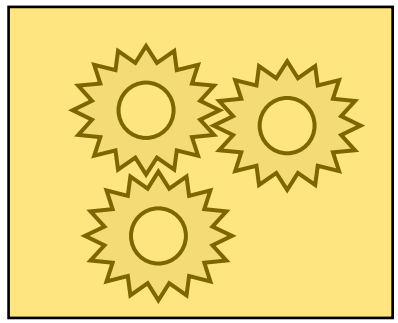
# Ubiquitous Computing and Seamlessness

- Seamless Design as the ruling design paradigm for ubicomp systems
- Seamless integration of different components into a system infrastructure
- Knitting different components tightly together, hiding their heterogeneity and complexity
- Goal: Seamless interaction with components through the seamless entity of the system

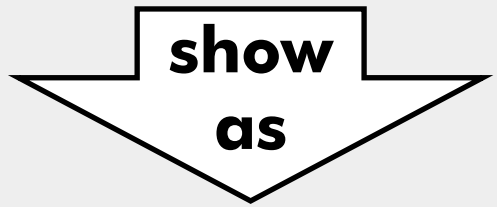


# Seams and Seamfulness

- Reality: systems and infrastructures have technical limitations
- Seams as deviations from notions of seamless, continuity and uniformity
- Discontinuity in technology and interaction
- Users recognize seams during interaction with a system

Inaccuracies in sensing and positioning, patchy network coverage, delays, ...

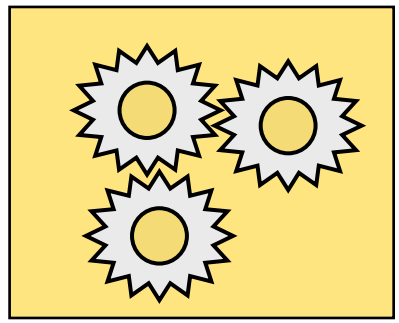

**Seams**




Uncertainties, Ambiguities, Inconsistencies

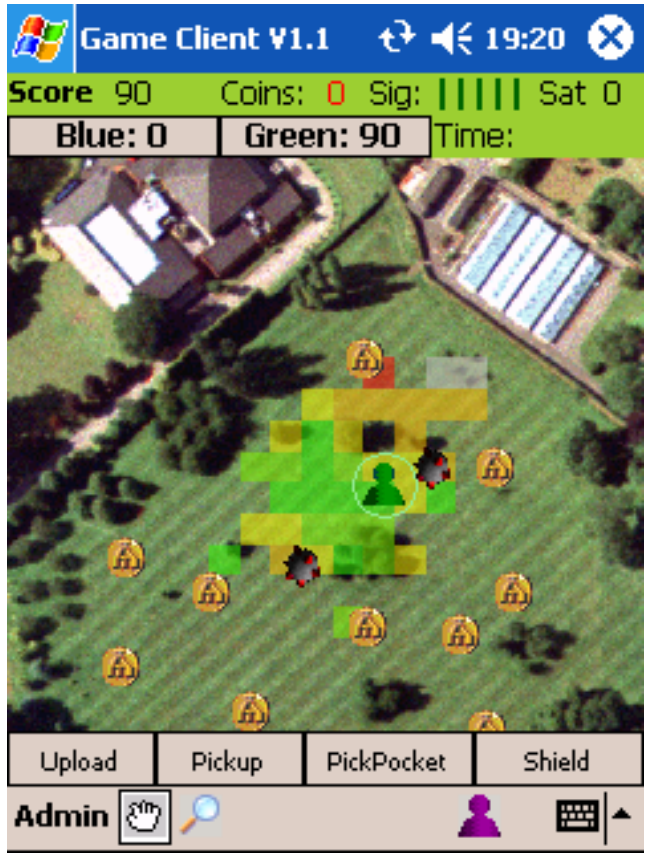
# Seamful Design

- Mark Weiser: Seamful systems with beautiful seams
- Goal: seamless interaction with seamful systems and their individual components
- Revealing seams in technology and interaction
- Presenting and exploiting them as a resource for better usability, gameplay or interaction design
- Design for appropriation



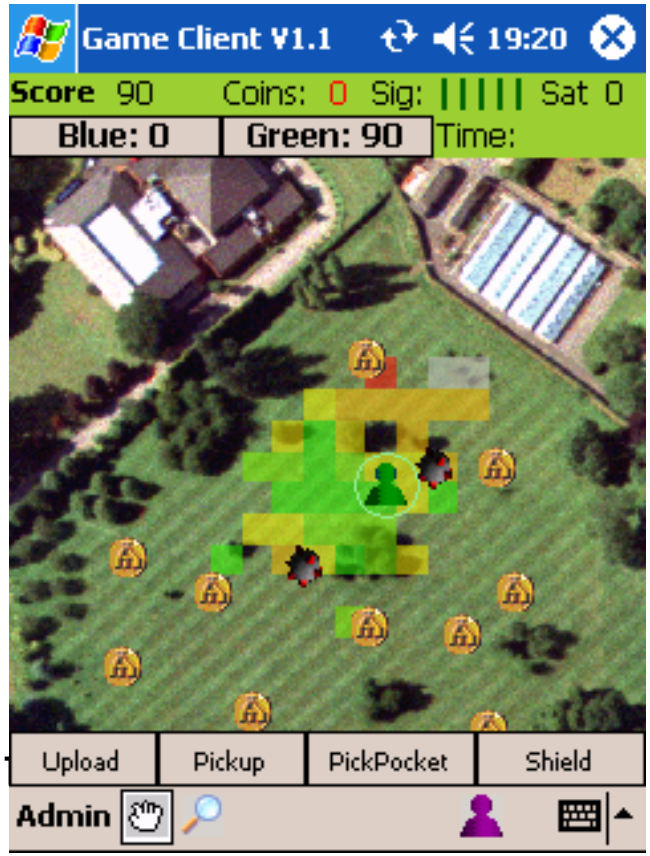
# Treasure (aka Bill): A mobile seamful game (1)

- Developed by Matthew Chalmers et al. in Glasgow
- Players with PDAs collect coins via GPS-positioning
- Uploading coins to the game server for credits in WiFi network covered areas
- Players build a shared map of WiFi coverage and signal strength



# Treasure (aka Bill): A mobile seamful game (2)

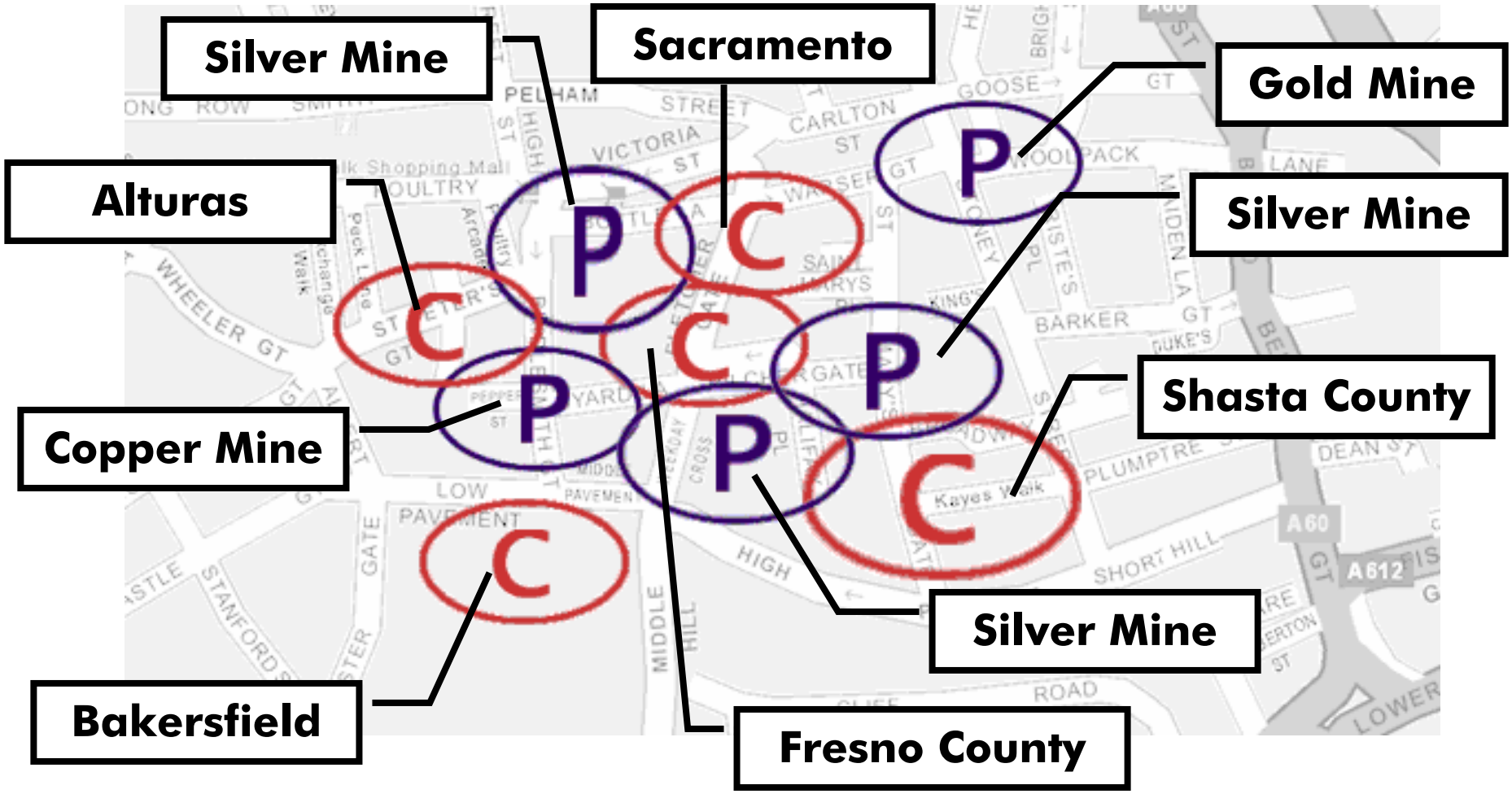
- Coverage map as helpful feature of the interface
- Revealing, presenting and exploiting seams in patchy WiFi coverage and inaccurate GPS-positioning
- Understanding the seams helps winning the game
- Players develop specialized tactics based on knowledge about seams



# Introducing Tycoon

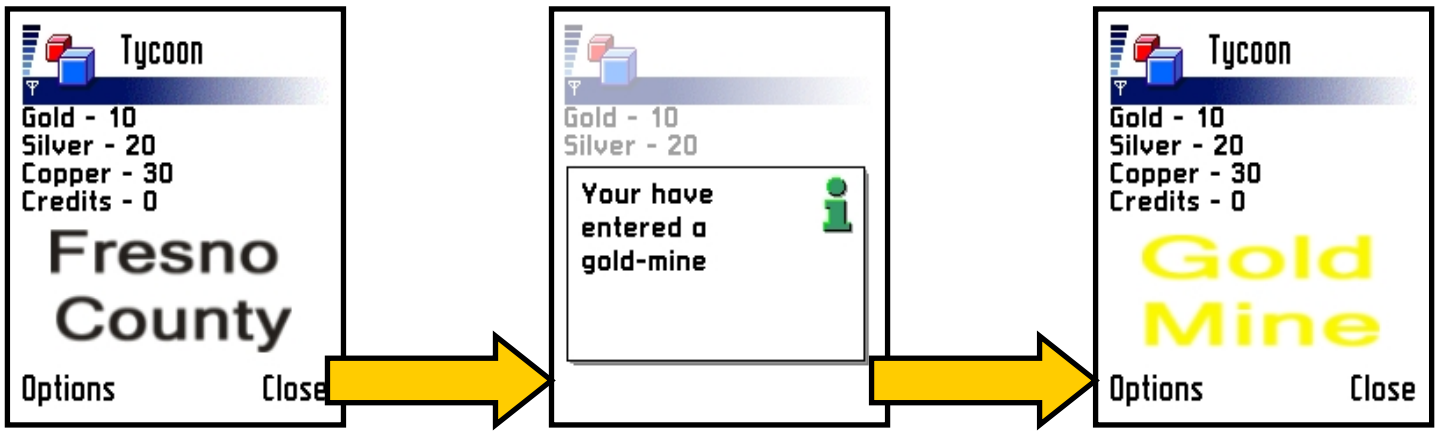
- Location-based consumer-producer trading-game for Series 60 mobile phones
- Consumers and producers mapped to GSM-cells
- Wildwest-scenario set in California
- Players collect local resources (gold, silver, copper) from mines (producers)
- Players use those to claim unique global objects (buildings, estate) from brokers (consumers)
- Players get credits for claiming global objects
- Game finishes after all global objects have been claimed; player with most credits wins

# Gaming Area


Silver Mine
Sacramento
Gold Mine
Alturas
Silver Mine
Shasta County
Copper Mine
Silver Mine
Bakersfield
Fresno County
P
C
PELHAM STREET
VICTORIA ST
CARLTON ST
GOOSE GT
WOOLPACK LANE
BARKER GT
WHEELER GT
LOW PAVEMENT
HIGH
PLUMPTRE
SHORT HILL
DEAN ST
A60
A612
MIDDLE HILL
ROAD

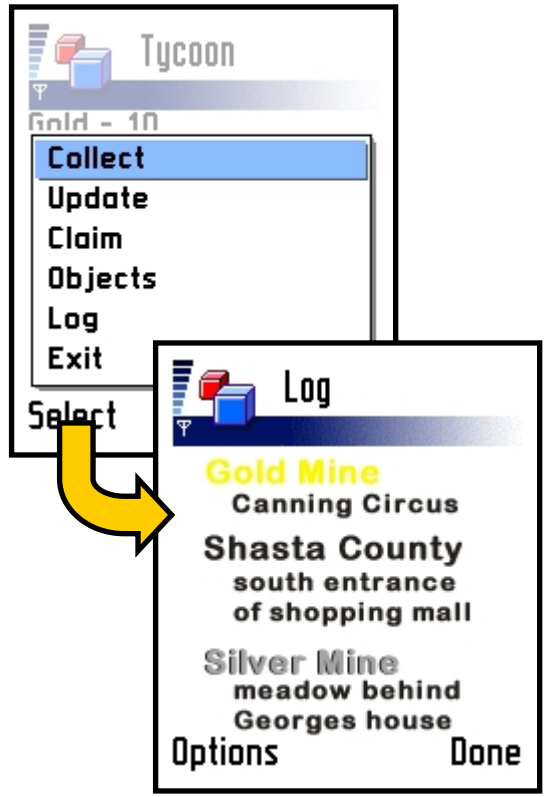
# Navigation

- Main screen shows amount of local resources, credits and the current cell
- Changing cells triggers a notification
- Interaction depends on location (collecting only in mines, claiming only in broker-cells)



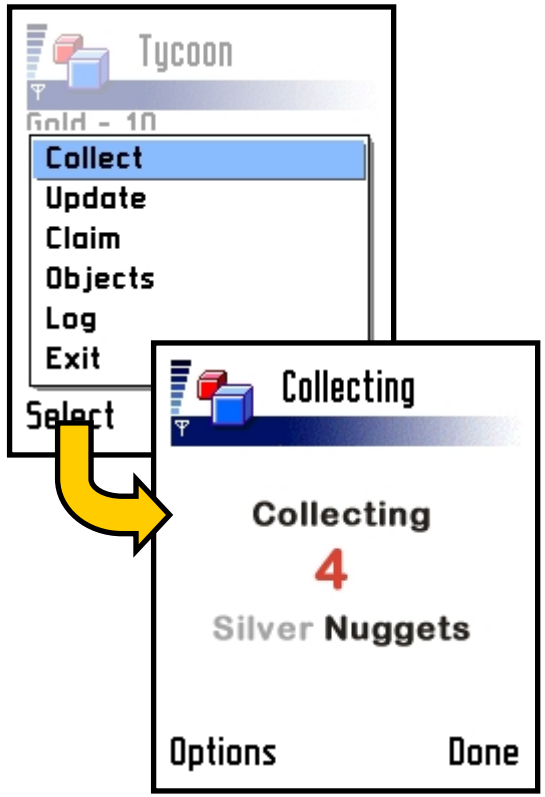
# Logging

- Players explore the gaming area and build a knowledge of the cells‘ positions
- Players can individually log where they found which cells
- Tycoon automatically logs the current cell, player adds a description of the current location
- Provides orientation, „substitute“ for map of gaming area



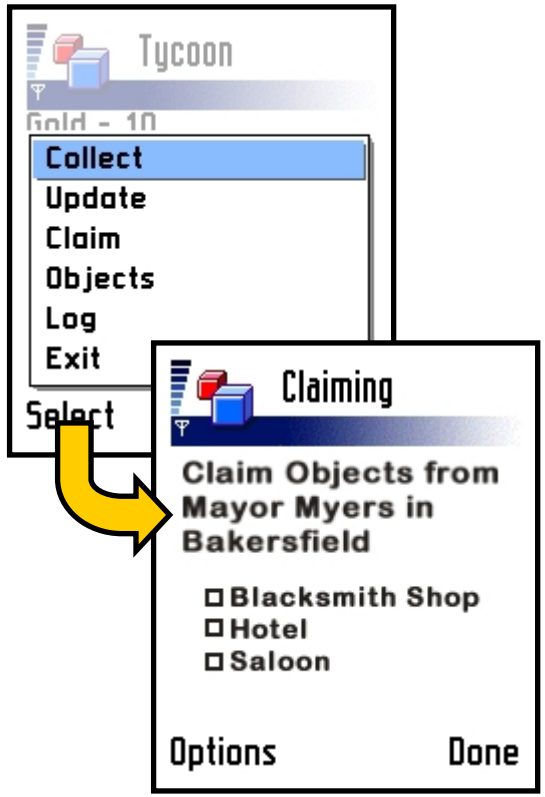
# Collecting local resources

- Each mine produces 1 of 3 unlimited local resources (gold, silver, copper)
- Players collect them independently by spending time in a mine-cell
- Collecting is done locally without the game-server‘s knowledge



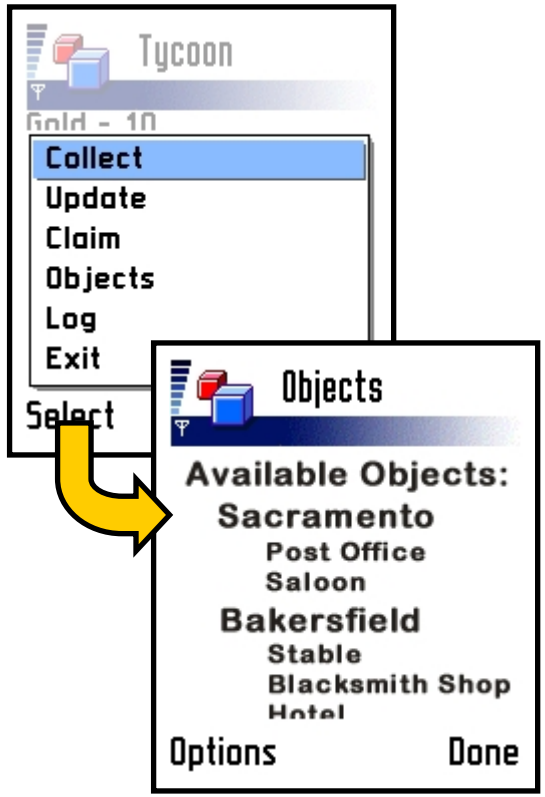
# Claiming global objects

- Each broker „governs“ a broker-cell and a list of global objects (buildings, estate) in it
- Global object: unique, price (in local resources) and value (in credits)
- Game-server maintains availability of objects as the global game-state
- Player gets credits by entering a broker-cell and claiming / buying one or several objects



# Updating

- Each player starts with a list of all brokers
- discovery of a broker reveals his initial list of global objects
- List is updated for single brokers after claiming from him
- Player can request general updates from game-server for all brokers he has found
- Update anytime, anywhere; charge



# Game Concept and Design Implications

- Competitive, pervasive multiplayer game
- Players share a common global game-state with each other via the game-server
- Seamless approach: synchronisation between local clients and game-server upon changes of the global game-state
- No inconsistencies between local and global game-states
- Lots of expensive  and unreliable GPRS-traffic

# Seams in Tycoon

- Expensive internet-connections: high fees for GPRS-connections; necessary for synchronising with the server‘s global game-state
- Data-inconsistencies: players see different subsets of available objects; inconsistencies between global game-state and its local copies
- Dynamic cell-coverage: players can‘t see „moving“ boundaries between cells

# Issues of Seamful Design

- Alerts and logs improve visualisation of cells‘ boundaries and propagation
- Allows exploitation of effects like flipping cells
- Emphasis on offline-play; incentives for bigger gaps between internet-connections
- Discount for successfully claiming several objects at the same time
- Credit-per-second-ratio rises when collecting resources for more valuable objects
- Gambling approach: more time offline, greater risk of inconsistencies, more profit possible

# Design for Appropriation

- Presentation of seams offers help for efficient collecting and claiming, but possibly harbour inconsistent data
- Players have to balance the chance of earning more credits during the same time against the probability of inconsistencies
- Players can appropriate individual strategies to play the game

# Conclusion

- Seamful design as a new approach to designing ubicomp systems
- Revealing, incorporating and exploiting seams as features of gameplay and interaction
- Tycoon-prototype is finished; user-evalution planned in Nottingham

## Questions?

Questions?

Thank you!