

# CS 581: Database Management Systems

Pervasive Computing & Knowledge Work  
Wearable Computing  
Location-Dependent Information Services  
(LDIS)

## Pervasive Computing & Knowledge Work

- Why: To increase access to data and computing – anytime & anyplace
- How: Mobile computing and embedded devices

## What are knowledge workers?

- Perform tasks which are inherently cognitive rather than physical
- Valuable to organizations because of their knowledge and their ability to apply it
- Examples: Programmers, doctors, lawyers, teachers, graduate students (?)
- Can benefit enormously from pervasive computing

## Benefits of Pervasive Computing for Knowledge Work

- Enhanced communications, coordination, collaboration, and knowledge exchange
- No time and space constraints
- Unlimited access to critical decision makers
- Enhanced ability to process rich streams of data about the organization and its environment

## Dangers of Pervasive Computing for Knowledge Work

- Decreased ability to focus attention (excessive interruptions)
- Weakened boundary between work & personal life
- Decreased decision-making ability from glut of information
- Illusion of control

## Maximizing the Benefits & Minimizing the Dangers

- Increase ability of workers to self-manage themselves
  - Systems that assist personnel with self-management
  - Training provided by those who know how to work productively in a high-access, high-interruption environment

*continued...*

## Maximizing the Benefits & Minimizing the Dangers

- Establish appropriate boundaries
  - Loosen organizational boundaries
  - Strengthen work/personal boundaries
- System development must be a collaborative process in which users participate

## Wearable Computing

- Wearable computing faces the same basic challenge as traditional HCI – “to use advances in technology to preserve human attention and to avoid information saturation”.
- Combined with pervasive computing, wearable computers will “provide access to the right information at the right place at the right time”.

## Context-Awareness

- Context-awareness is necessary for pervasive/wearable computing to minimize distraction.
- Two fundamental components:
  - Spatial awareness
  - Temporal awareness

## Some Design Considerations for Wearable Computers

- Placement
- Human Movement
- Size variations
- Weight
- Accessibility
- Thermal
- Aesthetics

## Future Challenges

- User interface metaphors
- Input/output devices
- Quick interface evaluation methodologies
- Avoid unnecessary functionality
- Social and cognitive models of applications

## Location-Dependent Information Services (LDIS)

- Important class of context-aware applications
- Greatest potential in pervasive computing environment
- Examples: Traffic reports, news, navigation, finding nearest restaurant

## What makes LDIS challenging?

- Mobile environment constraints
- Spatial property of queries
- User movement

## LDIS Terminology

- Location model
  - Geometric vs. Symbolic
- Query Type
  - Local vs. Nonlocal
  - Simple vs. General
- Valid scope

## On-demand Access: Research Issues

- Data placement
- Data replication
- Query Scheduling
- Indexing

## Broadcast Access: Research Issues

- Indexing on air
- Broadcasting strategies



## Data caching: Research Issues

- Location-dependent cache invalidation
- Cache replacement
  - Data distance
  - Valid scope area
- Data prefetching

## Conclusion

- There will be dramatic effects on knowledge work – both good and bad
- Wearable computers are cool, but really hard to pull off
- There are a lot of open research issues that need to be addressed before we get there