Lecture 1&2

Introduction to Mobile Computing

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REFERENCE

"MOBILE COMPUTING PRINCIPLES, DESIGNING AND DEVELOPING MOBILE APPLICATIONS WITH UML AND XML", REZA B'FAR

Contents

Introduction

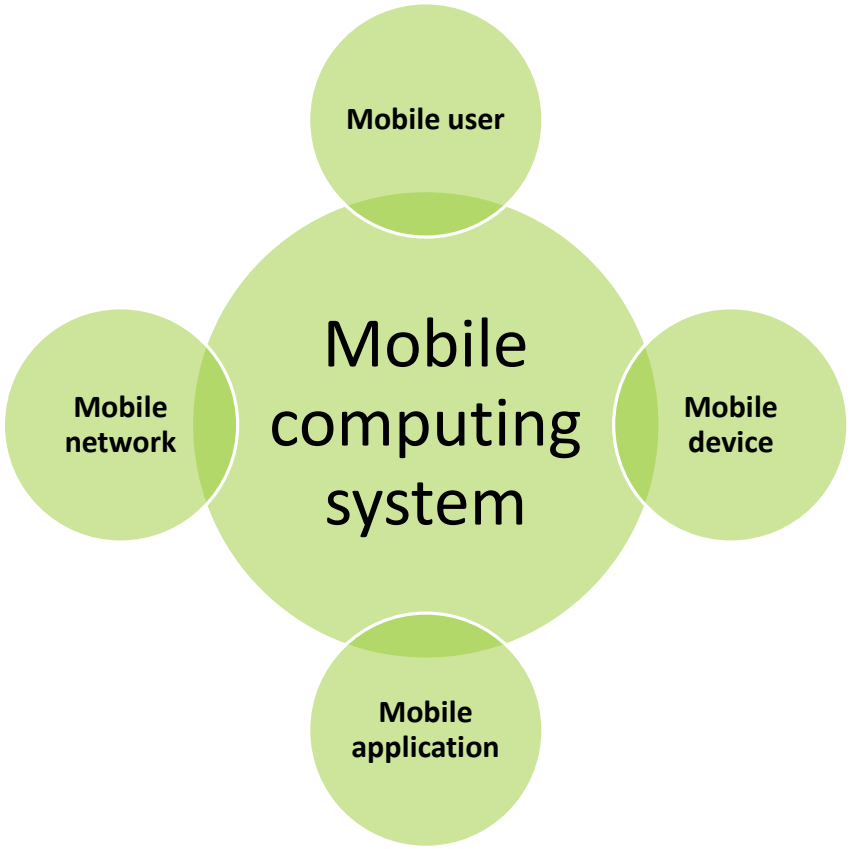
Mobile computing systems are computing systems that may be easily moved physically

and whose computing capabilities may be used while they are being moved

Examples :

laptops, personal digital assistants (PDAs), and mobile phones

Mobile App. Puzzle



Why mobile computing?

Mobile computing system can do set of properties a stationary computing system can't do

mobility includes:

- moving between different geographical locations
- moving between different networks
- moving between different applications

Advantages of mobile computing systems:

Prevalent wireless network connectivity

Small size

The mobility nature of their use

Power sources

Their functionalities that are particularly suited to the mobile user.

Brief History

Brief History

	<2000BC	2000BC-1800AD	1800s	1900-1940	1940-1960	1960s	1970s	1980s	1990s	2000s	>2010
Computing	Tally Stick, Abacus	Slide Rules	Mechanical & Analogue computers		Transistors, integrated circuit	Gemini & Apollo missions	Intel 4004, Portable calculator	PC, Laptops ARM,	NewsPad WebPad Newton	Nokia 770	iPad Kindle Nook
User Interface			QWERTY		Batch interface	OS/360, CP/M	touch screens	GUI, MAC OS	Symbian	IOS	Android
Display			RGB Photography	CRT & Television	colour tv			CGA, EGA, VGA, LCD TV			Google Glass
Comms		Optical telegraph	electrical telegraph, mechanical fax	walkie-talkie, commerical radio	bell/motorola car phone, Sputnik	ARPANET	Invention of Mobile Phone	1G, Commercial Cell Phones, Motorola, Nokia	2G & 3G, WIFI, Blackberry phones	4G, iPhone	
Storage		Punch cards		Magnetic drum	Selectron Magnetic tape IBM Model 350		Floppy disk	CD	ZIP DVD MMC	SD Card Blueray	
Battery		Leyden Jar	Battery				Lithium-ion battery				

Is wireless mobile ?

Or

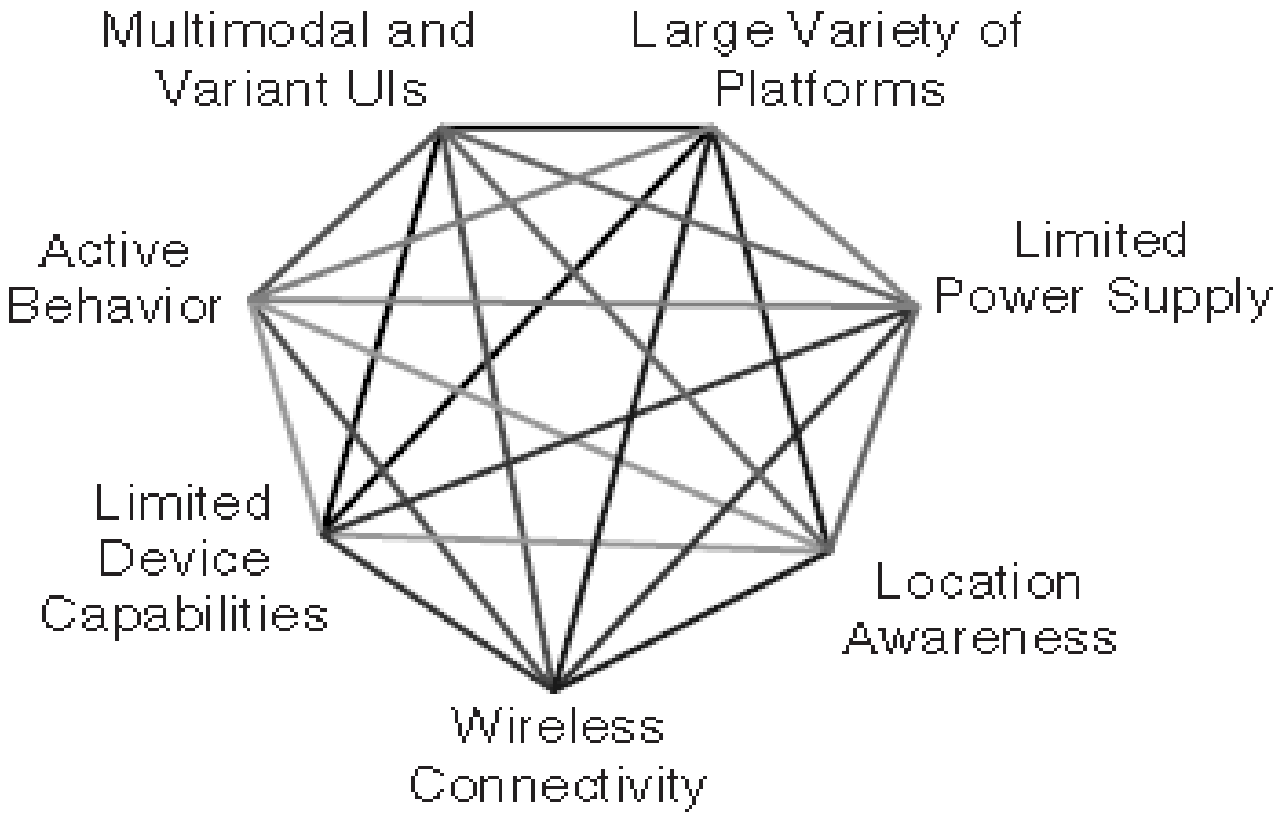
Is mobile wireless ?

2- Dimensions of mobility

dimensions of mobility **are** the tools that allow us to qualify our problem of building mobile software applications and mobile computing systems.

- Dimensions of mobility are not completely orthogonal with respect to each other.
- Some of these dimensions are limitations

continued


Multimodal and Variant UIs
Large Variety of Platforms
Active Behavior
Limited Power Supply
Limited Device Capabilities
Location Awareness
Wireless Connectivity

2.1 Location awareness

acquiring position information requires connectivity to some network-based infrastructure.

- *localization*
- *location sensitivity*

challenges and opportunities

continued

Methods for collecting and using the location of the user and the device

user may simply be prompted for his or her location (user unfriendly)

Location-sensing technology

- ✓ *Triangulation*
- ✓ *proximity*
- ✓ *scene analysis*

continued

Triangulation

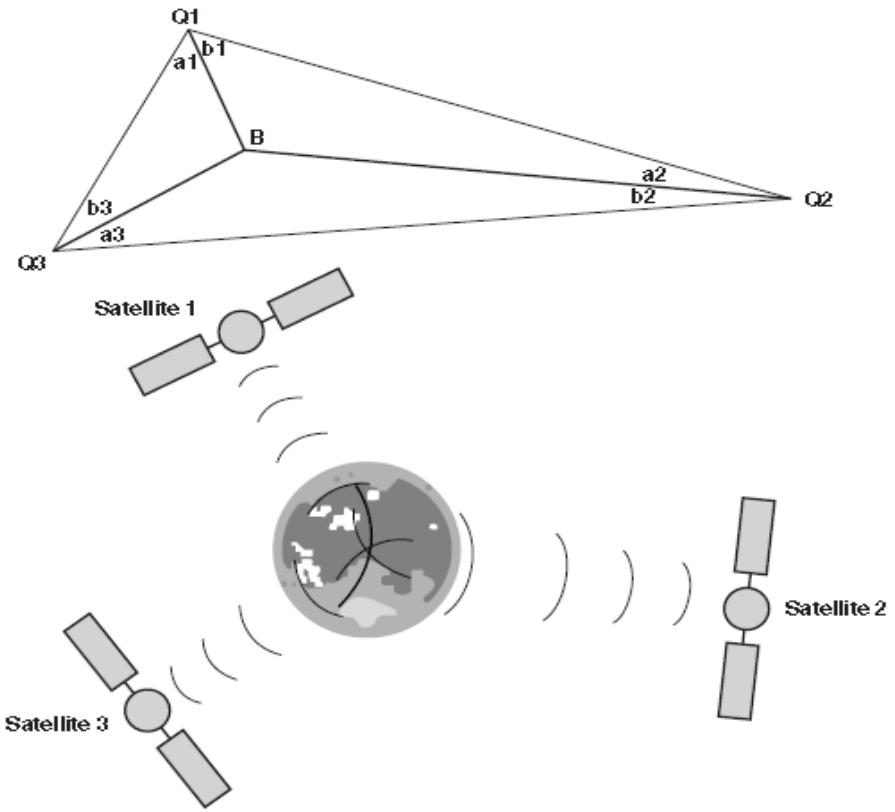


FIGURE 1.4. Determining Position Based on Triangulation.

continued

***Proximity*-based methods** measure the relative position of the unknown point to some known point.

Scene analysis method relies on image processing and topographical techniques to calculate the location of the unknown point based on a view of the unknown point from a known point

2.2 Quality of Service (QoS)

Moving from one physical location to another may cause some disconnected time from the network

The quality and type of the available network connectivity can significantly affect QoS

network connectivity and QOS need to be taken into account while designing a mobile application

continued

QoS:

Available bandwidth

Probability of connectivity

Statistical traffic measurements

continued

All mobile applications should know how to stop working when the application suddenly

disconnects from the network and then

resume working when it connects again

QoS is provided by the network operator.

Designing applications should dynamically adapt their features and functionality to the available bandwidth

2.3 Limited Device Storage and CPU

Size and Portability

&

Size and performance

continued

Smaller physical size limitation imposes boundaries on volatile storage, nonvolatile

storage, and CPU on mobile devices

when it comes to mobile systems and devices, *smaller is nearly always better*.

2.4 Limited Power Supply

The power supply has a direct or an indirect effect on everything in a mobile device.

Challenges:

- Battery life
- Mobility effect on battery life
- Connectivity effect on battery life
- Battery management
  - OS or App job?

continued

Platforms should provide:

monitoring of the remaining power and other related power information.

allow multiprocessing and multithreading

which have an effect on the control over the variation of the CPU activity, which in turn has an effect on the control over the power consumed by the device.

2.5 Varying User Interfaces

Stationary application users have more efficient user interface capabilities than mobile application users

Multichannel systems

This is not true for all application

The challenge is how to choose the best UI for the context

continued

User interfaces are difficult to design and implement for the following reasons:

1. Designers have difficulties learning the user's tasks.

2. The tasks and domains are complex.

3. A balance must be achieved among the many different design aspects.

4. The existing theories and guidelines are not sufficient.

5. Iterative design is difficult.

6. There are real-time requirements for handling input events.

7. It is difficult to test user interface software.

8. Today's languages do not provide support for user interfaces.

9. Programmers report an added difficulty of modularization of user interface software.

2.6 Platform Proliferation

Due to commercial competence in the world of mobile devices, every manufacture has his own platform proliferation (android vs ios)

It affects the device supported-applications

Platform proliferation heighten the importance of designing and developing mobile devices independent of the platforms

UML based design

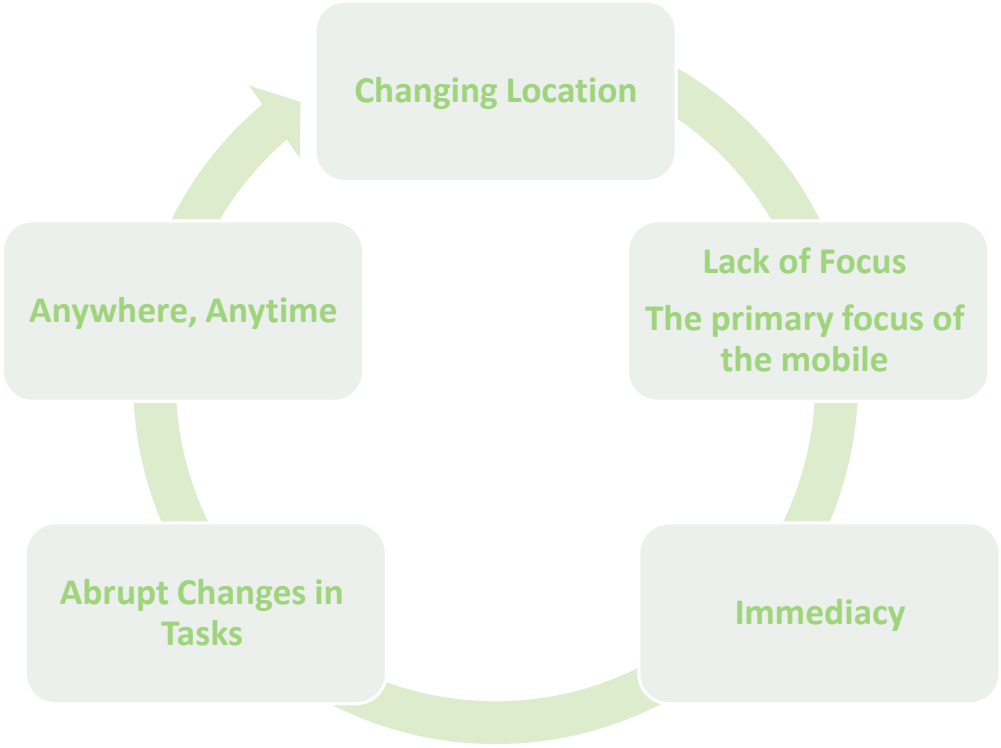
2.7 Active Transactions

Passive transaction

Active transaction

- ✓ synchronous
- ✓ asynchronous

3- CONDITION OF THE MOBILE USER



4- ARCHITECTURE OF MOBILE SOFTWARE APPLICATIONS

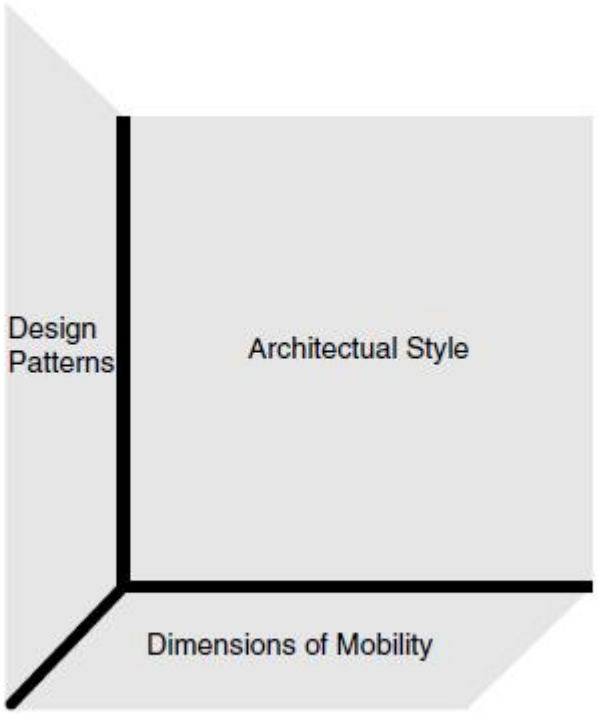


FIGURE 1.6. Mobile Application Development Design Consideration Space.

Thanks- Questions !