

CMSC436: Programming Handheld Systems

Handheld Systems & Their Applications

Some Statistics

More people own handheld devices than own toothbrushes

10+x more phones than PCs sold each year

More people access Internet via phone than via PC

Viewpoint #1

Handheld Device = Small Computer

Computers keep getting faster, lighter, cheaper & more powerful

Handheld devices are just another point in this evolution

1960's : Mainframes



1970's : Minicomputers



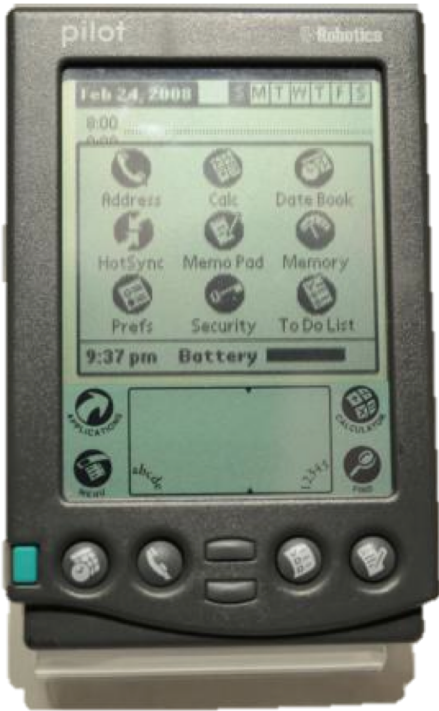
1980's : PCs



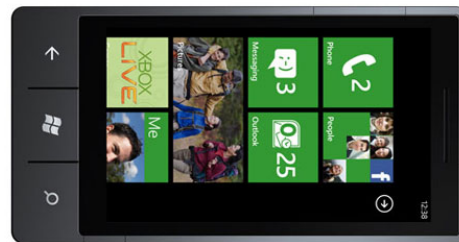
Early-1990's : Laptops



Mid-1990's : PDA's



Today: Smartphones & Tablets



Tomorrow?



Power



Mainframe



Mini-computer



Personal Computer



Notebook
Computer



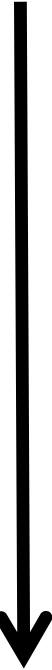
PDA



phone/ Tablet



Size



But...

Handheld Device Characteristics

Small, portable, battery-powered

Accept touch, audio, light & radio input

Sensor-enabled

Location, direction, motion, light & proximity

Characteristics

Networked

WiFi, cellular & bluetooth

Truly personal

Rarely shared (even among family members)

One study reported that 7/10 people sleep with their phone within arm's reach

Challenges

Limited resources

CPU, memory, battery, I/O bandwidth

Limited screen space & varied form factors

Diverse context of use

Different activities & usage patterns

Limited user attention

Limited Screen Space

Traditional webpages are designed for large screens

On mobile device displays operations are more difficult

Hard to select small objects

Typing is slow & difficult

May need to spread content over multiple screens



Summary Thumbnails
[Lam et al., 2005]

Diverse Usage Context

Specialized vs. general



Indoor vs. outdoor settings

Light & climate

Private vs. public settings

Different Usage Patterns

Handhelds do different things in different ways

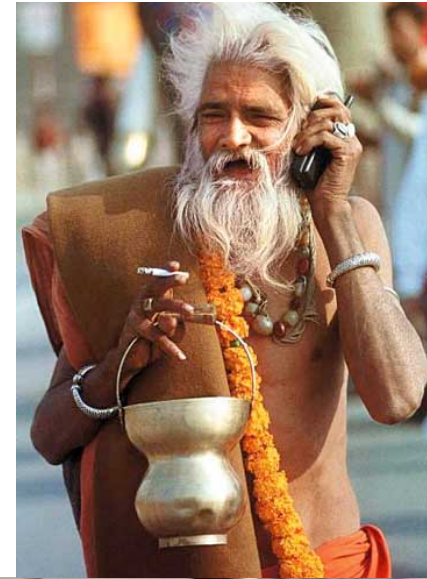
Highly context-dependent

Bursty usage patterns –
lasting seconds to minutes



Limited Attention

Mobile usage implies multi-tasking
Apps compete for limited mental & physical resources



Summary

Handheld devices are *just* computers, but...

They are resource-challenged, portable, networked, sensor-enabled, & truly personal

Their apps must be designed for:

Limited resources, unreliable networks, less than ideal usage environments, Privacy & security concerns

Next Time

Introduction to the Android Platform