Lessons from Field Trials with Windows Mobile Pocket PC Phones

Ahmad Rahmati and Lin Zhong

Rice Efficient Computing Group (recg.org)
Dept. of Electrical & Computer Engineering
Rice University, Houston, TX
Mobile phones in field studies

- Human behavior studies
  - Phones are carried throughout our lives
- Data collection
  - Phones are sensitive
- Usability evaluation
  - Phones themselves are subjects of research
Our field trials

- T-Mobile MDA and SDA
  - Windows Mobile 5
  - Bluetooth/Wi-Fi/GPRS/EDGE
- User behavior studies
  - How do mobile users carry phones? (accelerometer)
  - How do mobile users charge phones? (Collaboration with Corner and Rollins)
- Data collection
  - Network condition
- Usability evaluation of T-Mobile MDA
  - Pecan Park Project (Collaboration with Knightly)
Phone instrumentation

- **Software**
  - Loggers that run in the background
    - Information regarding networks and battery
  - Event-driven *in situ* survey
    - Ask questions when charging status changes

- **Hardware**
  - Install sensor boards to log motion
Software

- Windows Mobile is supposed to support many desirable features
  - OEM does not necessarily cooperate
- Windows Mobile API more intended for application developers, instead of hackers (instrumentation): multiple barriers before accessing lower-level services
- Battery lifetime impact
  - Need >12 hours for a good experience of participation
Example: Internet connectivity

- An early version of the ROM (ROM 1.x) does not allow turning on/off Wi-Fi interface through software.

- If Wi-Fi/USB is connected, no DATA or connection for GPRS/EDGE.
Example: Event-driven mechanism

- *In situ* survey triggered by recharging
- Windows CE in theory
  - UserNotificationTrigger
  - CeSetUserNotificationEx
  - CeRunAppAtEvent
  - NOTIFICATION_EVENT_ON_AC_POWER
  - NOTIFICATION_EVENT_OFF_AC_POWER
- Didn’t work on HTC wizard
  - End up polling
Hardware

- Minimize physical changes to the device
  - Solution: Bluetooth-based extension
  - Downside
    - Significantly reduced battery
    - Stability (bugs in Microsoft Bluetooth stack and our code)
  - Tricks: error correction, auto start upon reboot
Hardware (Contd.)

☐ Alternative solutions
  ▪ Hack the mini-USB port
    □ Physical change
  ▪ Develop sensor board with a mini SD interface and form factor
    □ $$$$
Dealing with human subjects: Recruiting

- Start early with Internal Review Board (IRB) approval
- GSM phones leverage subjects’ own plans
- Provide phones of multiple form factors
Dealing with human subjects: to begin with

- Subjects do not necessarily read manuals
  - A technical workshop
  - Can take weeks to converge
- Make sure they have realistic expectations
  - Battery lifetime
  - Single-handed operation
- Provide all necessary accessories
  - Holder/Holster for phones
Dealing with human subjects: keep on going

- Make sure the logger is running
  - Automatic data report
  - Auto restart
- Make sure subjects are happy
  - Periodical email/personal inquiries
  - Be available to answer their questions
- Provide incentive
  - In situ survey
The challenge of field trial

- Handy prototypes do NOT work
  - New ideas, particularly hardware ones, are difficult to validate
What we would like to have

- Open systems
  - Software
    - Device drivers and API
  - Hardware
    - Specification of I/O interfaces
    - Extensible hardware to incorporate new hardware without much form factor change

- It is not (only) Microsoft but the OEMs
Source code for tools and collected data will be released later this month

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