The Smart-its Platform for Embedded Context-Aware Systems

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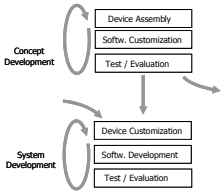
Overview

- Introduction
- DIY Smart-its
- Particle Smart-its
- Application Examples
- Further Work
- Conclusion

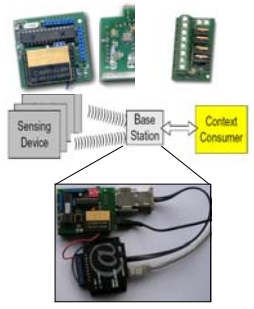
Designing embedded context-aware systems

- Customized wireless sensing solutions required
- Understanding of application environment vs. design of customized hardware
- Hurdle for researchers with a software centric background

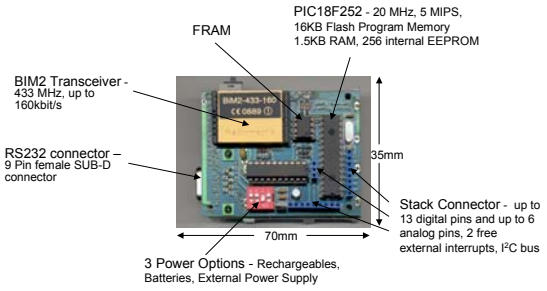


Lancaster DIY Smart-its

- Rapid prototyping
- Focus on sensing task rather than communication
- HW Modularity and extensibility
- Quick and easy assembly

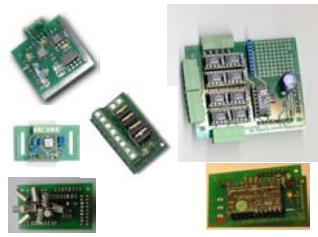


DIY Smart-its – Core Board



DIY Smart-its Add-ons

- Generic Sensor Board
- Load Sensing Board
- Actuator Board
- RFID reader
- Wearable 3D accelerometer board
- Ball switch add-on
- Gameport add-on
- Display add-on
- MIDI add-on
- Experimental add-on
- US add-on

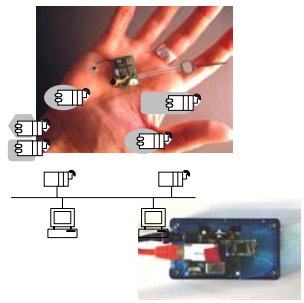


DIY Smart-its Software Environment

- CCS C compiler for PICs
- Library for RF Communication and hardware drivers
- Drivers and example code for add-on boards
- Software Templates for base station and sensing nodes
- Example code for interfacing the Smart-its in C/C++, C#, Visual Basic

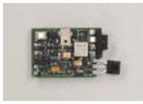
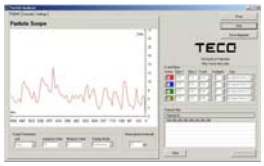
TecO Particle Smart-its

- Optimized for
  - power consumption
  - Size: 17x30mm
  - Communication efficiency: slotted TDMA/CS&CA
- Better suited for P2P applications
- One or two processor architecture
- Programmable over the air
- Range of core boards and add-ons



TecO Particle Smart-its cont.

- Processor
  - PIC 18F6720 @ 20 MHz
  - Internal Memory: 128kbyte program Flash
  - 4kbyte RAM, 1kbyte EEPROM
- Sensors
  - 3D acceleration, Microphone, Light sensors, Humidity, temperature, pressure, ball switch
- Software
  - OS and Libraries for CCS C Compiler
  - Particle Analyzer

Application Examples

- DIY Smart-its
  - Mouse driver for load based surfaces (Schmidt et al.)
  - Weight and location measurement on weight surfaces (Schmidt et al.)
  - Gesture recognition on a cube (Laerhoven et al.)
  - Rule engine (Strohbach et al.)
  - Body Sensor Networks (Laerhoven et al.)
- Particle Smart-its
  - IKEA shelf (Antifakos et al.)
  - Smart-its friends (Beigl et al.)
  - Relative positioning (Hazas et al.)

DIY Smart-its NG

- reliable wireless link up to 28kbps
- In System Programming
- Lower component count
- Increased modularity and flexibility
- external storage MMC card

Conclusion

- DIY Smart-its for Concept Development
  - evaluating sensors and algorithms
- Particle Smart-its for System Development and deployment
  - If size matters …
- Migration Possibilities
  - SW: easy for algorithms, harder for HW dependent code
  - HW: possible, done in Relate project
- More information
  - DIY: http://ubicomp.lancs.ac.uk/smart-its
  - Particle: http://smart-its.teco.edu