Smart-Its

Everyday objects made smart

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ETH Zurich
Vision

communication & sensing & computation

network

Smart-It

environment

user
Vision

communication & sensing
& computation
Prototypes

Smart-Its

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich
Hardware

Smart-It

communication & sensing
& computation
Hardware

Smart-It

| core board | sensor board |

communication computation  sensing computation
Sensor board

- temperature
- microphone
- 2-axis accelerometer
- pressure
- light
- microcontroller
- speaker
- LEDs

Smart-It sensor board (TecO)
Core board

- Bluetooth Smart-It
  - 8-bit microcontroller, 8 MHz/ 8 MIPS
  - 64 Kbyte RAM
  - 50 Kbyte EEPROM
  - 128Kbyte FlashROM
  - Bluetooth radio
  - Antenna on PCB
  - Input/ Output
    - sensor board
    - analog in, UART, ext
    - interrupts, programming

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Connect the World

- other smart objects
  - or infrastructure
- Bluetooth phone
  - send/receive SMS
  - access Address book
  - connect to Internet
- PDA (iPAQ),
  - camera, printer,...
Programming

- in C with GNU gcc cross compiler
  - straightforward
  - `malloc()` and `printf()` (to serial port)
- compile, upload, (run)
  - in-system programmable
- system software (library)
  - drivers: UART, RTC, Bluetooth, ...
  - event driven programming model
Status

- production
  - 200 pieces for project partners now

- can I have them?
  - no DIY (you will need to have them made)
  - design documents on the Web
    - http://www.tik.ethz.ch/~beutel/
  - ~ 200: 120€ pp for core board
    - Bluetooth (50 €), microcontroller (12 €)
    - PCB, placement (high initial cost)
Power consumption

- core-board @ 8MHz/3.3 V

<table>
<thead>
<tr>
<th></th>
<th>Bluetooth off</th>
<th>Bluetooth on</th>
</tr>
</thead>
<tbody>
<tr>
<td>idle</td>
<td>13 mW</td>
<td>~1 week idle</td>
</tr>
<tr>
<td>active</td>
<td>40 mW</td>
<td>~10 hours running</td>
</tr>
<tr>
<td>idle</td>
<td>84 mW</td>
<td></td>
</tr>
<tr>
<td>active</td>
<td>191 mW</td>
<td></td>
</tr>
</tbody>
</table>

on typical phone battery (600mAh)
Thanks

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