Adaptive Sampling for Sensor Networks
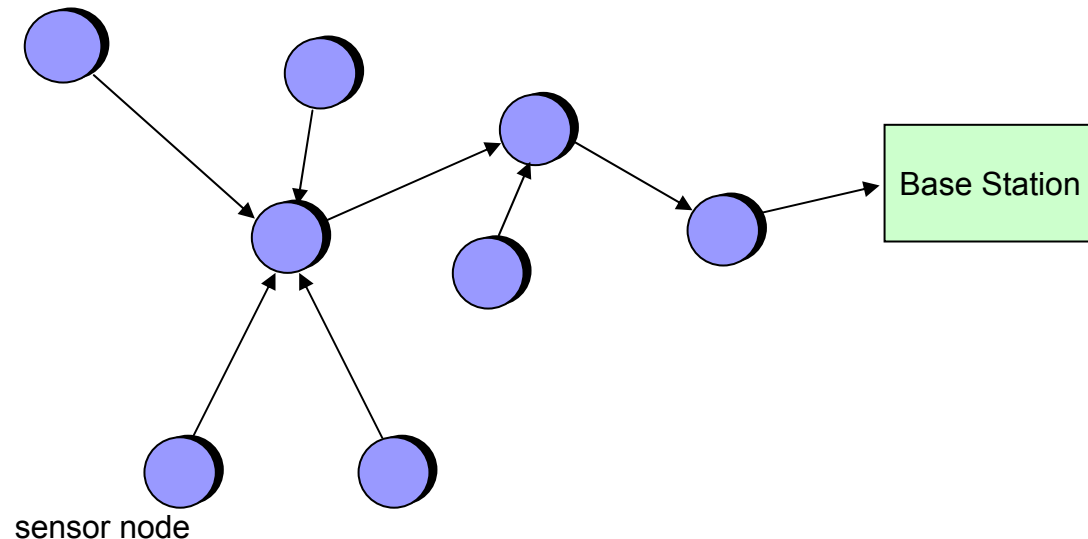
Seminarvortrag von Philippe Bourquin

Betreuung: Silvia Santini

Overview

1. Sensor Networks: an Introduction ←
2. Problems / Requirements in SNs
3. Adaptive Sampling
   a) Example 1: Feedback Control Mechanism
   b) Example 2: Kalman Filter
4. Other Issues: Spatial Domain
5. Conclusion and Future Work

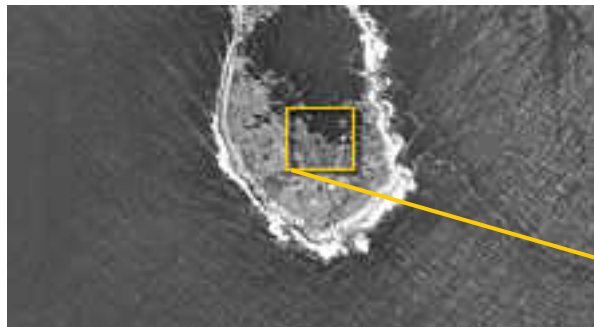# Sensor Networks: an Introduction (I)

- Base Layout

sensor node

- many, cheap(?) sensor nodes
- sensor nodes may be heterogeneous
- sensor nodes provide data to user (can be real-time)
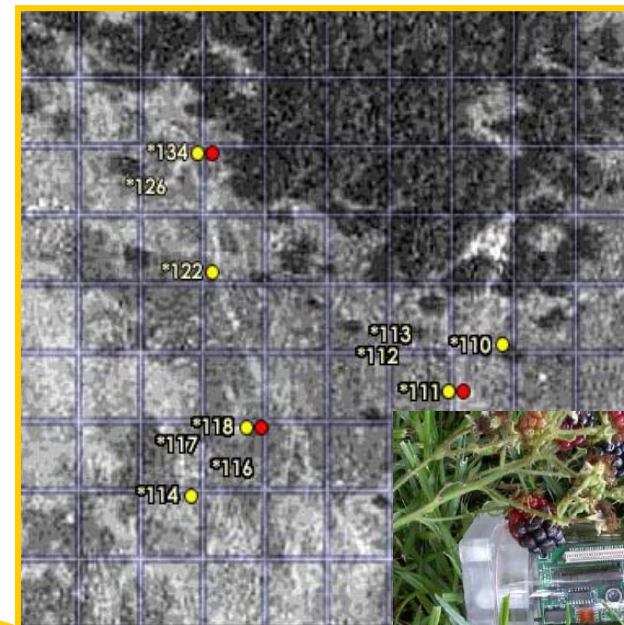- network should handle abstract queries

Sensor Networks: an Introduction (II)

Example: Great Duck Island (Maine, USA 2002)

- Goal: observation of Storm Petrel (Sturmschwalbe)
- Sensor nodes deployed on the island
- Wireless communication (multi hop)
- Computer base station to collect results
- Real-time access from internet

= microphone
= camera

Great Duck Island, Maine

[www.greatduckisland.net]

- Sensors for: humidity, barometric pressure, infrared, sound, motion (camera)

Sensor Networks: an Introduction (III)

Example: BTNode Platform

BTNode Rev3 [http://www.btnode.ethz.ch]

- Developed at ETH Zürich (D-INFK and D-ITET)
- Microcontroller: Atmel ATmega 128L (8 MHz @ 8 MIPS)
- Memories: 224 Kbyte RAM, 128 Kbyte FLASH ROM, 4 Kbyte EEPROM
- Bluetooth subsystem: Zeevo ZV4002
- Low Power Radio (868 MHz)
- Standard C Programming, TinyOS compatible

- Laptop + PC-card = 32x25x4 cm = 3200 cm^3
- Ipaq + CF-card = 15x10x2 cm = 300 cm^3
- **BTNode = 6x4x0.5 cm = 12 cm^3**
  that is a factor of **266** compared to a laptop!

[www.btnode.ethz.ch]

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Problems / Requirements in SNs (I)

- **Network**
  - many nodes
  - high node density
  - ad hoc, wireless communication
- **Nodes**
  - controller (CPU, memory, ...)
  - sensors (temperature, pressure, sound, light, ...)
  - (wireless) communication ability
  - limited resources (energy, memory, ...)
  - once deployed, often no physical access
- **Goals**
  - environmental monitoring
  - building monitoring
  - target tracking
  - entertainment, education

Problems / Requirements in SNs (II)

Adaptive Sampling in Sensor Networks