Towards Distributed Event Detection in Wireless Sensor Networks

Project: „Patrec"

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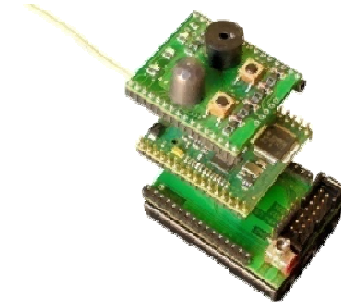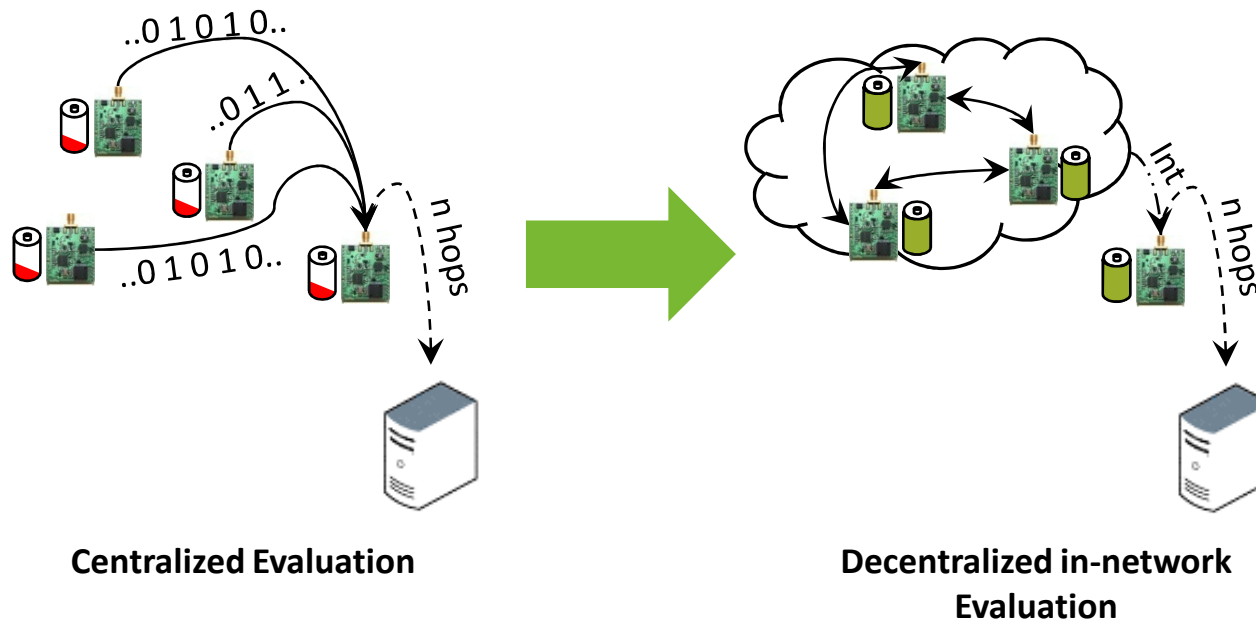
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Motivation / Use Case

- Raising **accuracy** of event detection in WSNs (more nodes => more accuracy)

- Existing **redundancy** in WSNs is leveraged to improve accuracy

- Reducing energy consumption due to **in-network data fusion**

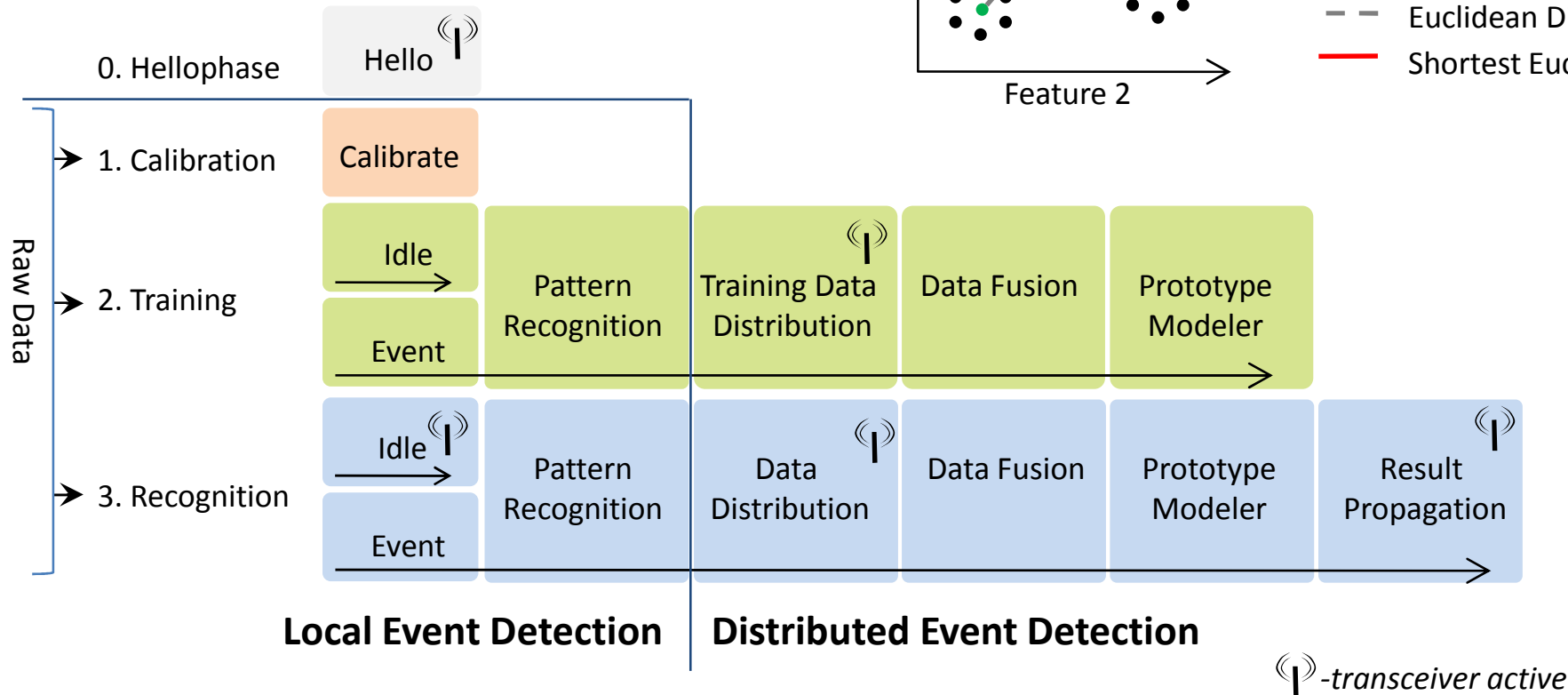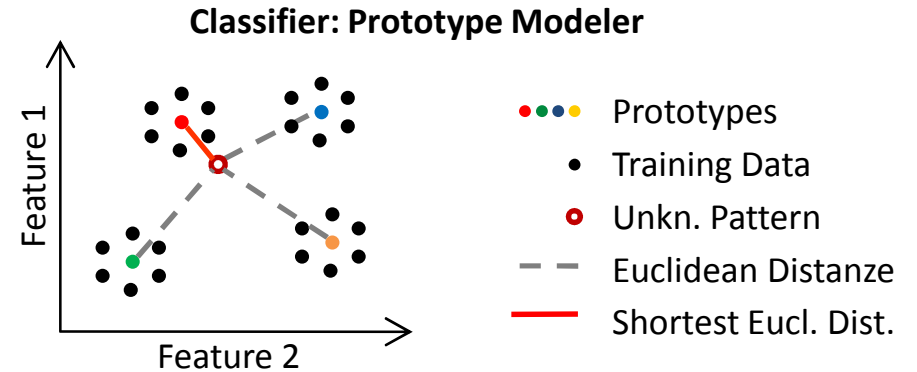- Detecting e.g. burglar **climbing events** over fences

Use Case: Fence Monitoring

Centralized Evaluation

Decentralized in-network Evaluation

- Scatterweb MSB-430 node
- MSP 430 F1612 16 Bit CPU
- Freescale Acceleration Sensor

System Concept

Classifier: Prototype Modeler

Feature 1

Feature 2

Prototypes
Training Data
Unkn. Pattern
Euclidean Distanze
Shortest Eucl. Dist.

Raw Data

0. Hellophase — Hello

1. Calibration — Calibrate

2. Training — Idle → / Event →

| Pattern Recognition | Training Data Distribution | Data Fusion | Prototype Modeler |

3. Recognition — Idle → / Event →

| Pattern Recognition | Data Distribution | Data Fusion | Prototype Modeler | Result Propagation |

Local Event Detection   **Distributed Event Detection**

-transceiver active

In-network Data Fusion

- Omnibus Model: defines distributed **fusion approaches**

- **Raw Data Fusion**: Extensive energy consumption => not recommended

- Evaluate: **Feature Fusion** & **Classification Fusion**
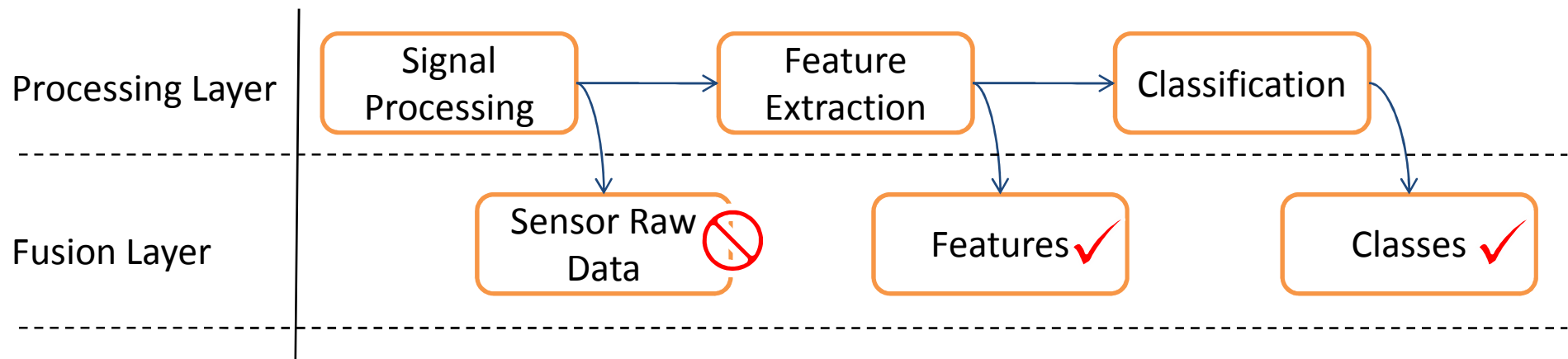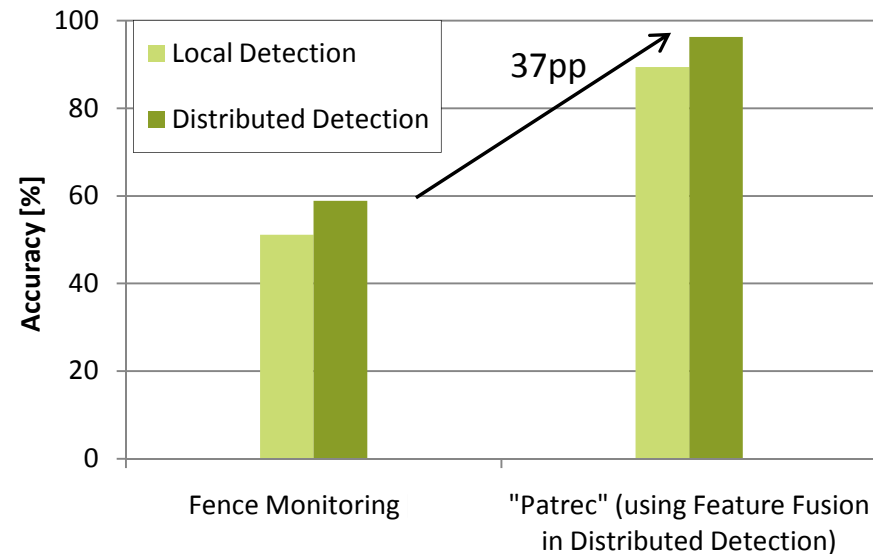
Current Results

Comparing accuracy to :

- local recognition: **increased** about 10 pp

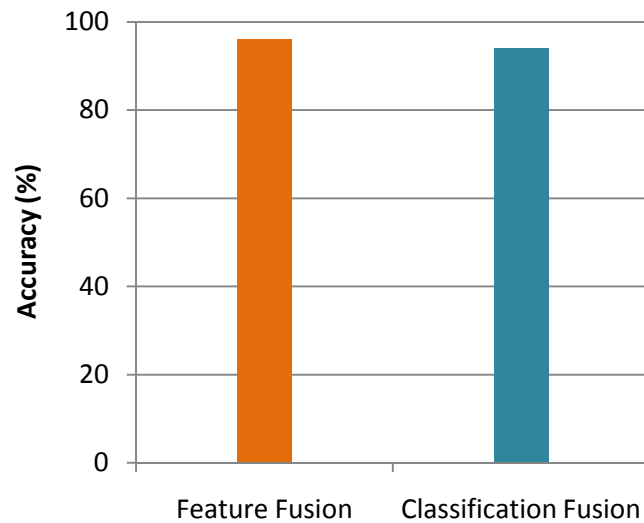- reference work: **increased** about 37 pp

More? Poster!

Comparison between local and
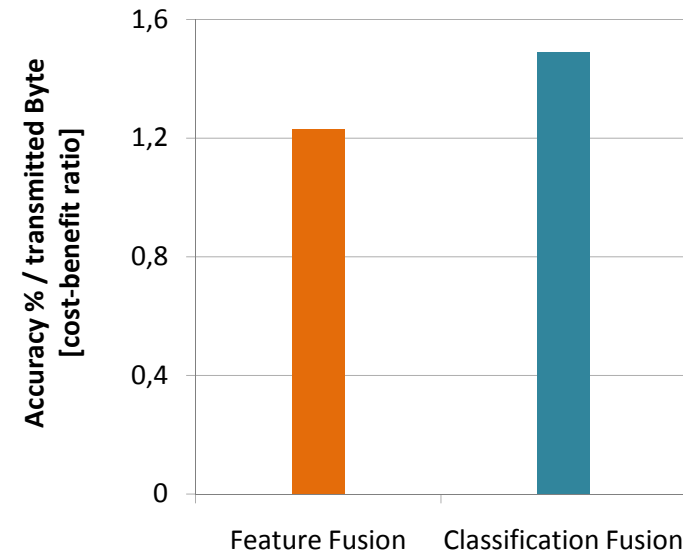distributed event detection

Current Results

Comparing fusion methods for new „Patrec":

More? Poster!

- Feature Fusion: **precise** & **costly**

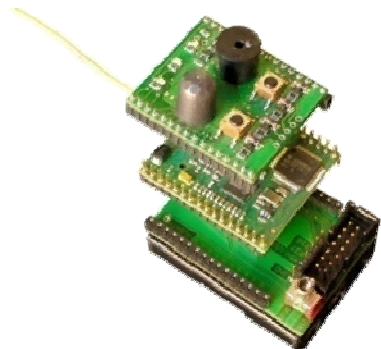- Classification Fusion: **efficient** & **reduced accuracy**

Accuracy analysis

Cost-benefit analysis

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Experiments with distributed event
definitions with three nodes
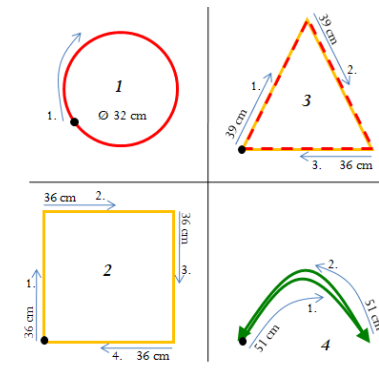
Acceleration sensor based two-
dimensional geometrical shapes