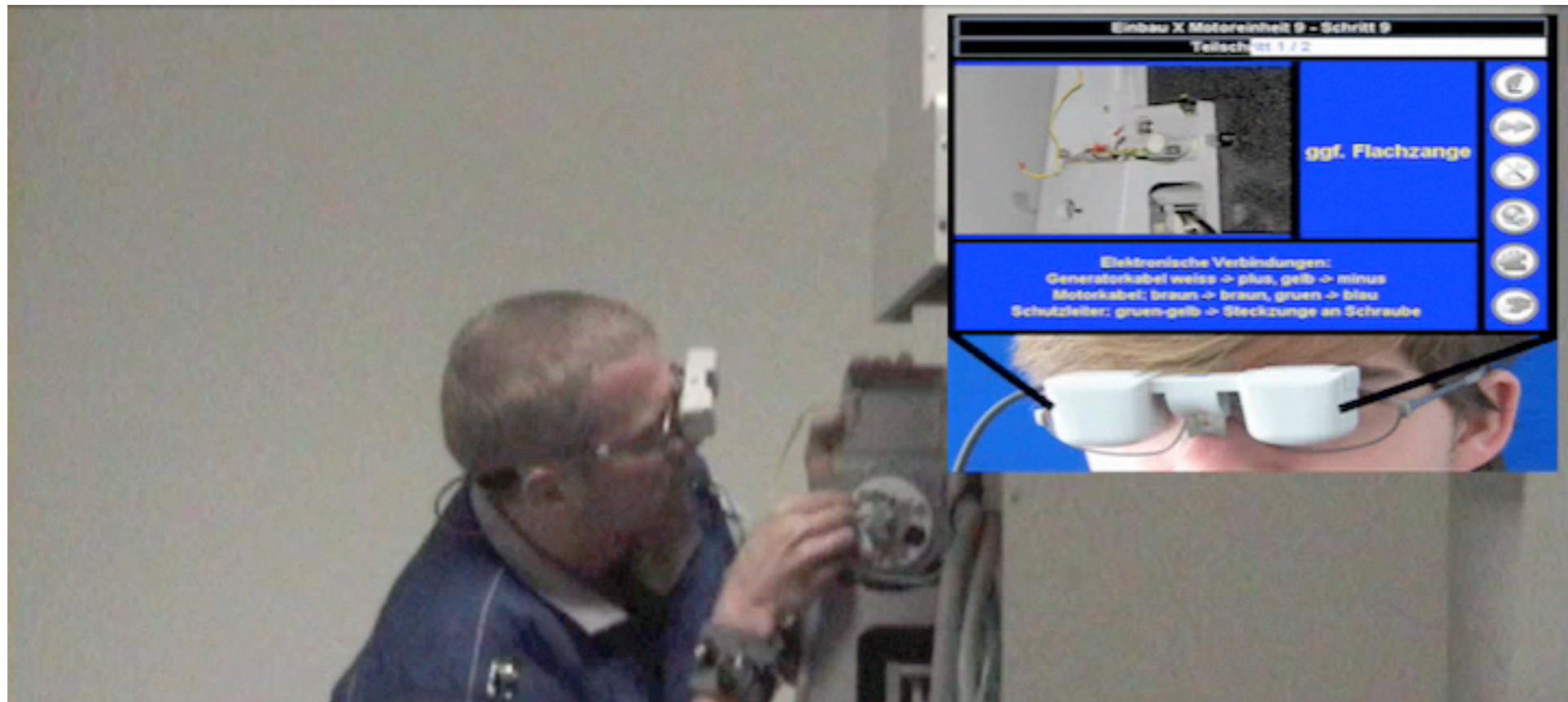
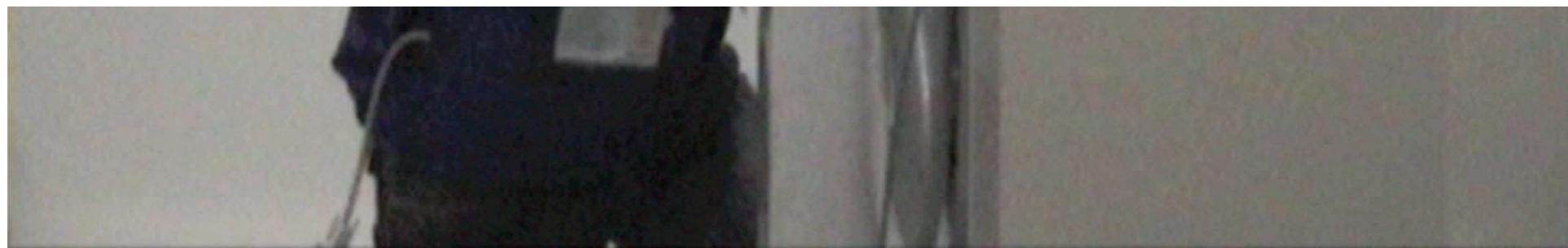


Towards Dynamically Configurable Context Recognition Systems

David Bannach, Kai Kunze

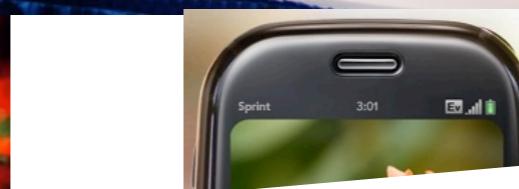
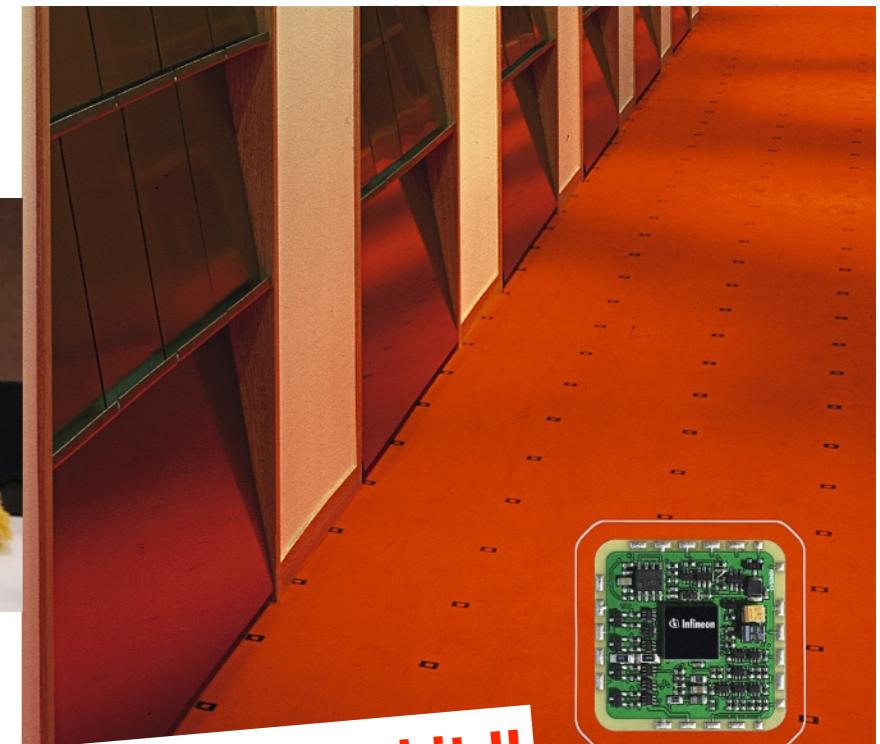


well defined, application specific sensor setups

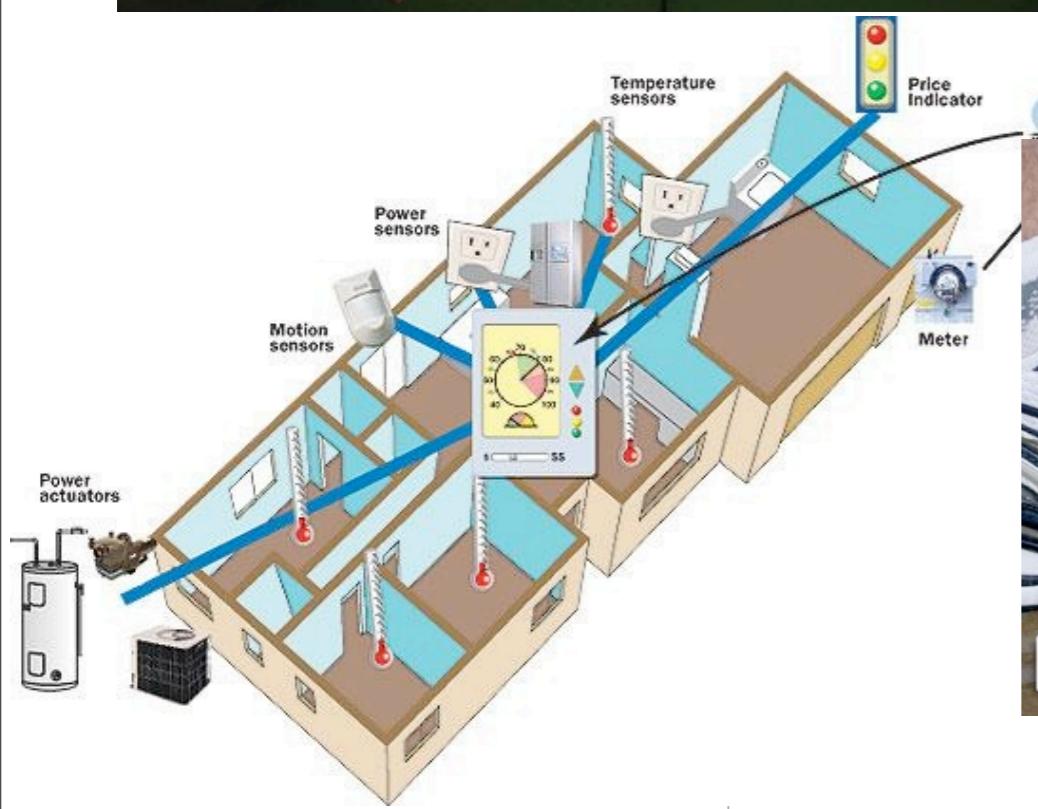
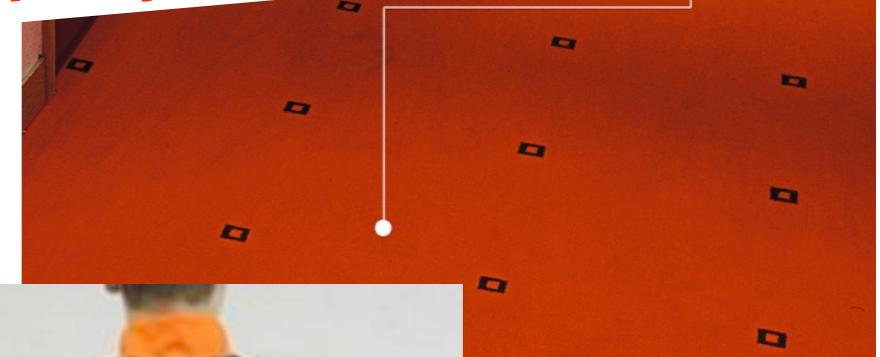


Kunze, K., Wagner, F., Kartal, E., Morales Kluge, E., and Lukowicz, P. Does Context Matter ? - A Quantitative Evaluation in a Real World Maintenance Scenario. In *Proceedings of the 7th international Conference on Pervasive Computing Nara, Japan, May 11 - 14, 2009.*

Sensing....



....but not what you need, when you need it, and where you need it !!



Activity Recognition in the Real World

-  a sensor rich environment does not imply
 -  the right combination of sensors for every application

-  in the real world sensor configuration are bound to **vary**
 -  both in time and space

Overview

- Introduction
- Standard Datasets for Context Recognition
- Toolchain for recording, post-processing
- Towards self-configuration and abstraction
- Future Work



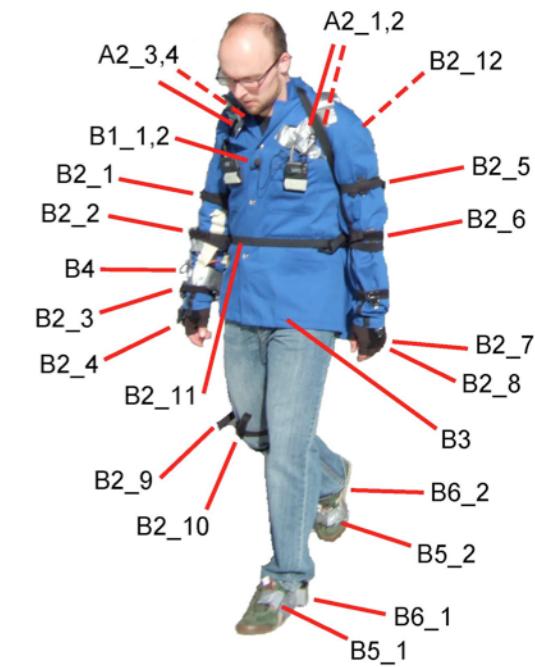
“The image is probably **the most widely used test image** for all sorts of image processing algorithms (such as compression and denoising) and related scientific publications.”

Wikipedia, 5 Oct 2011

“...the image contains a nice mixture of detail, flat regions, shading, and texture that **do a good job of testing** various image processing algorithms.”

D.C. Munson, JR. “A note on Lena”, IEEE Trans Image Processing (5) 1, 1996

Looking for an Context Rec. Lenas





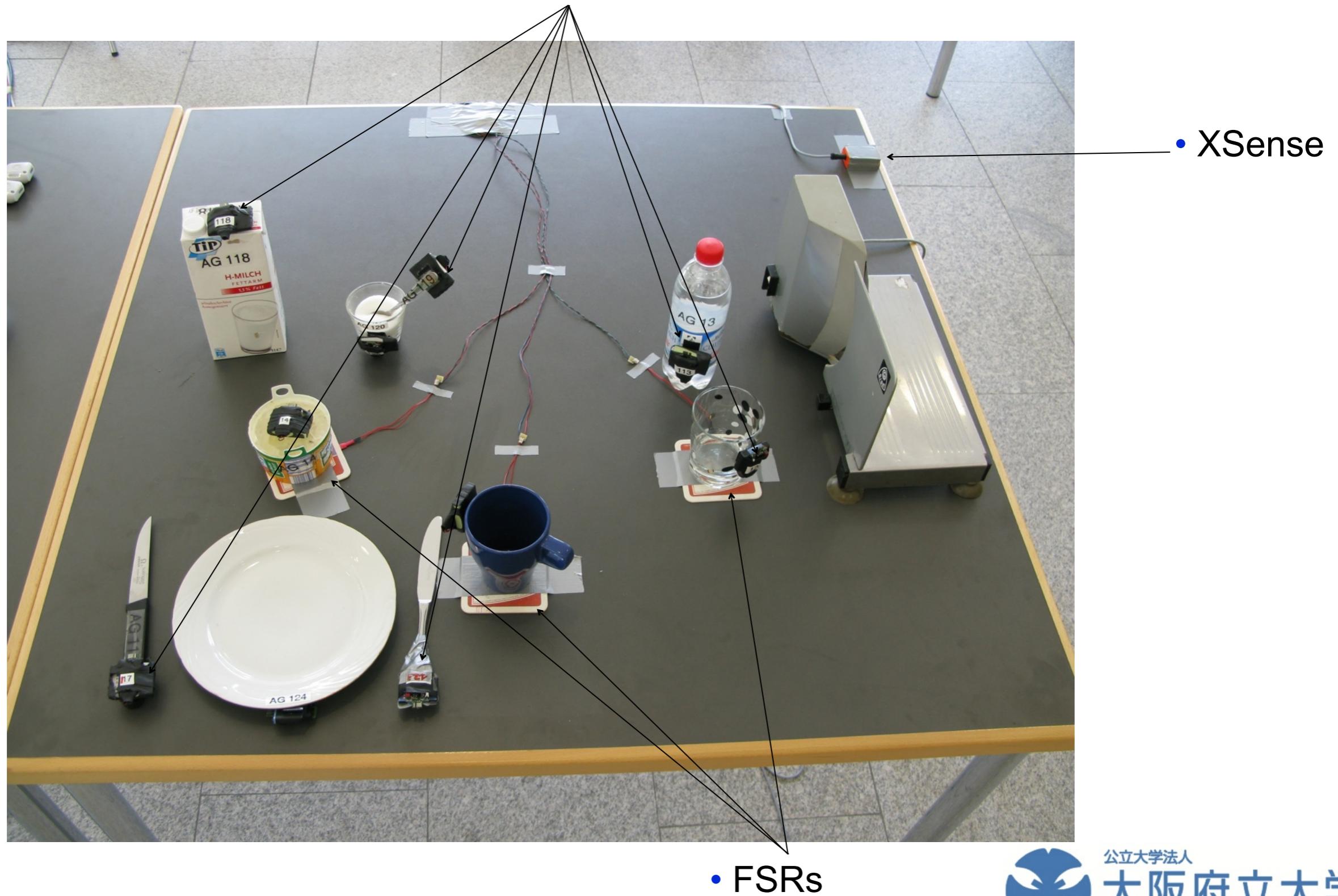
www.opportunity-project.eu
EC grant n° 225938



12 users, 5 repetitions each, total of 25 hours of data
high level loose instructions to subjects

Instrumented Objects

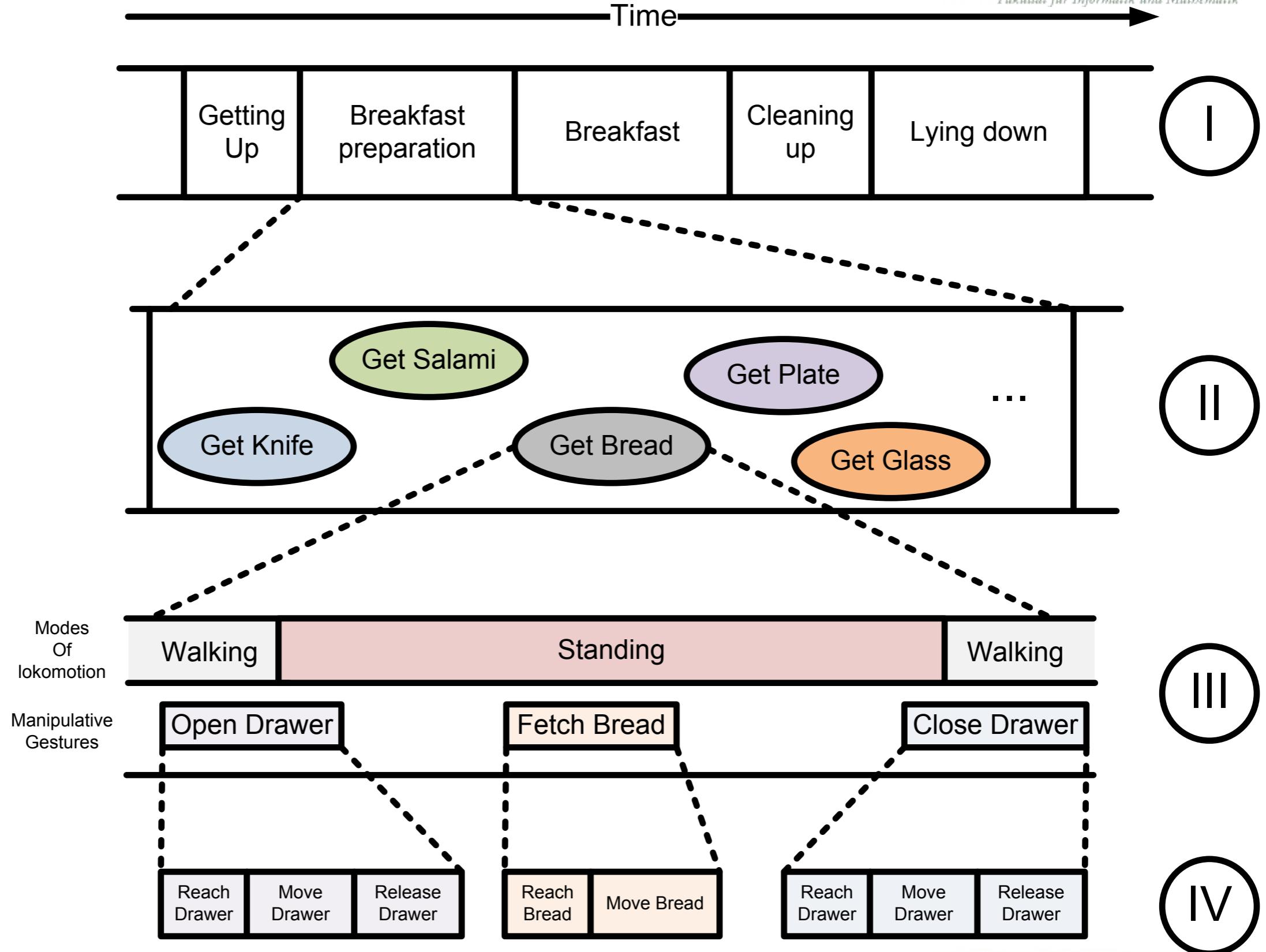
• Accelerometers





Activity Decomposition

~200 instances



~5000 instances

~30000 instances

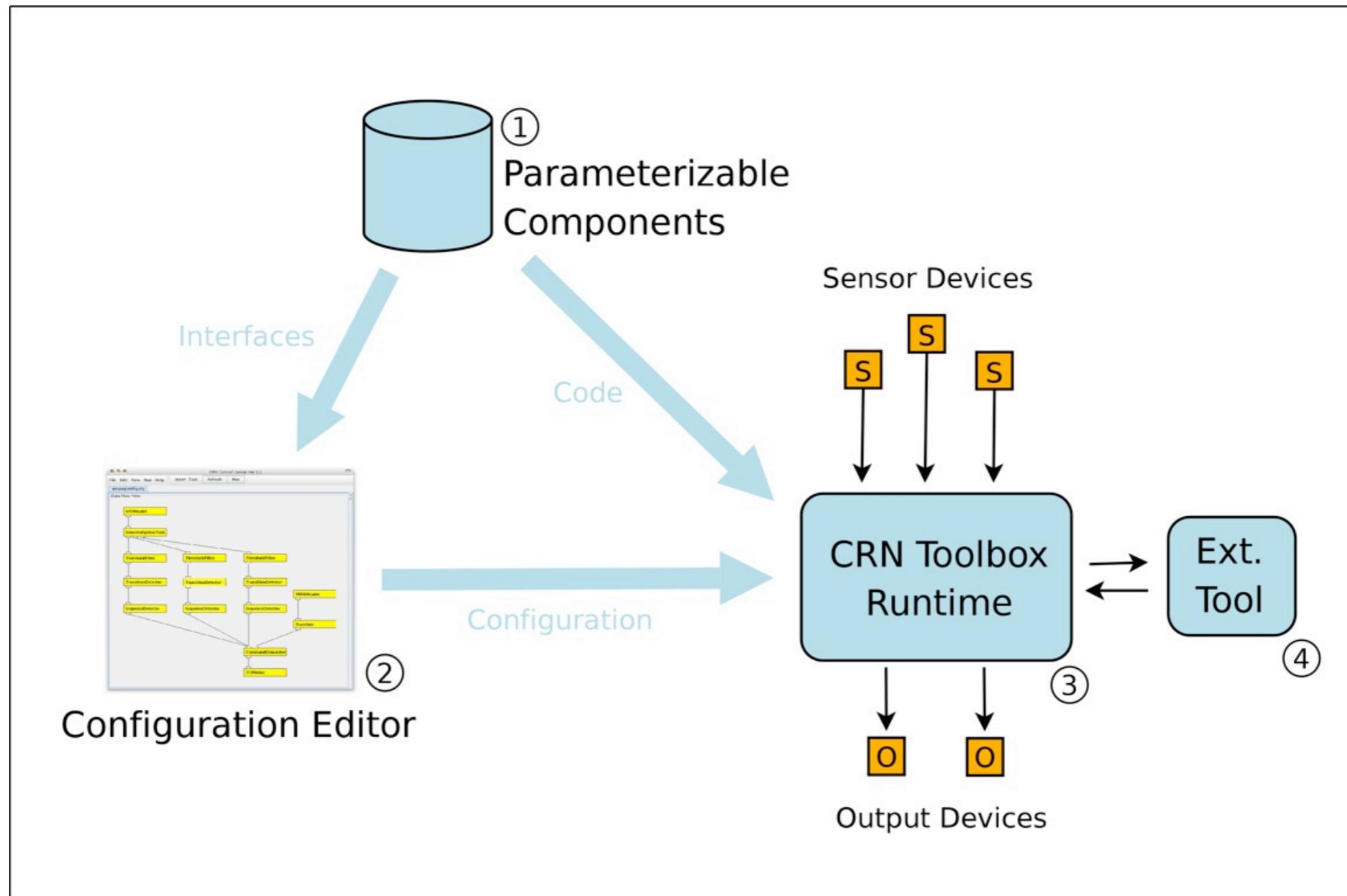
<http://www.opportunity-project.eu/challenge>

Towards Dynamically Configurable Context Recognition Systems

Overview

- small introduction
- Standard Datasets for Context Recognition
- Toolchain for recording, post-processing
- Towards self-configuration and abstraction
- Future Work, potential collaborations

CRN Toolbox



<http://crnt.sourceforge.net/>



MASS-Monitoring Tool

M.A.S.S. - OPP_recording_r2741

File Edit Window Export Help

Sensors Sensor systems Setup windows

Overview

- /127.0.0.1
 - shoetoebox_left [ID: 15]
 - shoetoebox_right [ID: 16]
 - fsr [ID: 27]
- /132.231.16.30
 - Xbus [ID: 1]
 - MTx [ID: 2]
 - bt_acc_5 [ID: 3]
 - bt_acc_8 [ID: 28]
 - bt_acc_10 [ID: 10]
 - bt_acc_11 [ID: 11]
 - bt_acc_21 [ID: 29]
 - bt_acc_22 [ID: 30]
 - bt_acc_23 [ID: 31]
 - bt_acc_24 [ID: 32]
 - bt_acc_25 [ID: 33]
 - bt_acc_26 [ID: 34]
 - bt_acc_27 [ID: 5]
 - bt_acc_28 [ID: 4]
 - bt_acc_111 [ID: 6]
 - bt_acc_123 [ID: 7]
 - bt_acc_117 [ID: 8]
 - bt_acc_125 [ID: 9]
 - bt_acc_113 [ID: 12]
 - bt_acc_114 [ID: 13]
 - bt_acc_118 [ID: 14]
 - bt_acc_119 [ID: 17]
 - bt_acc_124 [ID: 18]
 - bt_acc_120 [ID: 19]

Protocol

Protocol

Tabular Graphical

11:42	11:43	11:44	
			shoetoebox_left [ID: 15]
			shoetoebox_right [ID: 16]
			fsr [ID: 27]
			Xbus [ID: 1]
			MTx [ID: 2]
			bt_acc_5 [ID: 3]
			bt_acc_8 [ID: 28]
			bt_acc_10 [ID: 10]
			bt_acc_11 [ID: 11]
			bt_acc_21 [ID: 29]
			bt_acc_22 [ID: 30]
			bt_acc_23 [ID: 31]
			bt_acc_24 [ID: 32]
			bt_acc_25 [ID: 33]
			bt_acc_26 [ID: 34]
			bt_acc_27 [ID: 5]
			bt_acc_28 [ID: 4]
			bt_acc_111 [ID: 6]
			bt_acc_123 [ID: 7]
			bt_acc_117 [ID: 8]
			bt_acc_125 [ID: 9]
			bt_acc_113 [ID: 12]
			bt_acc_114 [ID: 13]
			bt_acc_118 [ID: 14]
			bt_acc_119 [ID: 17]
			bt_acc_124 [ID: 18]
			bt_acc_120 [ID: 19]

onbody [ID: 3] :: Experiment setup

Experiment setup

action_jacket [ID: 1] :: Experiment setup

a visualisation Open detail window

acc_28 [ID: 4] :: Zoom window

Data visualisation Open detail window

4 3 [x: time, y: acceleration] 5

Connected.

D: 2] :: Experiment setup

ment setup

bt_acc_24 [ID: 32] :: Zoom window

Data visualisation Open detail window

630
540
450
360

4 3 [x: time, y: acceleration] 5

Connected.

<https://redmine.esl.fim.uni-passau.de/projects/mass>

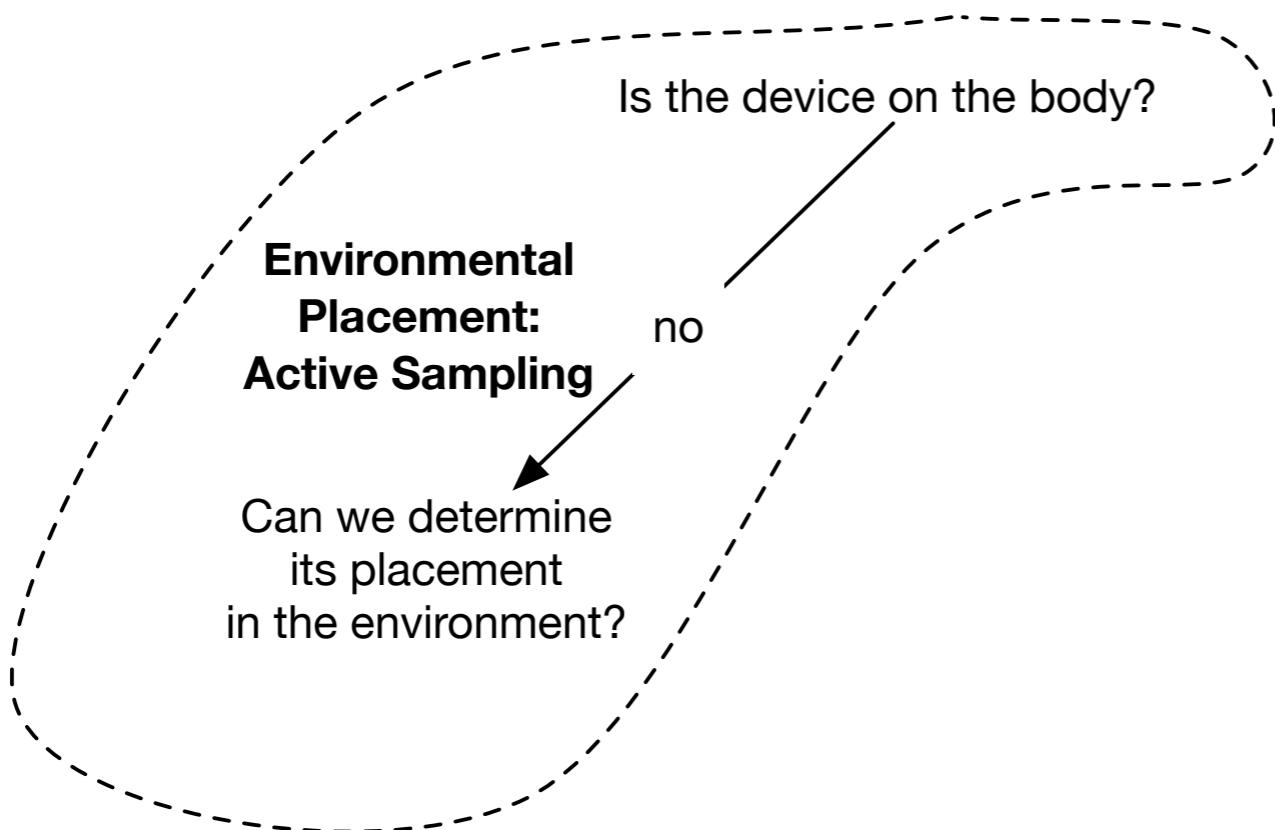
Post-processing -Labeling Tool



Overview

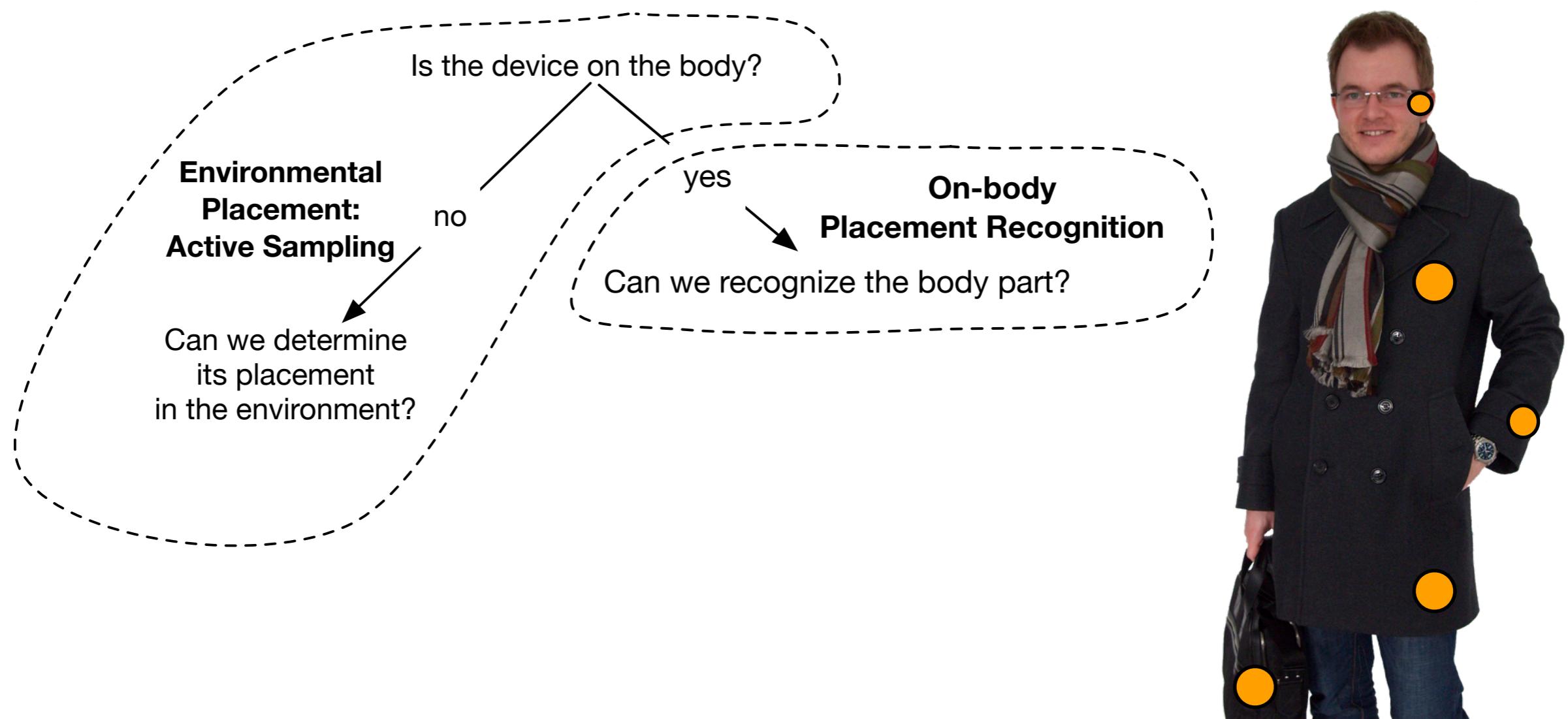
- small introduction
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- Future Work

Compensating for on-body placement effects



Kunze, K. and Lukowicz, P. *Symbolic object localization through active sampling of acceleration and sound signatures*. In Proceedings of the 9th international Conference on Ubiquitous Computing. Innsbruck, Austria, September 16 - 19, 2007.
nominated for best paper. (Acceptance rate: 14%)

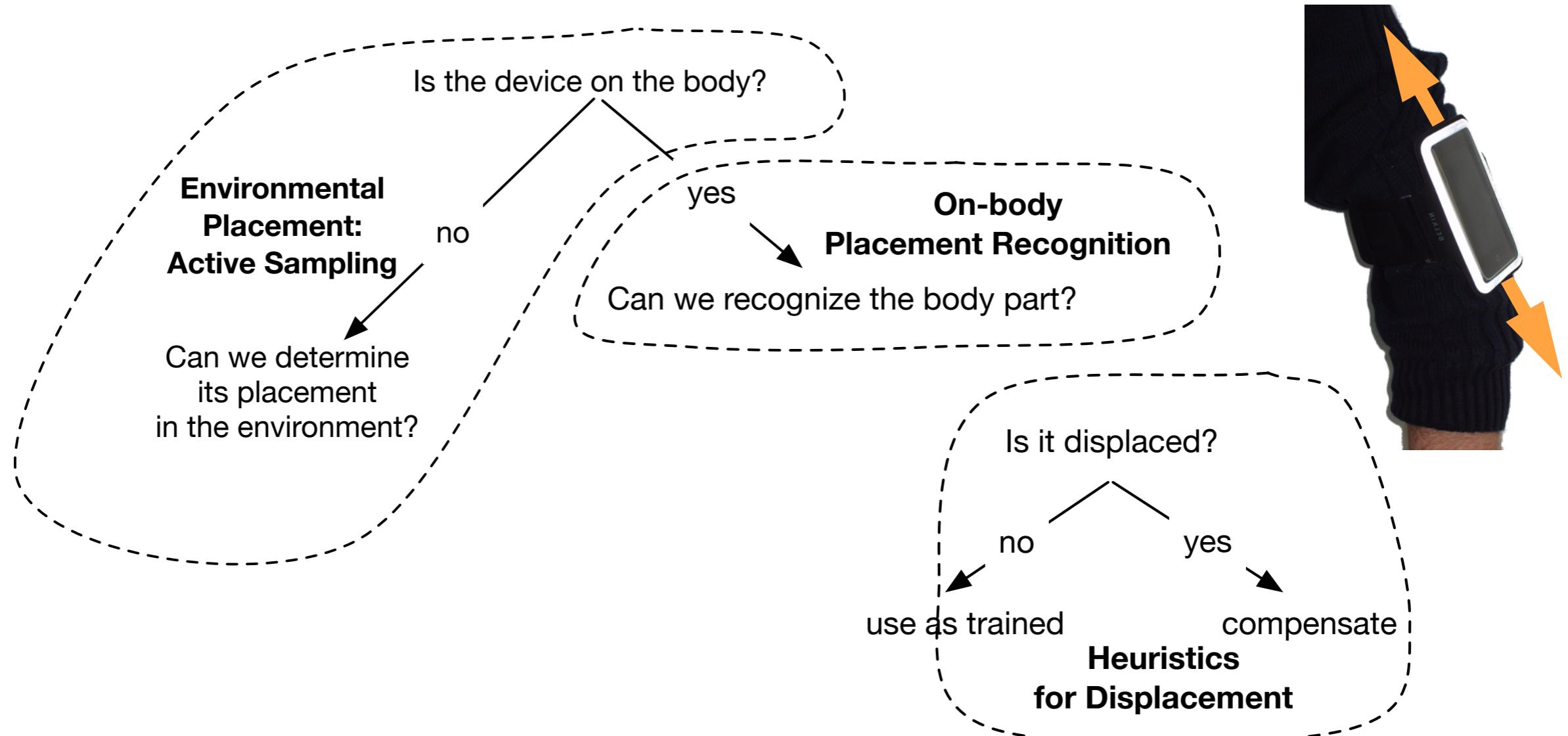
Compensating for on-body placement effects



K. Kunze and P. Lukowicz. *Using acceleration signatures from everyday activities for on-body device location*. 11th IEEE International Symposium on Wearable Computers, Sep 2007.

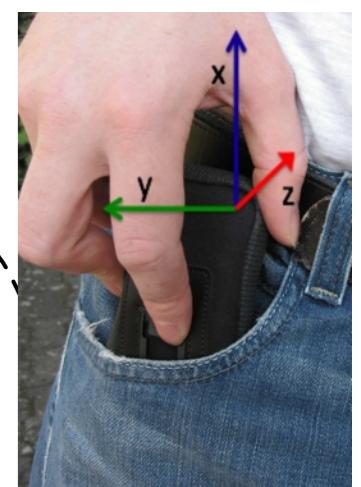
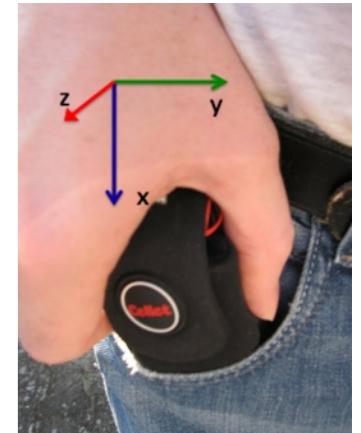
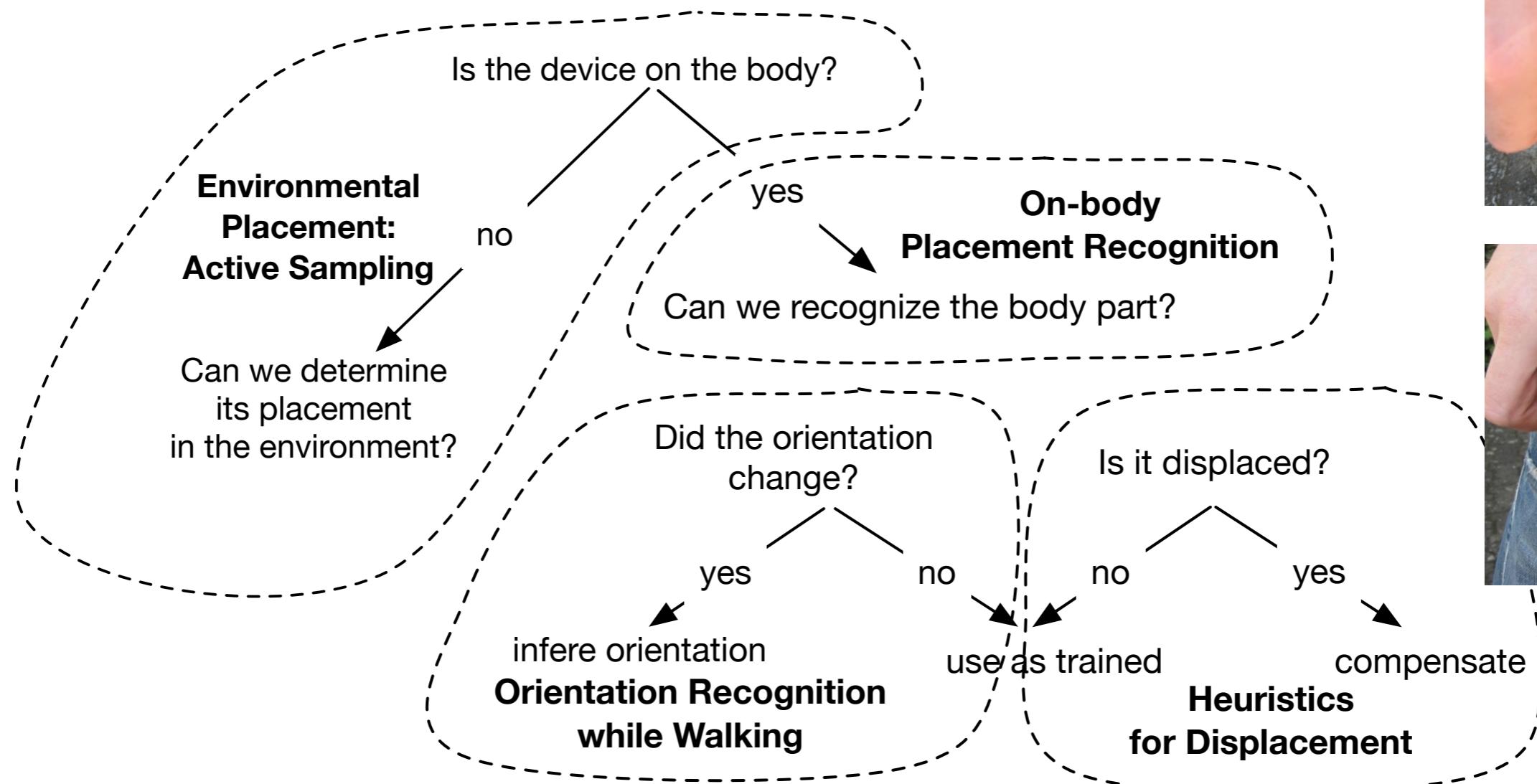
K. Kunze, P. Lukowicz, H. Junker, and G. Troester. *Where am i: Recognizing on-body positions of wearable sensors*. LOCA'04: International Workshop on Location and Context Awareness , Jan 2005.

Compensating for on-body placement effects



Kunze, K. and Lukowicz, P. *Dealing with sensor displacement in motion-based on-body activity recognition systems*. In Proceedings of the 10th international conference on Ubiquitous computing (UbiComp '08). Seoul, Korea, September, 2008.

Compensating for on-body placement effects



Kai Kunze, Paul Lukowicz, Kurt Partridge, Bo Begole, *Which Way Am I Facing: Inferring Horizontal Device Orientation from an Accelerometer Signal*, 13th IEEE International Symposium on Wearable Computers. Linz, Austria, 2009.

conclusions and future work

- some standard datasets and tools
 - ready to be used by you

We still need:

- better abstractions
 - over sensor modalities
 - combining on-body and environmental sensors
- participatory sensing
 - leveraging smartphone applications to gather datasets
 - ? how to engage people ?
 - ? some abstraction needed ?
 - ? how to deal with the additional noise ?
- democratizing big data

Questions, remarks, violent dissent??

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Kai Kunze

Towards Dynamically Configurable Context Recognition Systems

