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Adaptive Computing at HIIT

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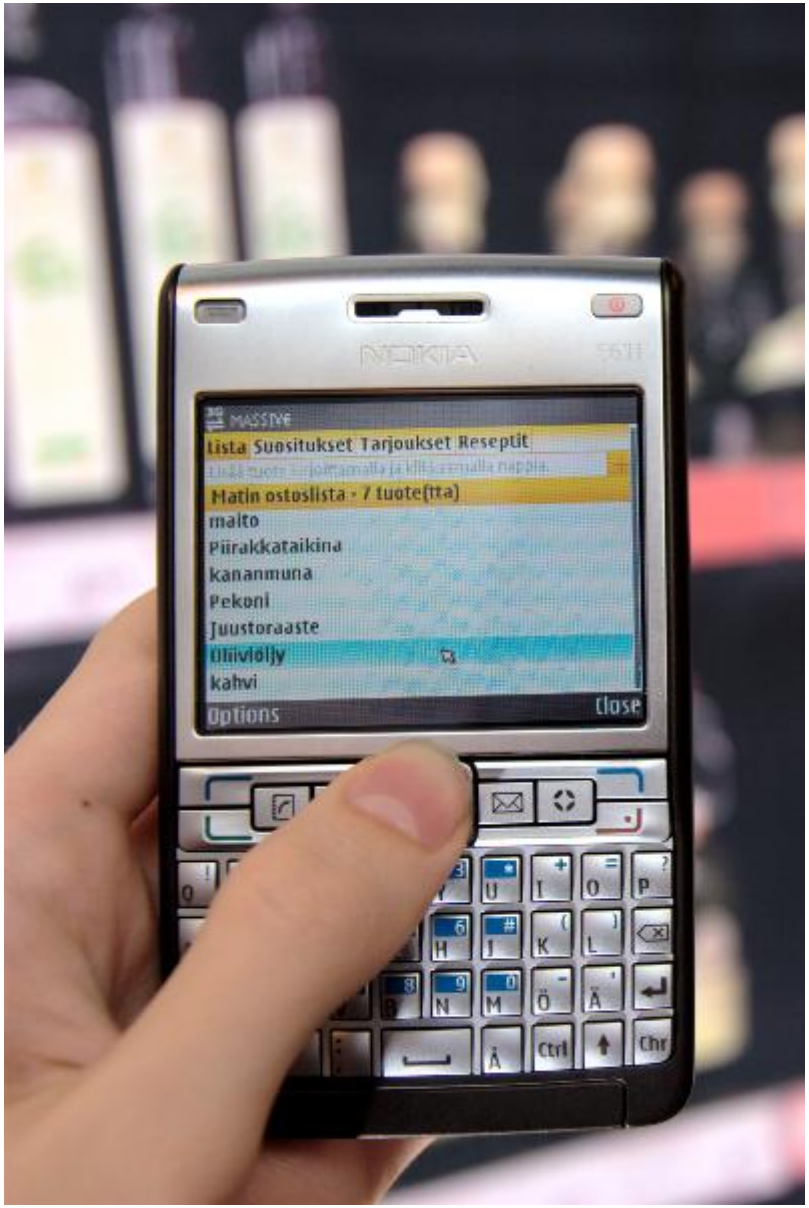

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The group's research area

- Our group works on sensor networks and ubiquitous computing in mobile environments

- Our working hypothesis is that

  in mobile environments the information needs of a user depend on his/her current situation

- Based on this hypothesis, our goal is then to

  provide a better end user experience by adapting applications to the user's context, information needs, intentions, background knowledge etc.

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Ubiquitous computing

- The user acts in a context, e.g. in a location, interacting with other users, with a view of achieving something
- Contextual information can be used for adaptation ⇒ making the application more efficient and user-friendly
- For this we need to
  1. Gather the context information
  2. Interpret the context information
  3. Model the user (personalization)
  4. Apply the context and the user model in the user interface and in the application logic

We have end-to-end experience in realizing context-aware web-based mobile applications!

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Gathering context information

- A platform BeTelGeuse for gathering and processing context information, e.g. for wearable computing (Bodynets 2007)
- Works on mobile devices compliant with MIDP 2.0 and CLDC 1.1
- Example devices: Nokia S60 mobile phones, HP PDA

- Can take as input information from resources on the mobile device and from external sensors over BlueTooth
- Supports also the interpretation of context data with so called plug-ins
- Open source under LGPL license
- Website: betelgeuse.hiit.fi

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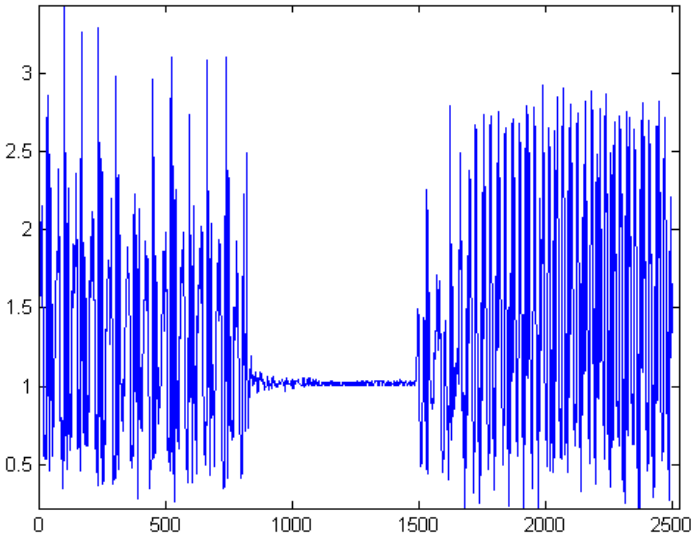
Interpretation of context data

- Interpretation = analysis of context data, in particular on-line analysis
- Research on location information
  - Automatic detection of important places for the user from traces of movements (Pervasive 2007)
  - Semantic annotation by users of places and sharing this with other users (Bodynets 2008)
- Research on activity recognition
  - Classification of user activity based on sensor readings, e.g. accelerometers



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User modelling / Personalization

- Personalization
  - Distributed decision support system (OTM 2006)
  - Empirical evaluation of personalization techniques for mobile applications (AINAW 2007)
  - Natural language recommendations in a mobile shopping assistant; natural language grocery product retrieval used here (SIGIR 2008, CIKM 2008)
  - Our focus is on statistical techniques, especially Bayesian modelling
- Adaptive Interfaces
  - Mobile widgets (Capricorn, MobileHCI 2008)
  - Mobile shopping assistant (Ma$$iv€, Adj. Ubicomp 2008)
- Reputation systems
  - Perseus reputation system (WI 2007)

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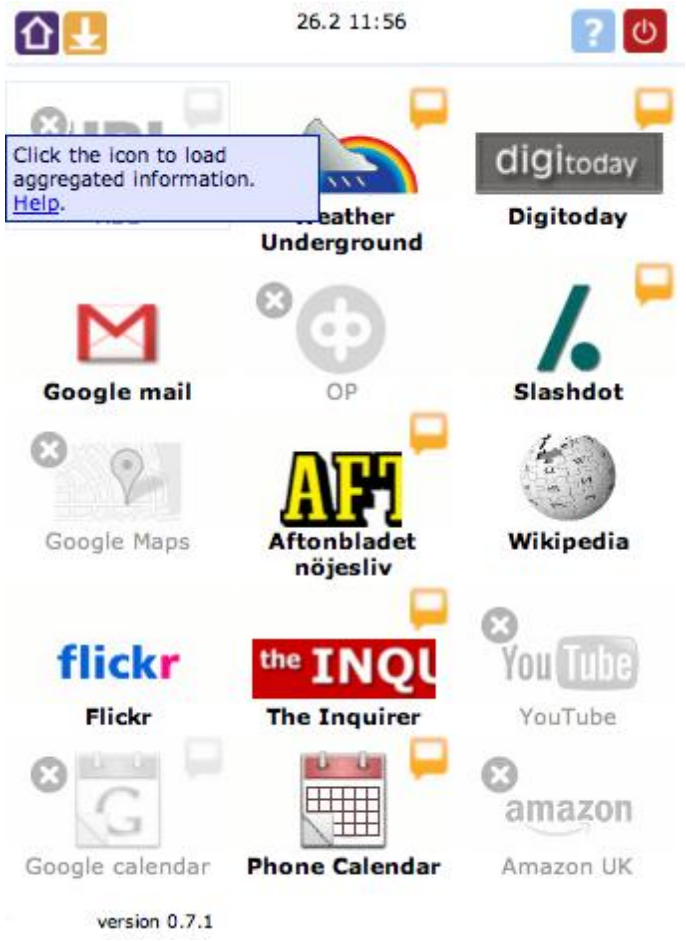
Application: Capricorn

- Adaptive user interface
  - Filter news items based on relevance
    - Highlight news items that are likely to be interesting or reorder the items in the feed based on user preferences
  - Hide inactive / unused items
    - Example on the right
  - Recommend services to the user
    - Collaborative filtering using information about what services other users have selected



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Application: Ma$$iv€

- Intelligent web-based shopping assistant with electronic shopping list
  - Natural language information retrieval from the store database of products
  - Predictive text input for entering products to the shopping list
  - Collaborative filtering recommendations of products
  - Recipe search and easy inclusion of the recipe products to the shopping list
  - WLAN-positioning of the customer and navigation support to find desired products in the store
  - User interface design and voice output

Contact information

Group homepage: www.hiit.fi/adaptive-computing

Publications available at www.hiit.fi/adaptive-computing-publications

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HIIT has also many other research groups covering a large spectrum of topics, see www.hiit.fi

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HIIT is a joint institute of

University of Helsinki and Helsinki University of Technology

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Selected publications (1/2)

- P. Nurmi, J. Kukkonen, E. Lagerspetz, J. Suomela and P. Floréen: “BeTelGeuse – a tool for Bluetooth data gathering.” Proc. 2nd Intl Conf. on Body Area Networks (BodyNets 2007)
- P. Nurmi and S. Bhattacharya: “Identifying meaningful places – the nonparametric way.” Proc. 6th Intl Conf. on Pervasive Computing (Pervasive 2008). LNCS 5013. Springer-Verlag, Berlin, 2008, 111–127
- S. Bhattacharya, P. Nurmi, J. Kukkonen and P. Floréen: “SerPens – a tool for semantically enriched location information on personal devices.” Proc. 3rd Intl Conf. on Body Area Networks (BodyNets 2008)
- P. Nurmi et al. : “A system for context-dependent user modeling.” Proc. OTM Federated Workshops 2006. LNCS 4278. Springer-Verlag, Berlin, 2006, 1894–1903
- P. Nurmi, M. Hassinen and K. C. Lee: “A comparative analysis of personalization techniques for a mobile application.” Proc. 21st Intl Conf. on Advanced Information Networking and Applications Workshops (AINAW 2007), Vol. 2, 270-275

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Selected publications (2/2)

- P. Nurmi: “Perseus – a personalized reputation system.” Proc. IEEE/WIC/ACM Intl Conf. on Web Intelligence (WI 2007), 798-804
- F. Boström, P. Nurmi, P. Floréen, T. Liu, T.-K. Oikarinen, A. Vetek and P. Boda: “Capricorn - An Intelligent User Interface for Mobile Widgets.” Proc. 10th Intl Conf. on Human Computer Interaction with Mobile Devices and Services (MobileHCI 2008), 327-330.
- P. Nurmi, E. Lagerspetz, W. Buntine, P. Floréen and J. Kukkonen: “Product Retrieval for Grocery Stores.” Proc. 31st Annual Intl ACM SIGIR Conf. (SIGIR 2008), 781–782
- P. Nurmi, E. Lagerspetz, W. Buntine, P. Floréen, J. Kukkonen and P. Peltonen: “Natural Language Retrieval of Grocery Products.” Proc. ACM 17th Conf. on Information and Knowledge Management (CIKM 2008), 1413-1414
- P. Nurmi, F. Boström, P. Floréen, J. Kukkonen, E. Lagerspetz, P. Peltonen and P. Saarikko: ”Ma$$iv€ - An Adaptive Shopping Assistant.” Adjunct Proceedings of the 10th Intl Conf. on Ubiquitous Computing (UbiComp 2008)