Modular Platform concepts and Universal service provision

Deepika Singh
Supervisors: Johannes Kropf and Sten Hanke
AIT Austrian Institute of Technology

24th October 2017
Background

- **PhD**
  Started on 1 September 2016

- **Research assistant (2015-16)**

- **Masters (2012-14)**
  2 years | Computer Science & Engineering

- **Bachelors (2007-11)**
  4 years | Computer Science & Engineering
Project Aim and Objectives

Aim of the project is to develop a context aware personalized module in the existing **Home Event Recognition (HOMER)** framework for activity recognition and user behavior analysis in the Smart Home domain. Following are the objectives of the project:

- Activity recognition model using machine learning techniques
- User behavior analysis from the activity recognized
- Decision making module to provide assistance in inhabitant needs
HOMER: Home Event Recognition System

Standard conform (ISO 11073) platform for Ambient Assisted Living applications and projects

- Sensor data representation
- Easy configurable
- Flexible
- Extensible
Limitations of existing solutions:

- Require large training data for probabilistic models
- User annotation
- Single resident occupancy
- Scalability
- Handling data uncertainty
- Physical activity monitoring using wearables and only smart phone data
Home activity monitoring and behavior recognition system in real time setting based on non-obtrusive smart home sensors
Home activity monitoring and behavior recognition system in real time setting

Data analysis from real house setting
Activity Recognition in Smart Home

- Unsupervised approach to reduce user labelling efforts
- Detection of recurrent patterns in ADL
- Detection of abnormal situations and long term behaviour changes
- Implementation of Active Learning approach to overcome scalability problem
- Investigate probabilistic and data mining models for identification multiple occupancy and data association problems in the smart home environment
- Context aware personalized user interaction system according to the user needs and requirements
Project to date

2016

- Sep
- Dec
- Mar
- Jun
- Sep
- Dec
- Mar
- Jun
- Sep
- Dec
- Mar
- Jun
- Sep

2019

Zuyderland (ORBIS)

Today

ISTI DMU

ISOIN

Literature Study

3 April - 28 April 2017
Zuyderland (ORBIS)

Real house data collection

Activity recognition on publicly available datasets

Detection of fault sensor events on data collected

Multiple resident activity module

Behavior analysis and personalized assistive system

30 January 2017 - ongoing HOMER

User Study
ESRs collaboration

- Privacy preserving standardized data models for Smart Home
- Integration of dialog for activity recommendation and personal coach for the residents
- Integration of sensor data from smart phone for accurate physical activity monitoring
- Personalized adaptive interface for the residents
Training Experiences

State of the art of assisted living RTD, Smart Home user needs and system requirements

- Gained insights about existing Smart Home and user needs for assisted living environment
- Introduction to CERTH smart home lab

Sensing and Monitoring for Assisted Living

- Learned scientific paper writing skills
- Feedback received from PIs on project update presentation

Context awareness, behaviour analysis, user-centred design and ethic

- Initiated collaboration with ESRs of SO4 and tentative secondment plan
- Discussion for real house sensor data of Casala Lab with DKIT partner and agreement of smart home data sharing
Publications


- Poster presentation on “activity recognition using context aware techniques in smart home domain” at 2017 MCAA Conference and General Assembly, Salamanca, Spain
Future Impact

- Improvement in technical and scientific skills
- Integration of activity recognition and user behavior module in various other projects at AIT
- ACROSSING experience help in writing research proposal for future projects in the field of AAL and Smart Environments
- Strong research network with ESRs, Project beneficiaries and partners
Thank you!
Questions?

**Acknowledgement**
This research work is funded by the EU H2020 Marie Curie Actions Programme