HCI Related Research @ Galatasaray University

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Agenda

- About Galatasaray University
- Peralab Research Group
- Activity Based Crowdsourced Sensing
- HCI Projects
  - Multimodal Interaction with Humanoid Robots
  - HCI based on EMG Signals
  - Measurement of Skin Empedance Variation in Response to Visual Stimuli

Background Information

- Phd in Computer Science, University of Twente (NL), 2009
  - Smart Surroundings Project
  - Visiting student University of Southern California (USA), 2007-2008.
- Postdoc, Boğaziçi University, 2009-2012
- Assistant Professor, Galatasaray University, since 2012.
- Research Projects:
  - Activity-Based Crowd-sourced/Participatory Sensing, Scientific and Research Council of Turkey Tubitak, 2013-2015 (National Young Researchers Career Development Program (CAREER))
  - Performance Evaluation of Classification Techniques for Activity Recognition on Smart Phones, Galatasaray University Research Fund (2013-2015).
  - SARAS: Sensor-Based Augmented Reality Application, Turkish Ministry of Science, Industry and Technology under the SAN-TEZ program, 2014-2015 (Researcher, PI: Dr. Gulfem Alptekin and Yapi Kredi Bank)

About Galatasaray University

- Galatasaray University, was first established in 1481 by Sultan Beyazit II as an Imperial School and was called the "Galata Sarayı" ('Galata Palace').
- In 1868, the school was opened under the name of "Galatasaray Mektebi Sultanisi" (Galatasaray High School),
- The university was established in İstanbul, Turkey in 1992, following an agreement signed with the presence of Presidents of Turkey and France
- Five faculties, two institutes, ten research centres, 200 faculty and 2500 students.

Peralab Research Group at GSU

- A research group under the Computer Engineering Department
  - 3 faculty, 2 research assistants, 10 graduate students
- Research Interests
  - Wireless Sensor Networks
  - Ambient Intelligence, E-health
  - Human Activity Recognition
  - Ambient Assisted Living
  - Biomedical Signal Processing
  - Medical Informatics
  - Multimodal HCI

Part 1: Human activity recognition using smartphone sensors

Activity-based Crowd-sourced Sensing
- a Tubitak funded project

- Activity Recognition on mobiles, mostly focuses on the development of applications for the end-user, such as monitoring fitness level

- Crowd-sourced sensing applications generally aim to collect geo and time-tagged environmental data, such as noise or air pollution levels

- **How can we combine Activity Recognition + Crow-sourced Sensing ?**
- Recognition of the activities of the crowds and communities rather than the activities of individuals,
- Enabling a new set of application domains in the fields of urban planning, urban transportation, targeted advertising

Activity-based Crowd-sourced Sensing

- a Tubitak funded project

ACTIVITY-BASED CROWDSOURCED SENSING

- Some areas will naturally have high concentrations of specific activities (such as running at a track or sitting in a stadium),
- By analyzing the activity of many people in the same area, applications can learn and tag places and times as popular for biking or other recreation, discover patterns and discover abnormal behaviors

APPLICATION DOMAINS

Transportation: Create transportation density maps of a city, real-time monitoring of city-wide activities

Leisure: Detect popular/ideal places and times for biking

Place tagging: Instead of obtaining the coordinates of a place, semantic information (context information) used to characterized the place (restaurant, gym, sports track, park)

Urban Planning: Detect if a newly constructed park, sports track is being utilized.

Objectives

Platform Development

- An activity based crowd-sourced sensing platform where the activities of the individuals related to movement, such as walking, running, as well as their transportation modes, travelling with a vehicle, will be recognized, with the sensors on the phones, such as accelerometer, GPS.

Dataset Creation

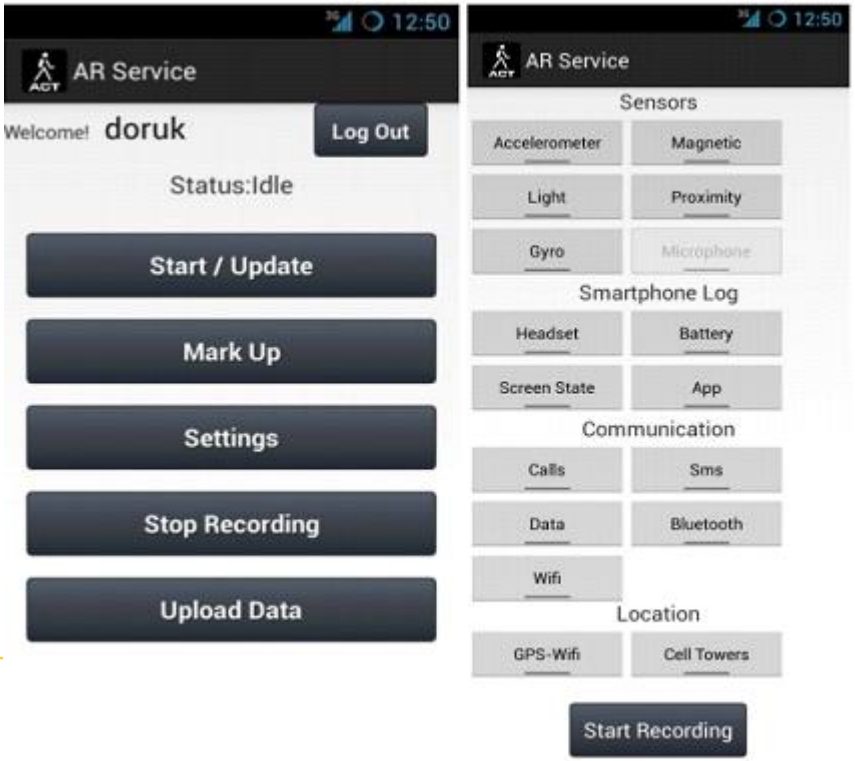
- A large-scale dataset will be created and will be shared with other researchers working in the domain and hence will constitute as a benchmark platform for the comparison of different studies in the field.

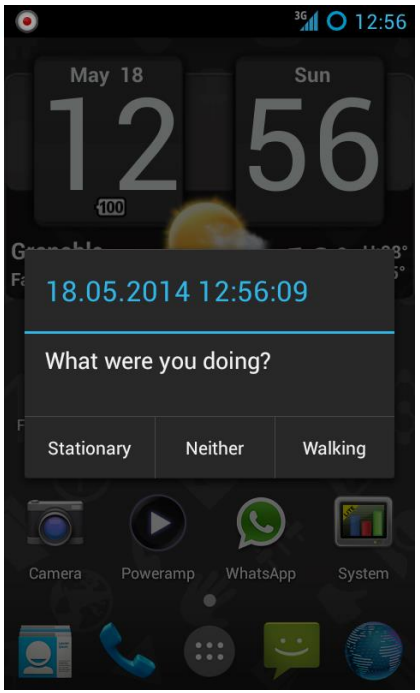
Analysis of the dataset

- Analyze the dataset particularly for activity-based place tagging, analyze crowd behaviors.

ARService Application

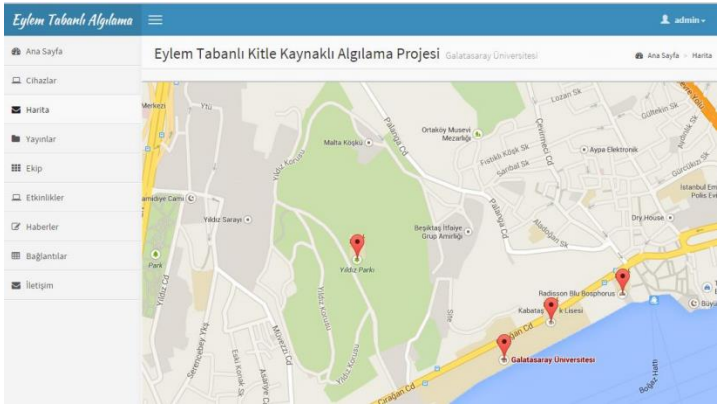
- Services
  - Sensors Recording: Activity, Location, Phone Activity
  - Real-time activity and phone position recognition: Hierarchical Decision Tree (~77% accuracy in real time)
  - Activity tagging
  - Upload data

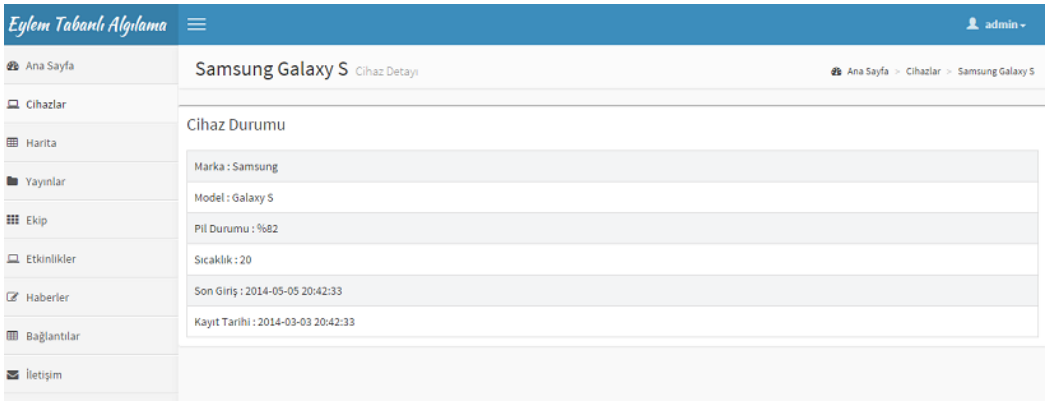




User Interfaces

- Both on the mobile and web interfaces, users can track their activities



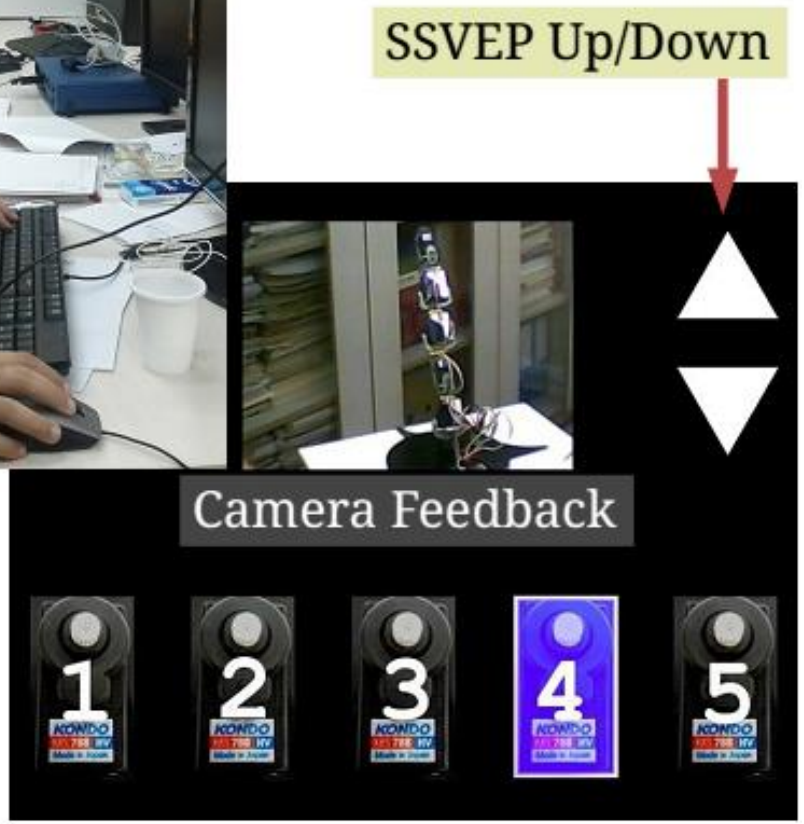


- Dataset Collection, Starting soon
  - Minimum 25 persons (2 countries, total 50)
  - Minimum 6 months of data collection
  - Both in Istanbul(TR) and Enschede (NL)
  - Locomotion and transportation activities
  - Will be made available to other researchers

Part 2: Human-Machine Interaction Research at GSU

Multimodal Interaction with Humanoid Robots

P300 SSVEP Robotic Hand Control BCI



Multimodal Interaction with Humanoid Robots

Emotiv Wireless EEG Headset

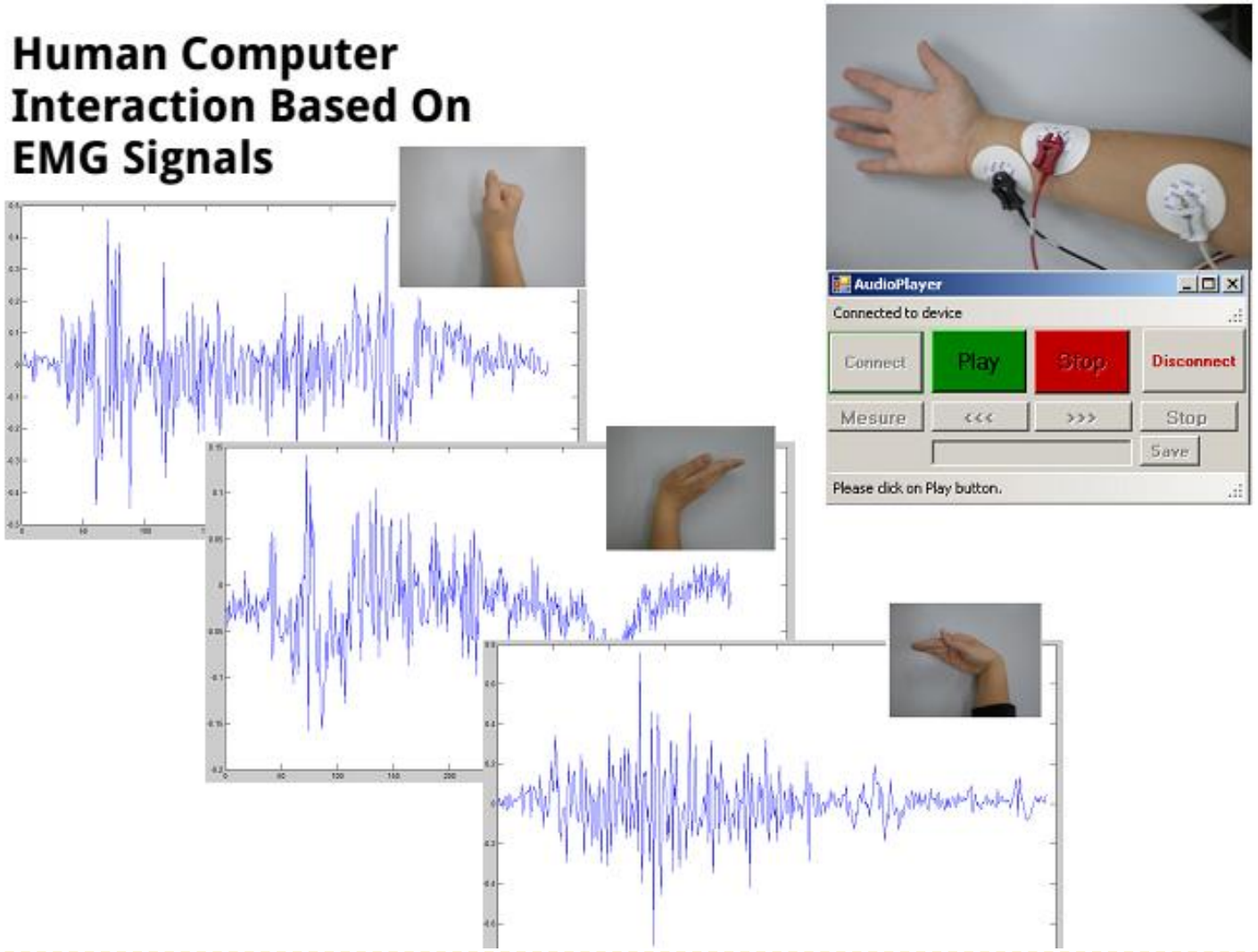
BeagleBone Black ARM Computer

Kondo KHR-3HV Humanoid Robot

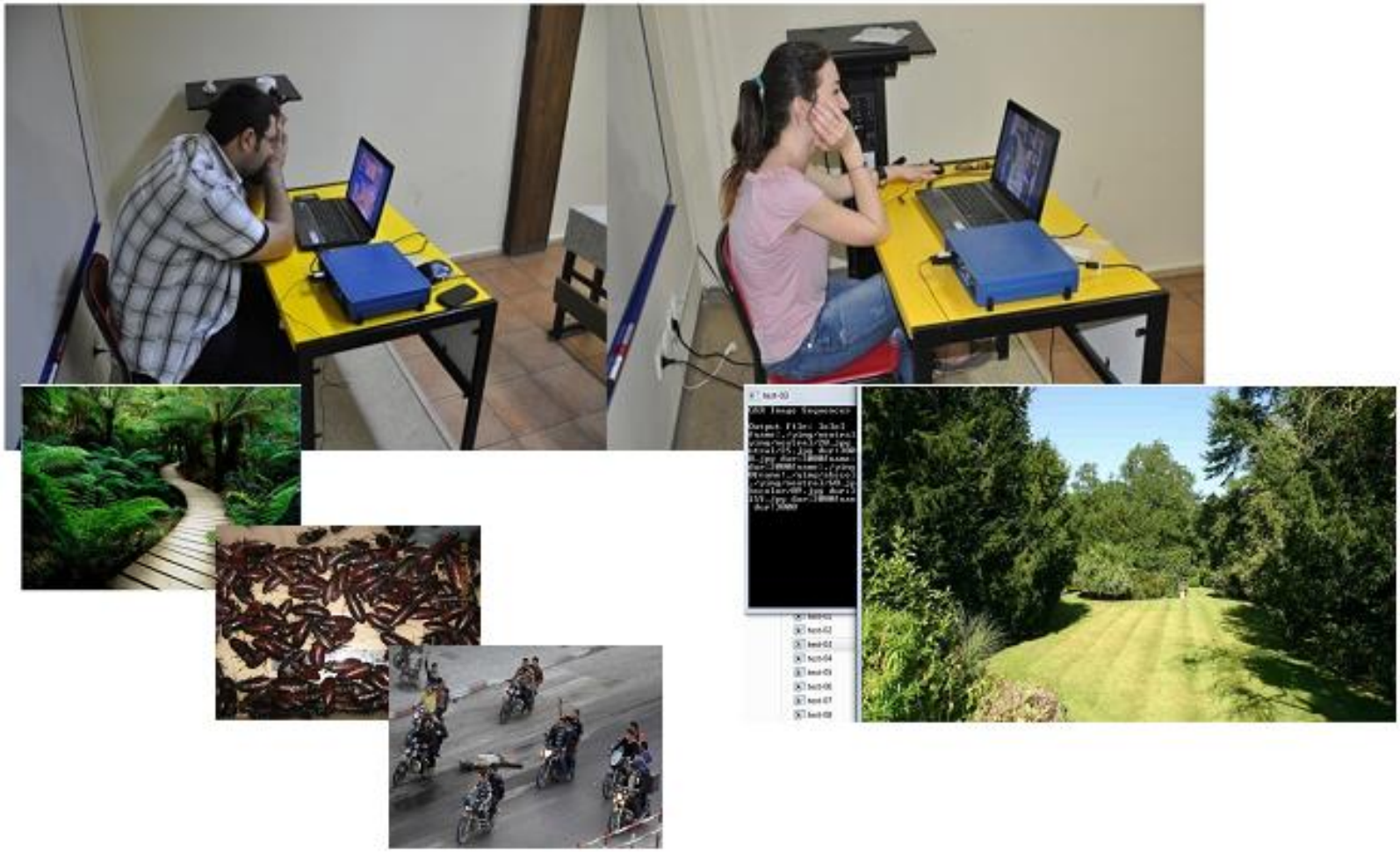
A Portable and Embedded SSVEP BCI System: emBCI

Implementation of a Brain-Machine Interface for Humanoid Robots usin EEG Signals

HCI based on EMG Signals



Measurement of Skin Empedance Variation in Response to Visual Stimuli



Networking Interest

- Data collection using ARService in Germany?
- Gamification for ARService
- Joint Graduate Programs
- Student and Researher Exchanges
- Joint Research Projects
  - Targeted Calls:
    - CHIST-ERA: Resilient Trustworthy Cyber-Physical Systems (RTCPS)
    - COST Actions
    - H2020-ICT-2015
    - Call For Factories Of The Future, H2020-FoF-2015

Thanks for listening

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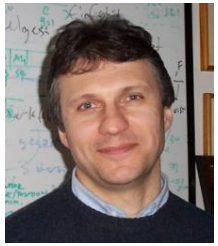

Questions?

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