Platforms for End User Development of Internet of Things and Humanoid Robot Applications

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University Course:
Progettazione di Interfacce e Valutazione dell’Usabilità

Group

Topic
- Human Computer Interaction
- End User Development for IoT
- Human Robot Interaction
- Accessibility Usability Evaluation
- Emotion Based User Interface
- Cross devices User Interface
End User Development in IoT Scenarios

Interactive devices and intelligent objects with different objectives installed in different contexts.

Impossible to foresee at design time which devices and objects users will exploit, how they will be organized and in which situations and for which objectives they will be used.

Empower end users to easily and independently customize the behaviour of their IoT applications.

Solution

Trigger – Action Rules
End User Development in IoT Scenarios

Possible Thesis

Recommender System for adaptation rules: personalized recommendations to help users in rule definition by combining the content-based approach (rules already created) and the collaborative one (which rules you are interested in)
Conversational Interfaces

Conversational interfaces enable people to interact with smart devices using conversational spoken language. It is a combination of automatic speech recognition (ASR) for converting speech to text, natural language understanding (NLU) to recognize the intent of the text, and text to speech (TTS) to provide answers to the users.

Possible Thesis

- Voice bot for creating personalization rules
- Voice bot to know the status of sensors in the home and to be informed when a sensor changes state
- Conversational Interface to provide assistance to older adults
- Conversational Interface and Learning Environment for children with Autism Spectrum Disorders (ASD)
Augmented reality (AR) is an interactive experience of a real-world environment where the objects that are placed in the real world are enhanced by computer-generated information.

**Possible Thesis**

- Augmented Reality application that shows IoT devices, allows to control them and displays the associated personalization rules.

- Elderly Assistance using Augmented Reality

- We are looking forward to receive new proposals!
Pepper Robot

Microphones
Four microphones detect which direction sound originates from.

Speakers
Speaks multiple languages, including English, French, Spanish and Japanese.

Depth-perceiving sensor
Infrared camera gives Pepper 3D “sight” of its surroundings, up to a distance of 3 metres (9.8 inches).

HD cameras
A pair of HD colour video cameras works together to give him close and long-range vision.

Arms
With anti-pinch articulations that let him make fluid and expressive movements.

Touchscreen
Used to communicate along with voice and gesture; displays abstract visual representations of its feelings.

Hands
Equipped with touch sensors for getting his attention, but unable to pick up objects.

Internal gyro
Provides information about the position of his body and how it is moving in space.

Base sensors
Three bumper sensors, a line of paired bore sensors and a sonar range finder help Pepper judge distances.

Omnidirectional wheels
Enable him to move around freely, including reversing and rotating on the spot, at speeds up to 3km/h (1.9 miles).
Pepper

Engaging

Help and support for seniors and children with disabilities

Training through the use of games

Emotion and Face Recognition. It makes the gaming experience more personal

User involvement through emotions

Reproduces feedback through arm movements and bright LEDs and sounds
We developed a musical game for memory stimulation of older adults, we would like to add the voice modality and to provide the robot with conversational skills.
People want to talk with pepper!

Develop a game to help children with autism spectrum disorder in learning how to manage money

Develop a multimodal application in order to stimulate positive emotions

Social Robot for Children Education

Let us know your proposal!
Lab Web Site: http://hiis.isti.cnr.it/

Publications: https://scholar.google.it/citations?user=ONUzw0gAAAAJ&hl=it

- **Personalization of context-dependent applications through trigger-action rules**
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  Proceedings of the 14th International Conference on Mobile and Ubiquitous Multimedia, 2015

- **Supporting end-user debugging of trigger-action rules for IoT applications**
  M Manca, F Paternò, C Santoro, L Corcella
  International Journal of Human-Computer Studies 123, 56-69, 2019

- **Trigger-Action Programming for Personalising Humanoid Robot Behaviour**
  N Leonardi, M Manca, F Paternò, C Santoro
  ACM Conference on Human Factors in Computing Systems (CHI'19), Glasgow

- **The Design of Web Games for Helping Young High-Functioning Autistics in Learning How to Manage Money**
  S. Caria, F. Paternò, C. Santoro, V. Semucci
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