GUIDE: Personalisable Multi-Modal User Interfaces for Web Applications on TV

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In a nutshell

How can we make Smart TV more accessible and usable (e.g. for elderly users)?

- Compensate for individual user limitations and address preferences
- Automatic personalisation („Smart“ accessibility)
- Efficiently targeting heterogeneous user groups
- Reach new users and customers
- Available as open source

GUIDE User Interface Adaptation Framework

User(s)

Capabilities
Preferences
Age-related impairments
Experience
Context

Smart TV

Adaptation!

New TV-based services
Lack of user-centred design knowledge
New interaction technologies
Accessibility (APIs)
Technical constraints of platforms & standards

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User profile-based multi-modal adaptation

Modal input transformation

Speech
Remote control
Gestures
Second screens

Fusion

Application Logic

Modal output transformation

Graphical User Interface
Audio, Text-to-Speech
Haptic feedback
Virtual Characters

Multimodal Adaptation

User model & profiles
· User profile management
· Multi-modal data fusion
· User input mapping
· Dialog management
· Contextual reasoning
· UI configuration

- Semantic UI Mark-up: WAI-ARIA
- API calls to sync

- Abstraction of application’s UI based on UIML

- User Interface ontology
- Inter-process communication (IPC)
- C++ API

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Main challenges

1. How to measure user properties and represent them?

2. How to integrate legacy applications’ user interfaces and extract UI/service semantics?

3. How to map user properties to UI parameters?
Measuring the user: User Initialisation

- Start adaptation based on a strong initial estimation of user properties -> User Initialisation
- A Framework service for
  - Onetime guided profile creation
  - Introduction to system features
- Measuring user capabilities and preferences
- Generates user profiles and submits to Adaptation Core

By completing this process, your TV will know your preferences and it will be easier to interact with it. This interaction process is simple and brings many advantages.

Use the up and down arrows to match the number on the right, to the number on the left. Select "Next" when you are done.

Tutorial and guidance by Virtual Character

Interactive tests (here: Colour blindness)
User model: Mapping user properties …

- Developed and calibrated in user studies
- Modelling impairments and preferences
  - Vision (colour blindness, ...), motor functions (dexterity, grip strength, range of motion, tremor), hearing, cognitive parameters
- Clustering of user data and simulating cluster centers
- Generate recommendations for each cluster
- At runtime:
  - Find nearest cluster center for measured user (-> adaptations)

User trial data

Clusters based on range of abilities of users

Adaptations

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Examples for adaptation scenarios

- Multi-modal interaction
- Adaptation of Graphical User Interface
  - Font size, color scheme, layout, ...
- Contextual support
  - 3D Virtual Characters
  - Automatically generated support dialogs
  - Sensing: e.g. render font size based on screen distance, etc.
- Automatic user login (face recognition)
- Screen cursor motion
- Text-to-Speech
- Second screens as alternative UI component

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Integration of HTML web applications

- UI semantics: WAI-ARIA mark-up to be provided by developer
- Temporal synchronisation of Application and Adaptation Core (API)
  - **Application phase**: Perform internal state changes, update UI
  - **Adaptation phase**: Interpret user input, adapt UI
- Support for TV-oriented front-ends

From HTML to UIML:

```xml
<?xml version="1.0"?>
<uiml>
  <presentation base="HTML_4.01frameset_Harmonia_0.1"/>
</uiml>
```

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Demo Video

Demo Video…
Open source developer portal

- GUIDE Framework available open source
- Code, documentation, examples, programming reference
- Interested external institutions are invited to evaluate
- More information available on www.guide-project.eu
Future work

- Extend contextual support for users
  - Generate dialog-based interventions for more exceptional situations during interaction
- Study multi-user adaptation scenarios
- More advanced support for mobile devices
  - Adaptations on second screens
- First public experimentation and testing with external partners
- Validation of the Framework in 2 user studies in Spain, UK