



Work on Model-based UI at HIIS / ISTI-CNR


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Model-based User Interface Design

- Motivations
- First generation
 - UIDE, Humanoid
- Second generation
 - Mastermind, Adept, Mobi-D
- Third Generation
 - UIML, TERESA, PUC



Abstraction Levels in Interactive Systems

- Task and object
 - – *I want to select a work of art*
- Abstract Interface
 - – *Single selection object with high cardinality*
- Concrete Interface
 - – *List Interaction object with X elements*
- Implementation
 - – *List object in Java or XHTML or*

Possible Transformations

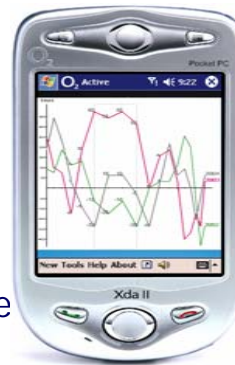
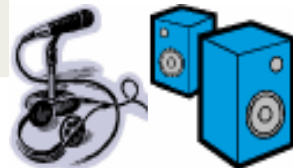
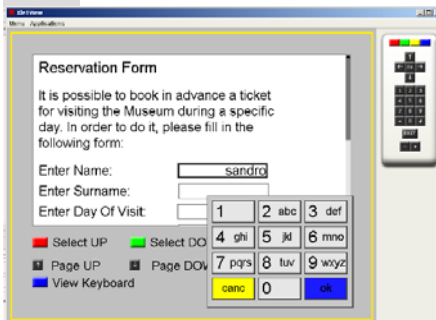
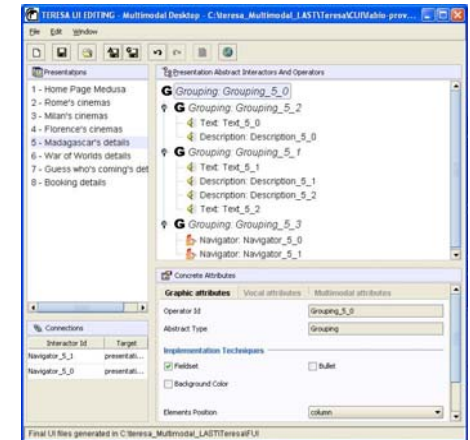
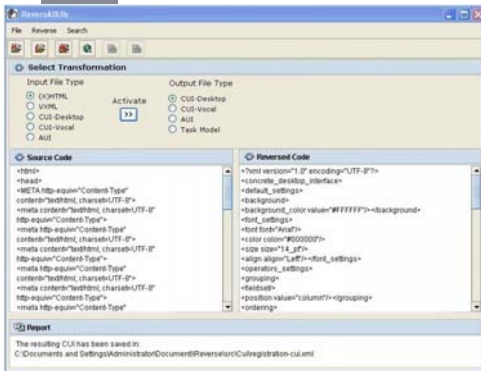
Reverse

Forward

Task Model

Abstract Interface

Concrete Interface



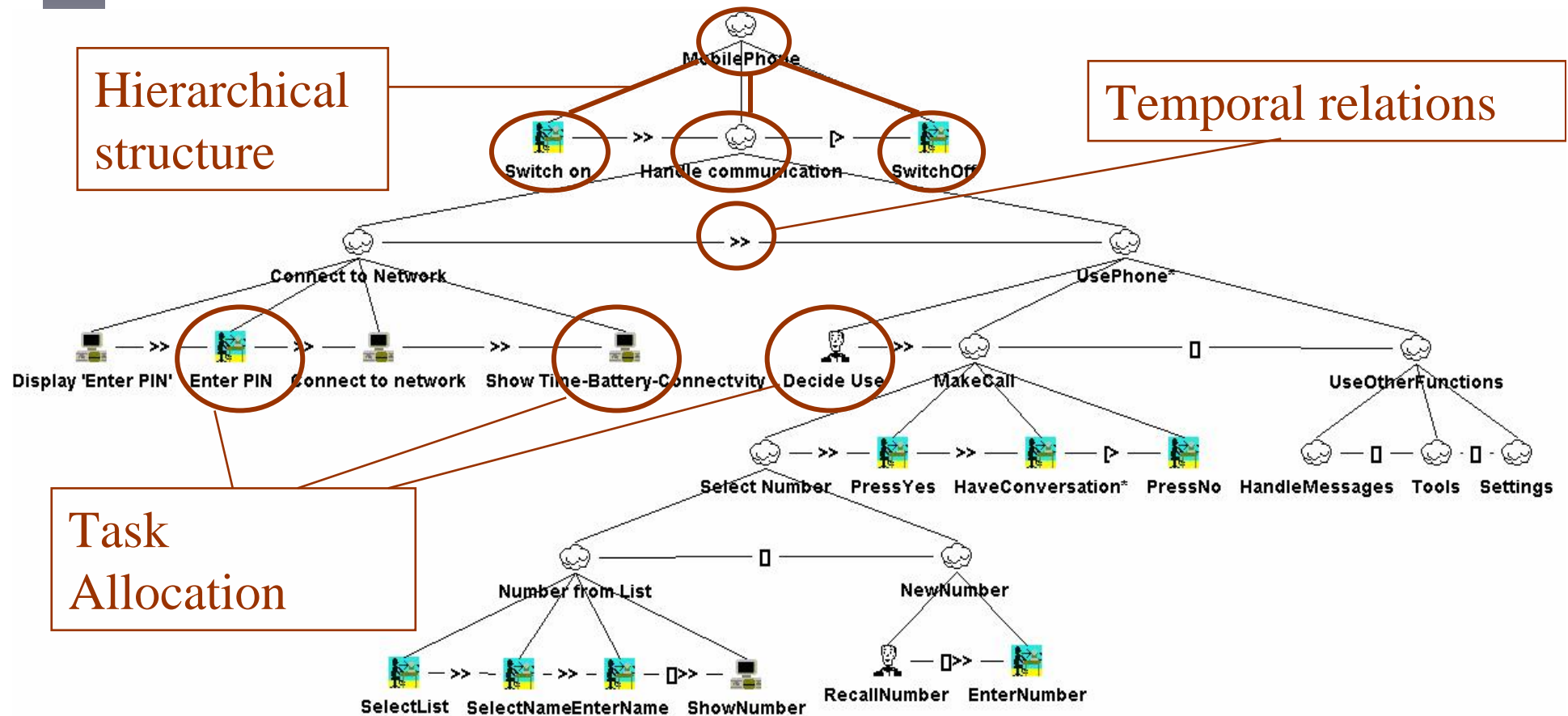
base IS1



Multiple Levels of Abstraction Advantages

- Focus on the main design choices
- Linking semantic information and implementation elements
- Semantic Web vs Interaction Semantic
- Interoperability through many possible implementation languages

The ConcurTaskTrees Notation for Task Models



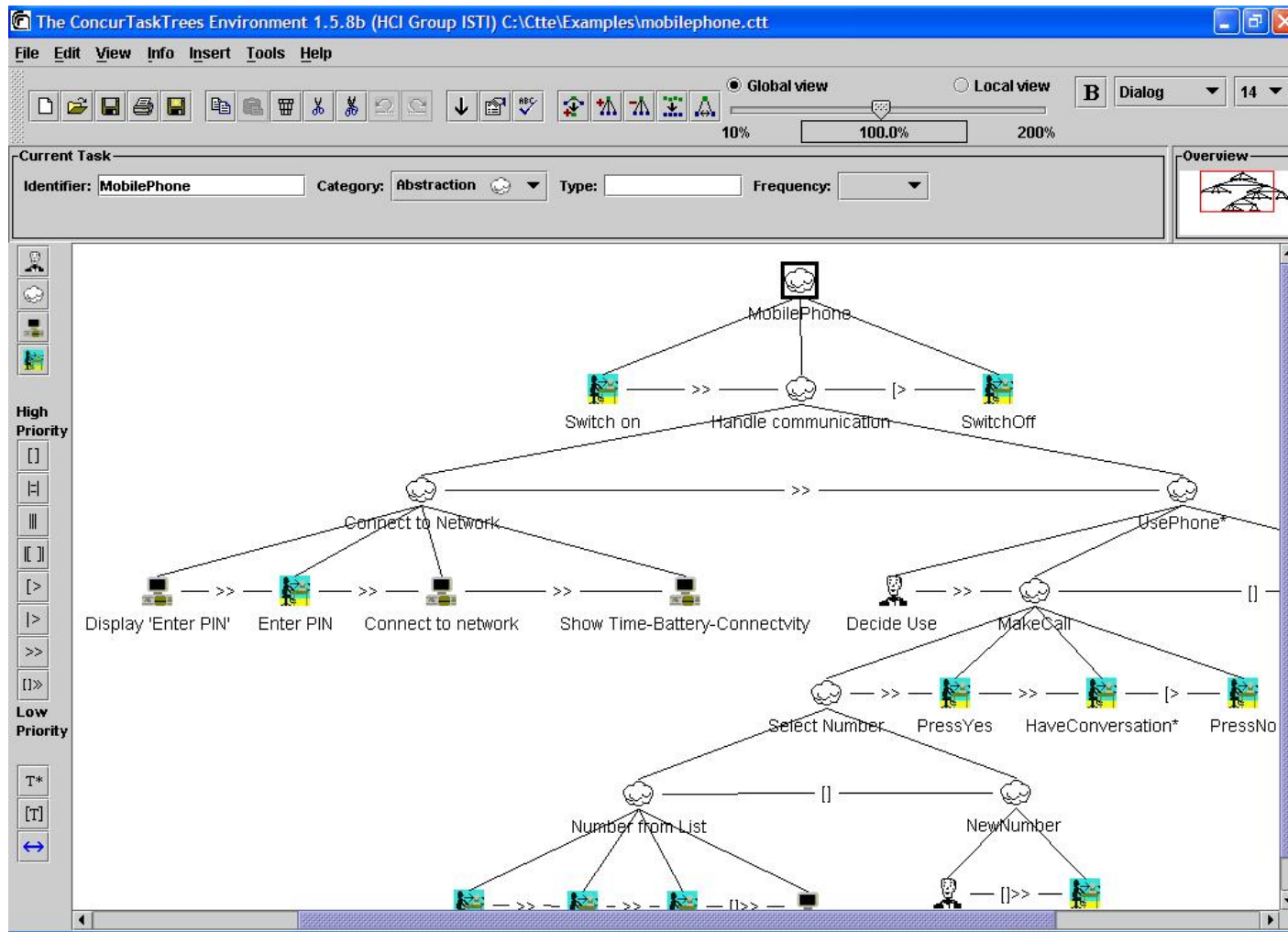
Specifying Platform-dependent Tasks

The screenshot displays the 'The ConcurTaskTree Environment 2.3' interface. The main window shows a task tree with a root node 'Access_general_info' branching into 'Select_access_to_gen_info' and 'Show_museum_in...'. The 'Task Properties' dialog box is open, showing the following details for the selected task:

- Identifier: Select_access_to_gen_info
- Name: (empty)
- Category: interaction
- Type: Control
- Frequency: Medium
- Platform: Pda (unchecked), Desktop (checked), Mobile (checked), Vocal (unchecked), others (button)
- Description: (empty text area)
- Options: Iterative (unchecked), Optional (unchecked), Part of Cooperative Task (unchecked)
- Precondition: (empty)

The dialog box also includes 'Update', 'Cancel', 'Clear', and 'Ok' buttons at the bottom.

The user interface of the CTTE tool - DEMO



Task model - based design

1. Analysis of temporal operators amongst tasks



Identify structure of dialogues

2. Analysis of each task (objects, attributes, ...)



Choose suitable interaction objects

Design Practice

The image shows a screenshot of the Times Online website from February 11, 2005. The page is annotated with four red boxes and labels:

- Relation:** A box around the search bar and navigation tabs (ARCHIVE, CLASSIFIED, SHOPPING, PROMOTIONS, GAMES, FAST TIMES, MY TIMES, WEATHER).
- Ordering:** A box around the top navigation bar and the main headline area.
- Grouping:** A box around the left-hand navigation menu (Home, News, Britain, World, Business, Your Money, Sport, Comment, Travel, Entertainment, Law, Crossword, Driving, Property, Women, Health, Jobs, Food and drink, Books, Education, Student, Sunday Times, Site Map).
- Important!:** A box around the main headline area, including the photo of Charles and Camilla, and the 'OTHER TOP STORIES' sidebar.

The main headline is titled "Charles puts affair in order" and includes a photo of Charles and Camilla. Other headlines include "Iraqis take over danger zone" and "Labour starts the hard sell". The sidebar contains "OTHER TOP STORIES" and "QUOTE OF THE DAY".



Communication-oriented Composition operators

- **Grouping:** a set of elements logically related to each other
 - **Ordering:** existing of an order among interactors (i.e. temporal)
 - **Hierarchy:** a logical hierarchy among a set of interactors
- **Relation:** One interactor related to a group of other interactors (i.e. disabling them)

Structuring the User Interface

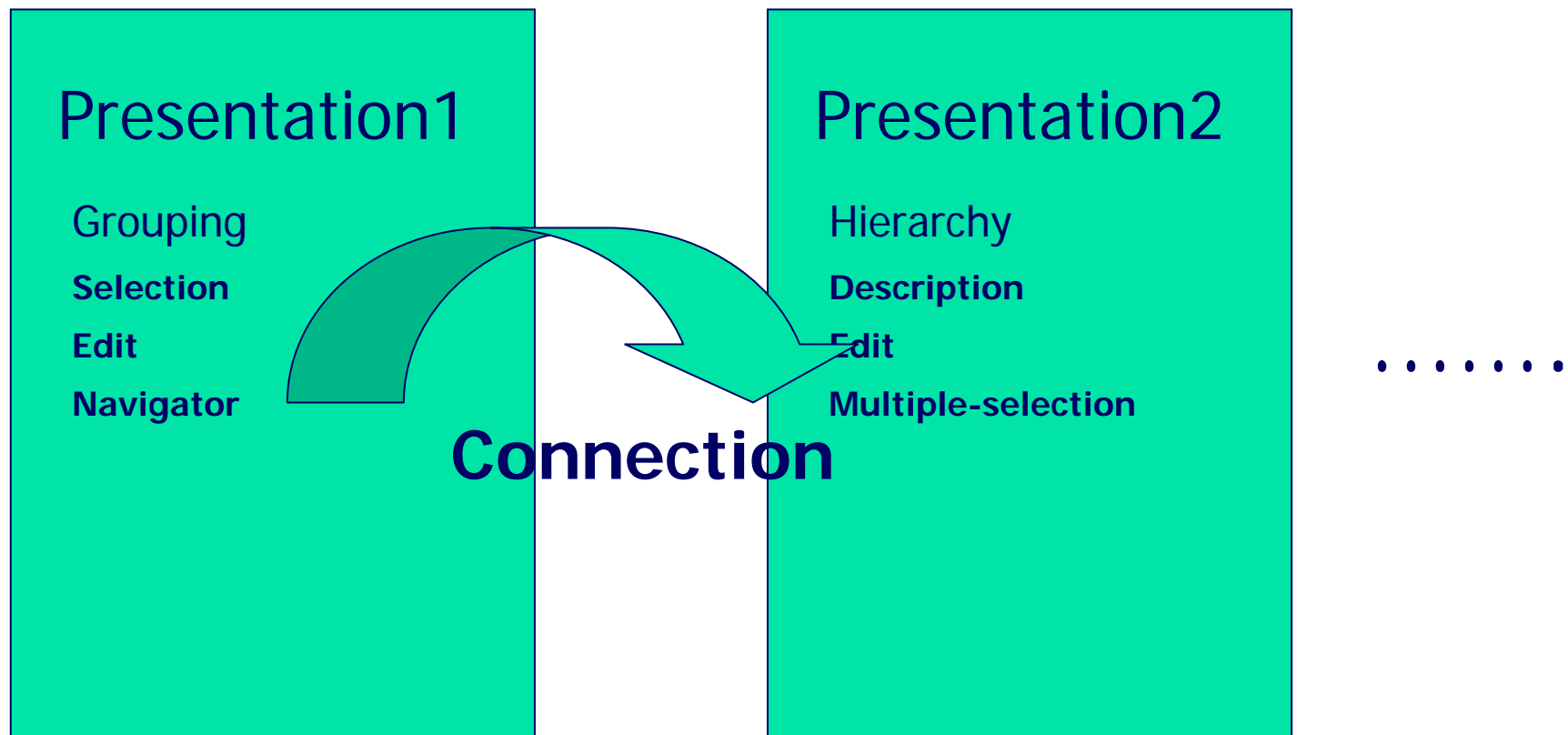
- Grouping – Example: Task decomposition -> grouping of corresponding interaction techniques
- Ordering – Sequential communicating tasks -> adjacent interaction techniques
- Relation – Control tasks (one to many relations)
- Hierarchy – Frequent tasks -> More space or larger attributes

TERESA XML

- Two platform-independent languages : task (CTT) and abstract interface
- One level (concrete interface) represented through a number of platform dependent languages
- Designers aware of the potential platforms (not devices) early on in the design process
- Method allows developers to avoid dealing with a plethora of low-level details (transformation from concrete description to implementation is automatic)
- Easy to add support for new implementation languages

The Structure of the Abstract User Interface

User Interface



Example of platform-dependent concrete interactor choice

EXAMPLE:

Single choice abstract interactor

Cardinality	Desktop Computers	Mobile Phones
Low cardinality	Radio Button	Radio Button
Medium cardinality	List Box	Drop Down List
High cardinality	List with scrollbars	Drop Down List

Example of platform-dependent composition operator implementation

EXAMPLE: Grouping Operator

- Desktop Computers
 - Fieldset
 - Bullet
 - Background Colour/Image
 - Column-oriented organization
 - Row-oriented organization
- Mobile Phones
 - Unordered List in Column
 - Fieldset

The Authoring Environment

The screenshot shows the TERESA UI EDITING application window. The interface is divided into several panes:

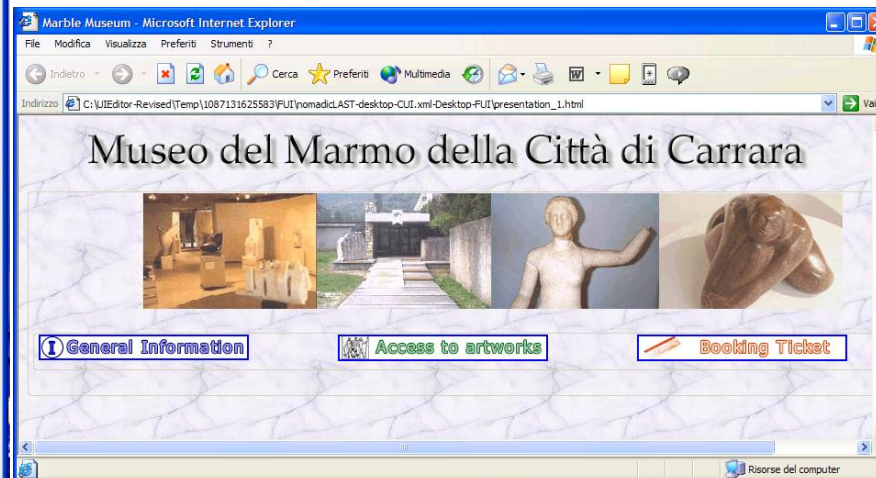
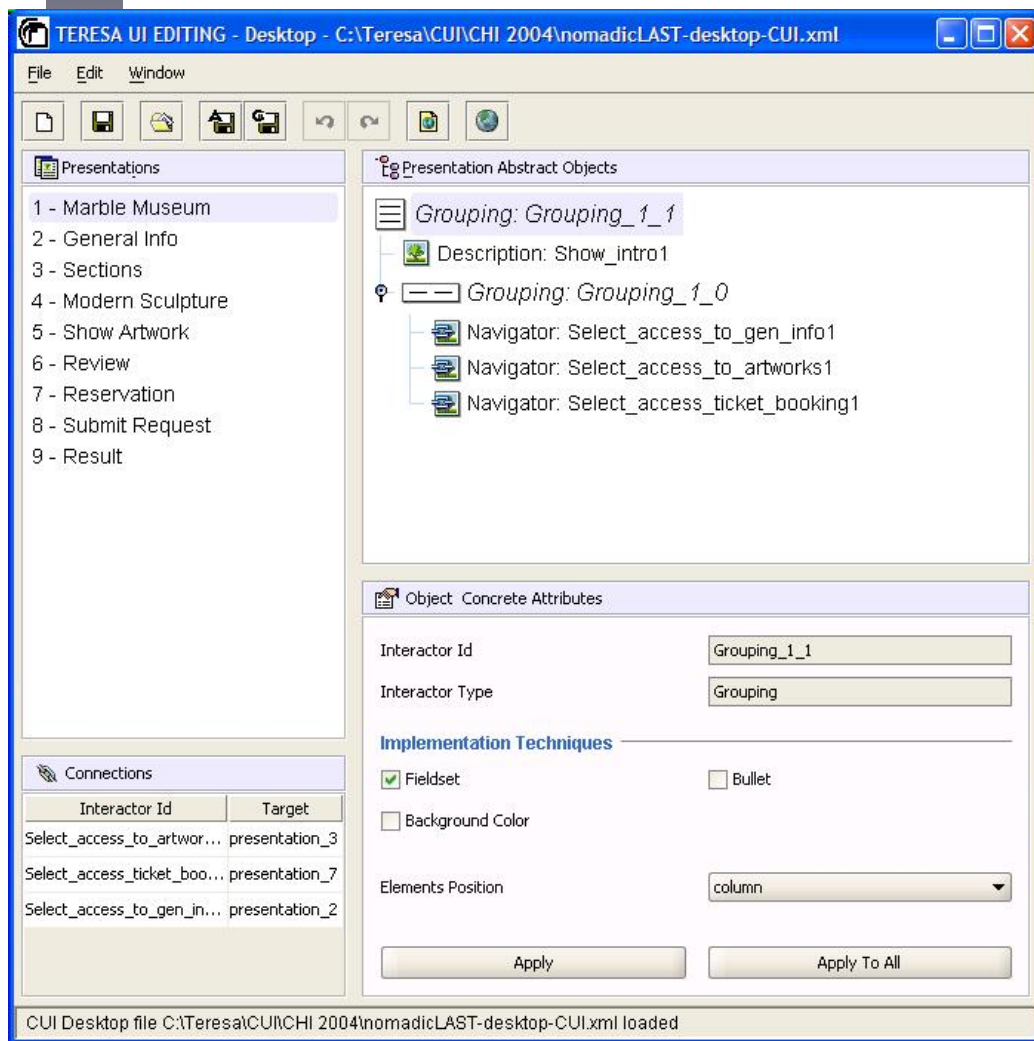
- Presentations List:** A list on the left side containing 8 items: 1 - Home Page Medusa, 2 - Rome's cinemas, 3 - Milan's cinemas, 4 - Florence's cinemas, 5 - Madagascar's details, 6 - War of Worlds details, 7 - Guess who's coming's det, 8 - Booking details.
- Connections List:** A table at the bottom left showing interactor connections.
- Presentation Abstract Interactors And Operators:** A tree view in the center-right showing a hierarchy of groupings (Grouping_5_0, Grouping_5_2, Grouping_5_1, Grouping_5_3) and their associated text and navigator elements.
- Concrete Attributes:** A panel at the bottom right showing configuration options for the selected element, including Operator Id, Abstract Type, Implementation Techniques, and Elements Position.

Annotations with arrows point to these specific areas:

- Presentations List:** A blue arrow points from the text label to the list.
- Connections List:** A red arrow points from the text label to the table.
- Presentation Abstract Description:** A green arrow points from the text label to the tree view.
- Element Concrete Description:** A pink arrow points from the text label to the Concrete Attributes panel.

Interactor Id	Target
Navigator_5_1	presentati...
Navigator_5_0	presentati...

Example of TERESA-generated User Interface- DEMO





Vocal Interaction

- Characteristics: linear, not persistent, faster and more natural for some operations
- Provide feedback to check the status of application
- Brief prompts and short lists of options to reduce memory capability
- Management of events (no-input , no-match, help)

Speech implementation of composition operators

Grouping:

- Insert a sound
- Insert a pause
- Use some keywords
- Use a specific volume of synthesizer voice

Ordering

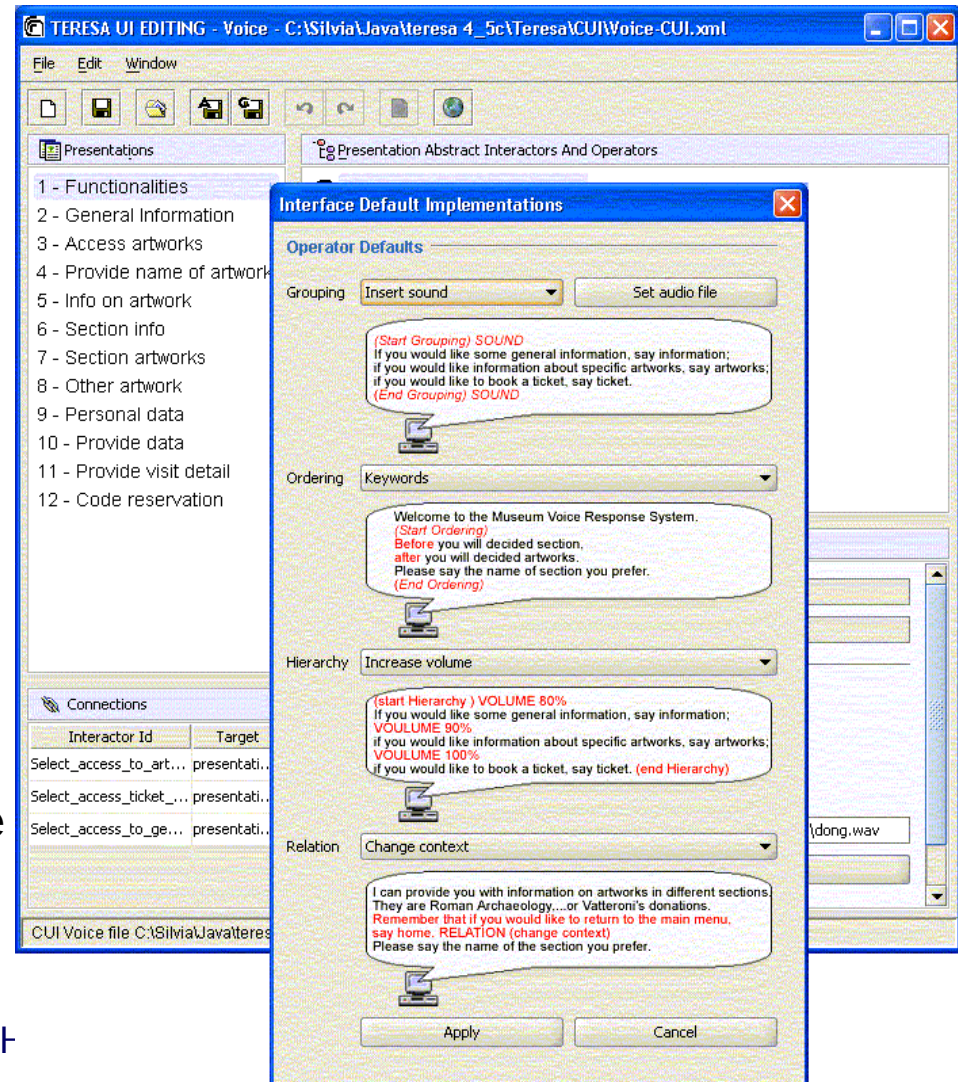
- Alphabetical order
- Use some keywords

Relation

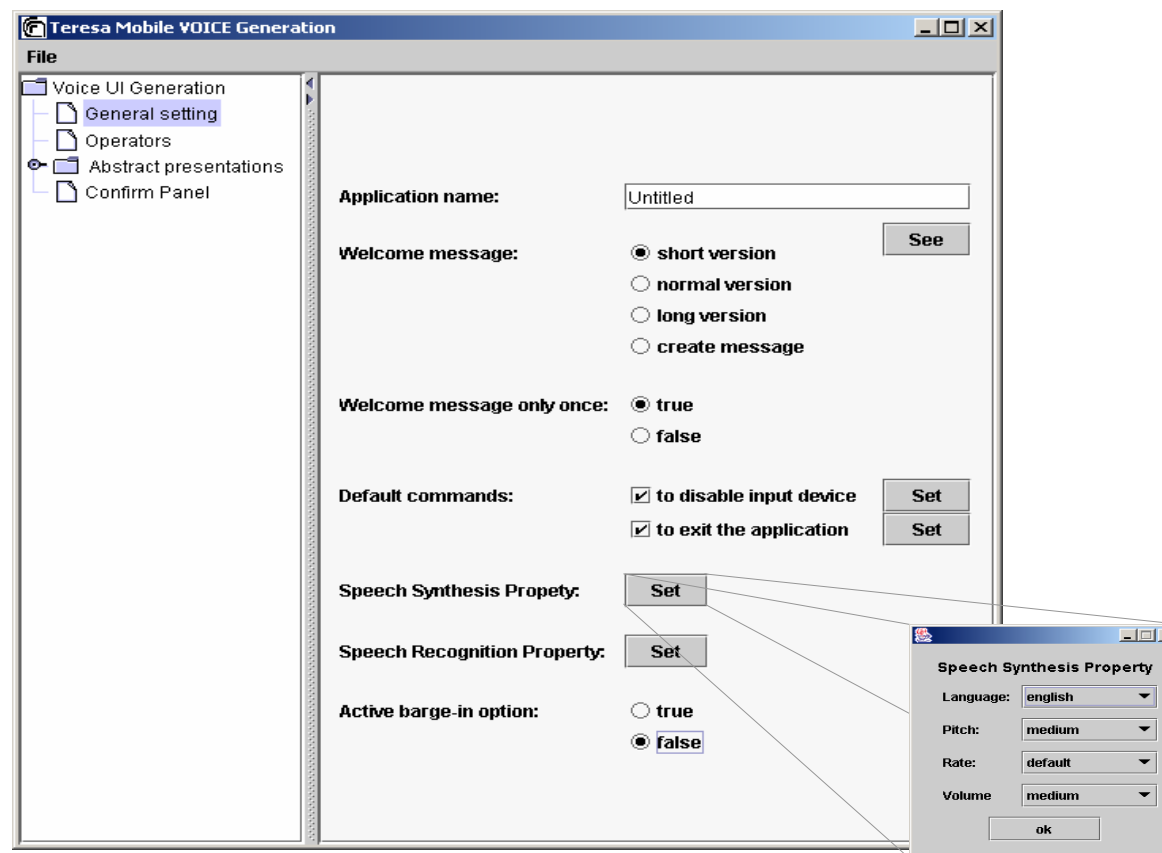
- Change context (change type of menu)

Hierarchy



- Increase or decrease the volume of synthesizer voice



Specifying general parameters for all presentations



VUI vs GUI

Fifth presentation	 System:	The Boat has been achieved through the subtle divisions of the planes enveloping its central part, which is only rough-hewn; the material is white marble. <i>(Five second pause)</i> Remember that if you would like to return to the main menu, say home or if you would like to go back to the previous menu, say back.
	 Caller:	Home



- Welcome message
- Management of no input event
- Provide feedback
- Description Object
- Composition operators



Adding support for a new multi-modal platform

- Define new concrete description languages (as refinement of the common abstract one)
- Identify target implementation language(s)
- Identify how to support multi-modality



Generation of Multi-Modal Interfaces

- X+V – W3C standard
- Supported by OPERA and NetFront Browser, also for PDAs
- EMMA not supported by any public tool
- SMIL not interaction oriented
- X+V application structured into three parts (document definition, head and body)



Design of MultiModal Support

- CARE properties (Complementarities, Assignment, Redundancy, Equivalence)
- Application to composition operators, interaction and output-only elements
- Interaction structured into prompt, input, feedback
- Identify meaningful solutions, provide suggestions

Design of Multimodal Support (graphical+voice)

- Identification of new platforms (multimodal desktop, multimodal PDA, ...)
- Design how to support composition operators and interactors
- multimodal desktop:
 - composition operators -> graphically supported
 - interactors -> graphical prompt, input either graphical or vocal, feedback in both modalities
- multimodal pda:
 - composition operators -> supported both graphically and vocally
 - interactors -> redundant/complementary prompt, input either graphical or vocal, feedback in both modalities

The Authoring Environment

The screenshot displays the TERESA UI EDITING environment, which is a multi-modal desktop interface. The main window is titled "Booking details - Opera" and features a large "MEDUSA Al Cinema" logo. Below the logo, there is a "Booking options" section with the following fields:

- Select day: []
- Select time: 6pm, 8pm, 10pm
- Place's row: Row A
- Place's position: Position 1

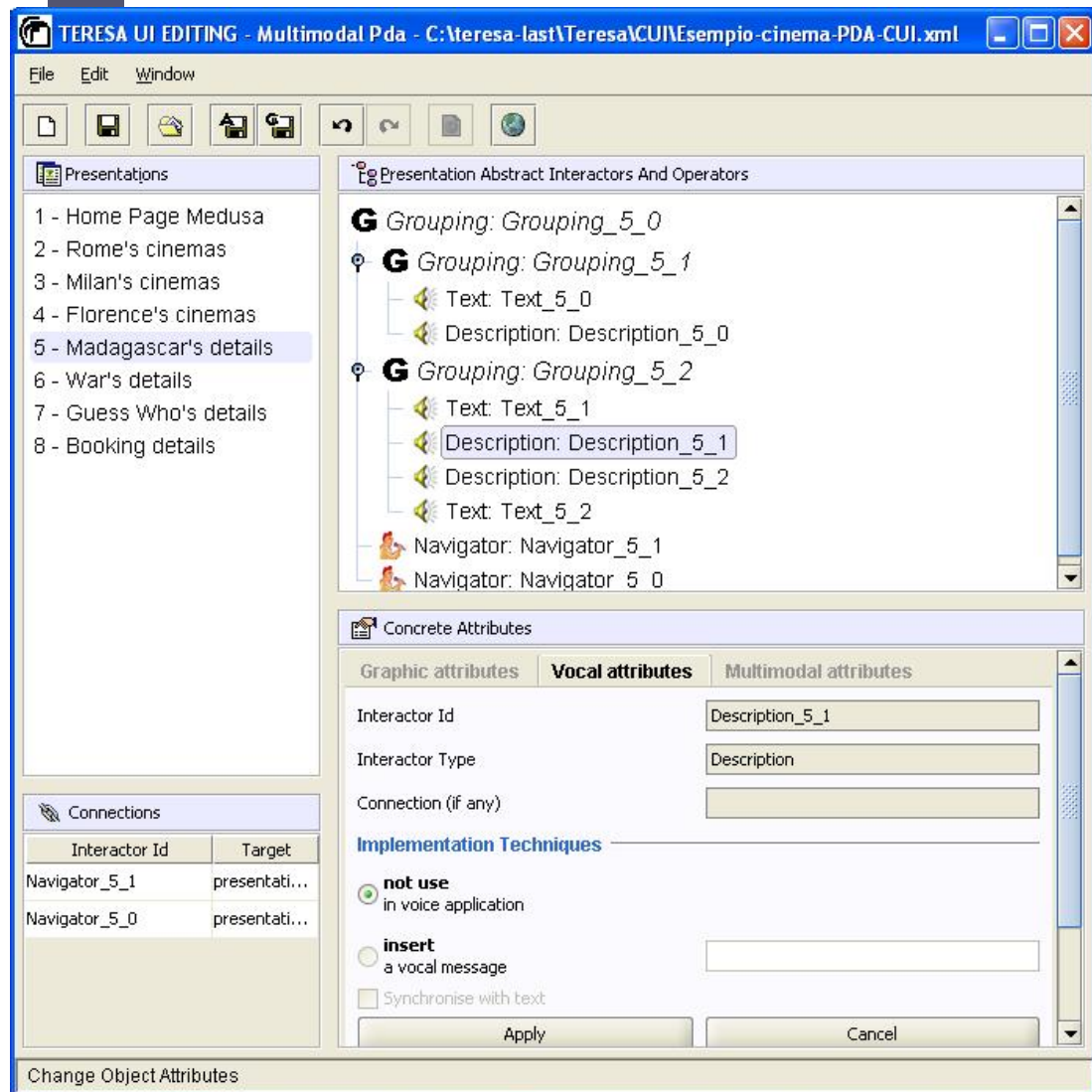
At the bottom of the booking options section, there are two buttons: "Back to Home" and "Confirm".

The left side of the interface shows a "Presentations" list with items like "1 - Home Page Medusa", "2 - Rome's cinemas", etc. Below this is a "Concrete Attributes" panel with tabs for "Graphic attributes", "Vocal attributes", and "Multimodal attributes". The "Multimodal attributes" tab is selected, and it contains sections for "Input", "Prompt", and "Feedback", each with radio buttons for "Graphical assignment" and "Redundancy".

Blue boxes and arrows highlight the "Multimodal attributes" panel and the "Booking options" section. A text box on the right side of the screenshot reads: "Please enter your booking details, remember you can say back to return to the home at any time".

Multi-Modal attributes definitions

The Authoring Environment

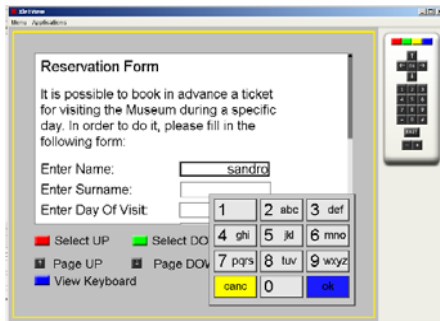


*Madagascar, 2005. Director: ... Written by: ...
Genre: animation
Plot: In new york central zoo, four friends...
You can say book to buy places for this movie, or back to go to home page*

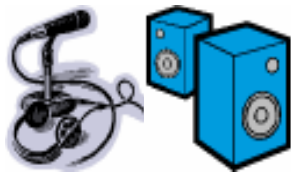


MultiModal TERESA

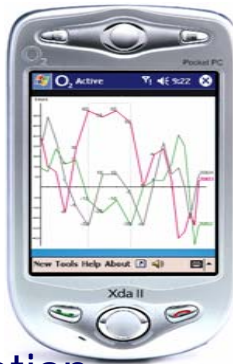
<http://giove.isti.cnr.it/teresa.html>



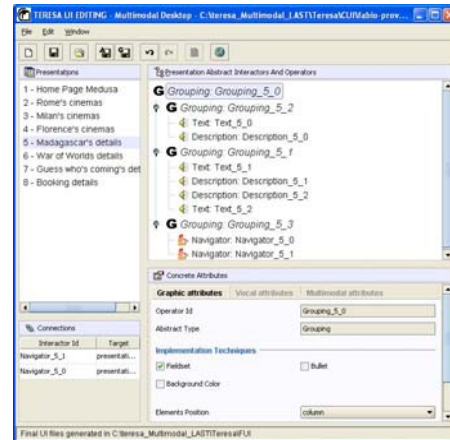
Digital TV



Vocal interfaces (VoiceXML)



Direct Manipulation XHTML/SVG



Mobile XHTML MP



Graphical+Gesture C#



Form-based XHTML



Graphical+Vocal X+V

MARIA XML Requirements

(**MARIA – Model-based Authoring enviRonment
for Interactive Applications**)

- XML-based Languages with Schemas
- Support for Abstract Data Types
- More engineered and powerful language (e.g. Pacman)
- Able to generate user interfaces including complex Javascripts and Ajax scripts

MARIA Tool Requirements

(**MARIA – Model-based Authoring enviRonment
for Interactive Applications**)

- New Authoring Environment
 - Integrated Support for Web Services
 - Mappings WSDL/LUI
 - Generation/Refinement
 - Not only traditional top-down approaches
 - Transformations not hard-coded but defined externally and performed with XSLT
 - Integration of BPMN/BPEL with Model-based UIs.



Agenda

- How to Manage JavaScripts
- Integration of wider set of interaction modalities in multi-device environments
- Multi users applications
- Integration of model-based user interfaces with Semantic Web
- ServFace and OPEN