Dynamic User Interfaces

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Outline

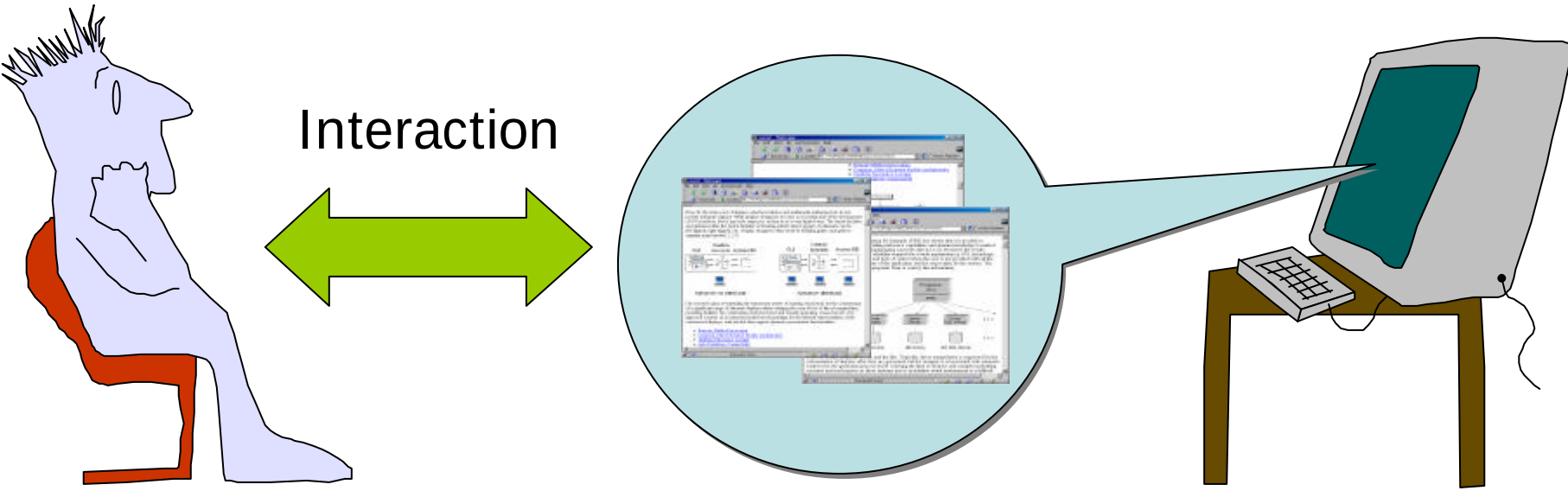
- Why Graphical User Interfaces (GUI) ?
- Human-Computer Interaction
- Modeling GUIs
- Dynamic Web-Based User Interfaces
- Dynamic Web Page Authoring
  - PEGASUS
  - PERSEUS
  - DESK
- Conclusions

Why GUI?


Kodak


¡NUEVO!
él escribe
ViaVoice 98
EXECUTIVE
él escribe
¡NUEVO!
ViaVoice 98
HOME

Why GUI?

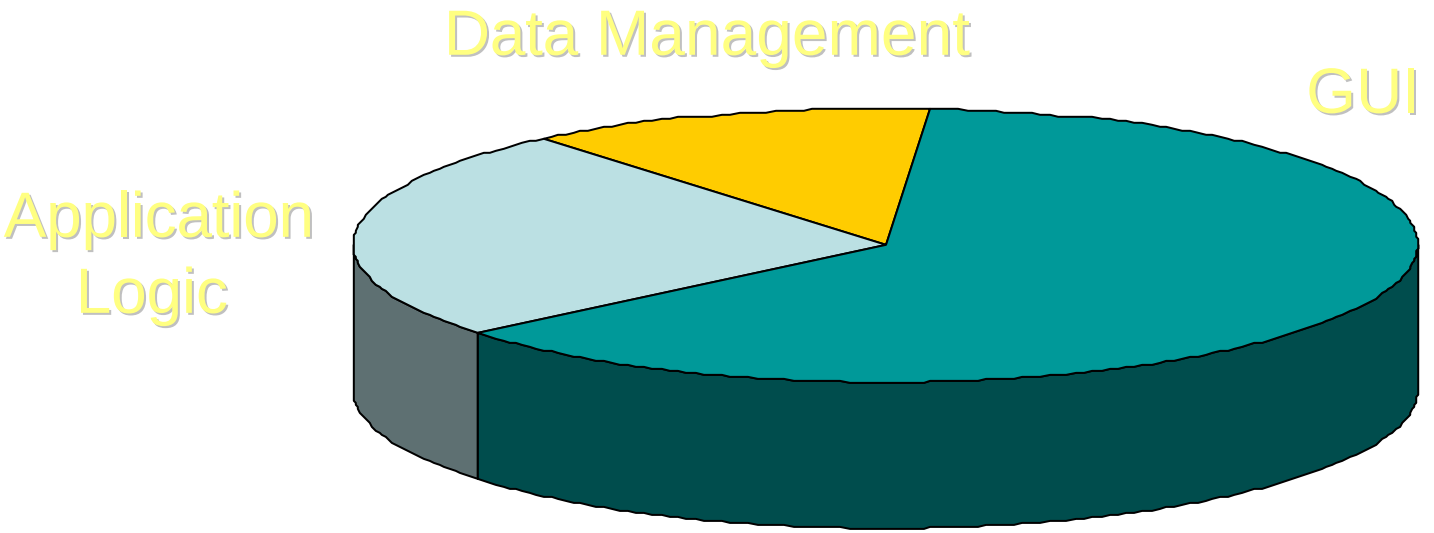


End-User Graphical User Interface Computer

Why GUI?

- The GUI is a chief component in mostly today's software development projects
- It determines the success or failure of any software application
- Almost 48% uptake of code lines correspond to GUI
  - [Myers, 92]

Why GUI?



70% uptake of total software development effort concerns GUI design

Human-Computer Interaction

- GUI increasing led the CS world to get more involved in GUI design as time goes by
  - New discipline appears: HCI
    - Psychology
    - Sociology
    - Design
    - Artificial Intelligence
    - Software Engineering
    - Ergonomics
    - …
- Main Topics
  - Cognitive Aspects of Interaction
  - Usability
  - Accessibility
  - User-Centered Design
  - Devices
  - AI applied to new interaction algorithms
  - …

Modeling GUIs

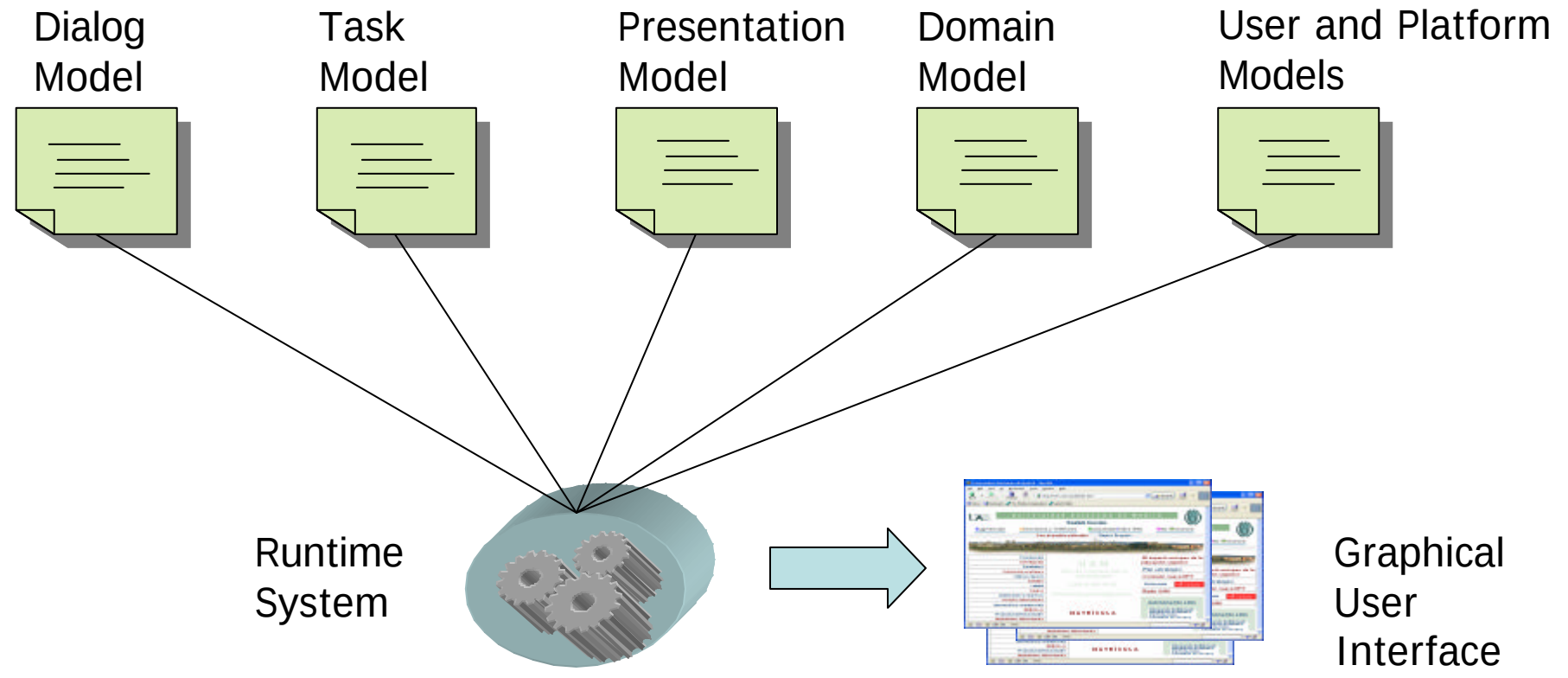
- Creating and maintaining GUIs takes too much time
- Same problem than past software crisis about amounts of GUI code to manage
- Then appear Interface Builders and GUI programming libraries
  - These tools manage the Interface information all together
  - The GUIs are still difficult to maintain
  - GUI programming results complex, and some aspects cannot be managed very well
    - User's Tasks
    - User's Interaction Models
    - …. In general: **Interaction Behavioral information**

Modeling GUIs

– Solution
  - Split up the GUI information into different conceptual levels
  - Create specifications for GUIs creation, independent of the programming language
  - Provide with automatic mechanisms for GUI generation and maintenance

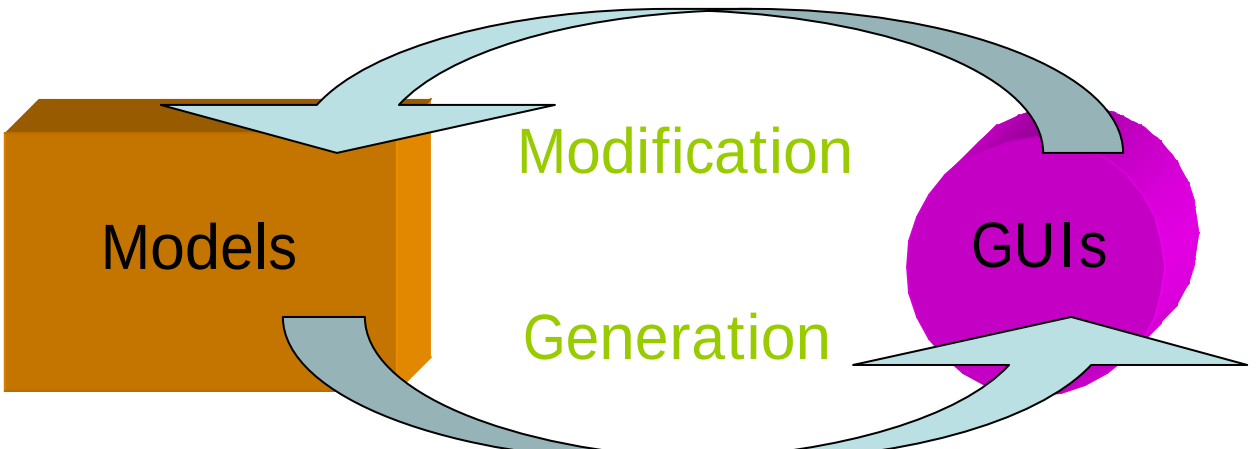
Model-Based User Interface Approach

Modeling GUIs



Modeling GUIs

- MBUI Approach
  - Allows for defining, separately
    - Interface knowledge
    - Interface presentation
  - Is more efficient regarding the production cycle
  - Allows for reserve engineering processes



Dynamic Web-Based User Interfaces

- Dynamic User Interfaces concern all kind of automatically generated user interfaces
  - Dynamic Web Pages
- The Web
  - Navigation-oriented Universal GUI
  - More used even than desktop GUIs
  - Easy to use for most of end-users
  - Easy to deal with for most of programmers
    - Available collections of widgets and programming languages

Dynamic Web-Based User Interfaces

- The World Wide Web
  - 1st Generation
  - 2nd Generation
  - 3rd Generation

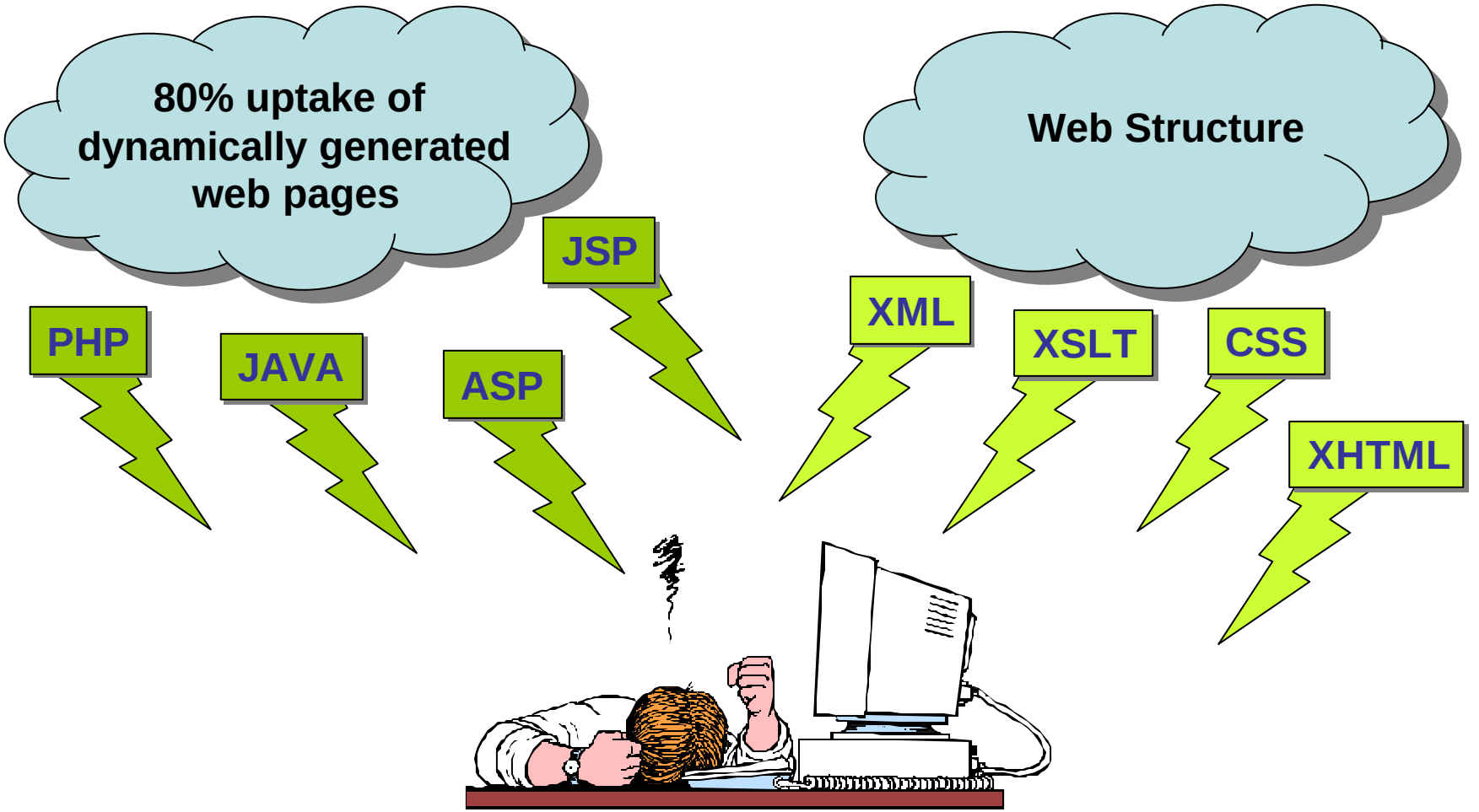
Web Structure

80% uptake of dynamically generated web pages

Dynamic Web-Based User Interfaces

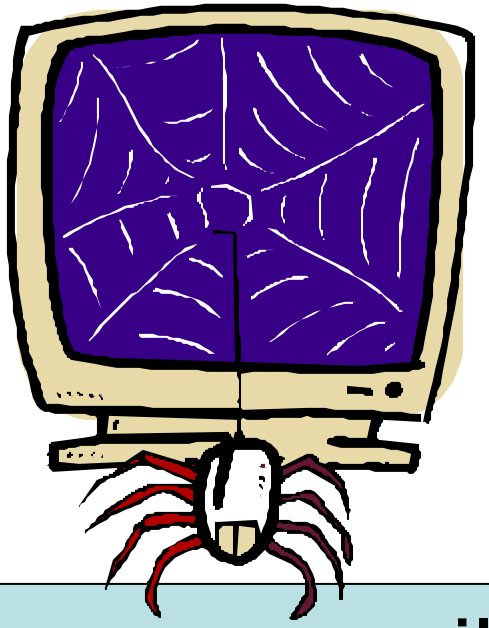
- Increasing necessity, by non-expert-in-CS users, in creating and modifying their own web pages
  - Designers, creative jobs
  - Administrative staff working on DB-based web pages
  - Occasional programmers creating their own small web pages for different purposes
  - … and, in general terms, people who need to go beyond usual web page navigation

Dynamic Web-Based User Interfaces



Non-expert-in-programming web author

Dynamic Web-Based User Interfaces



How one can easily author dynamic Web-based pages?

Dynamic Web Page Authoring

- Most of existing Authoring tools provide partial solutions
  - Mostly focused on static authoring
  - It is not easy to split up knowledge and procedural information regarding generation
    - Procedural behavior is hard to be depicted visually
- The provided solution should be end-user-based
  - Gentle Slope of Complexity
    - Tradeoff between expressivity and ease-of-use
    - Avoid the user from facing up to programming and specification languages
      - WYSIWYG Environments
      - Non-intrusive user assistance during interaction
  - Compatibility, reuse and integration

Dynamic Web Page Authoring

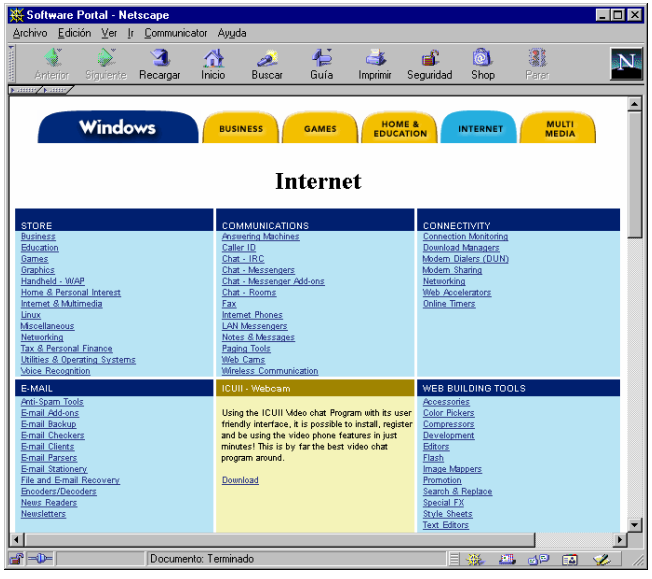
- 1) Dynamic generation mechanisms
  - Splitting up contexts and presentation
    - MBUI approach
  - Defining complex relationships between components and knowledge units
    - High level domain and presentation knowledge
- 2) Authoring dynamic web documents
  - Direct manipulation environment
  - Artificial Intelligence techniques to infer the user’s intents
  - Automatic changes and modifications to underlying models

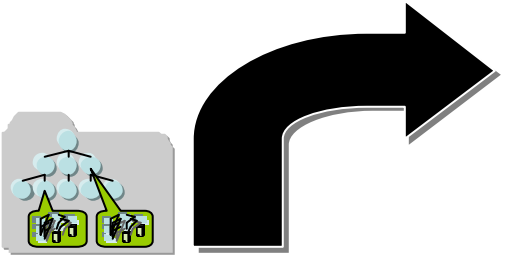
Dynamic Web Page Authoring

	**PEGASUS -** Presentation modelling Environment for Generic Adaptive hypermedia SUpport Systems
	**DESK -** Dynamic web documents by Example using Semantic Knowledge
	**PERSEUS -** Presentation ontology buildER for cuStom lEarning sUpport Systems
	**HADES** – Hypermedia ADaptive Educational Server

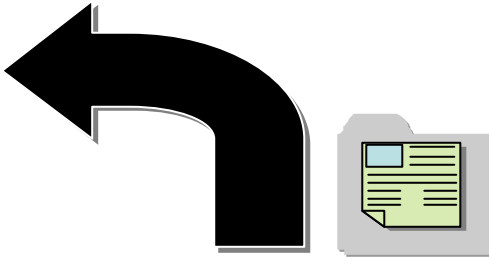
An example of dynamic web page generation by PEGASUS

PEGASUS Presentation





Domain Model

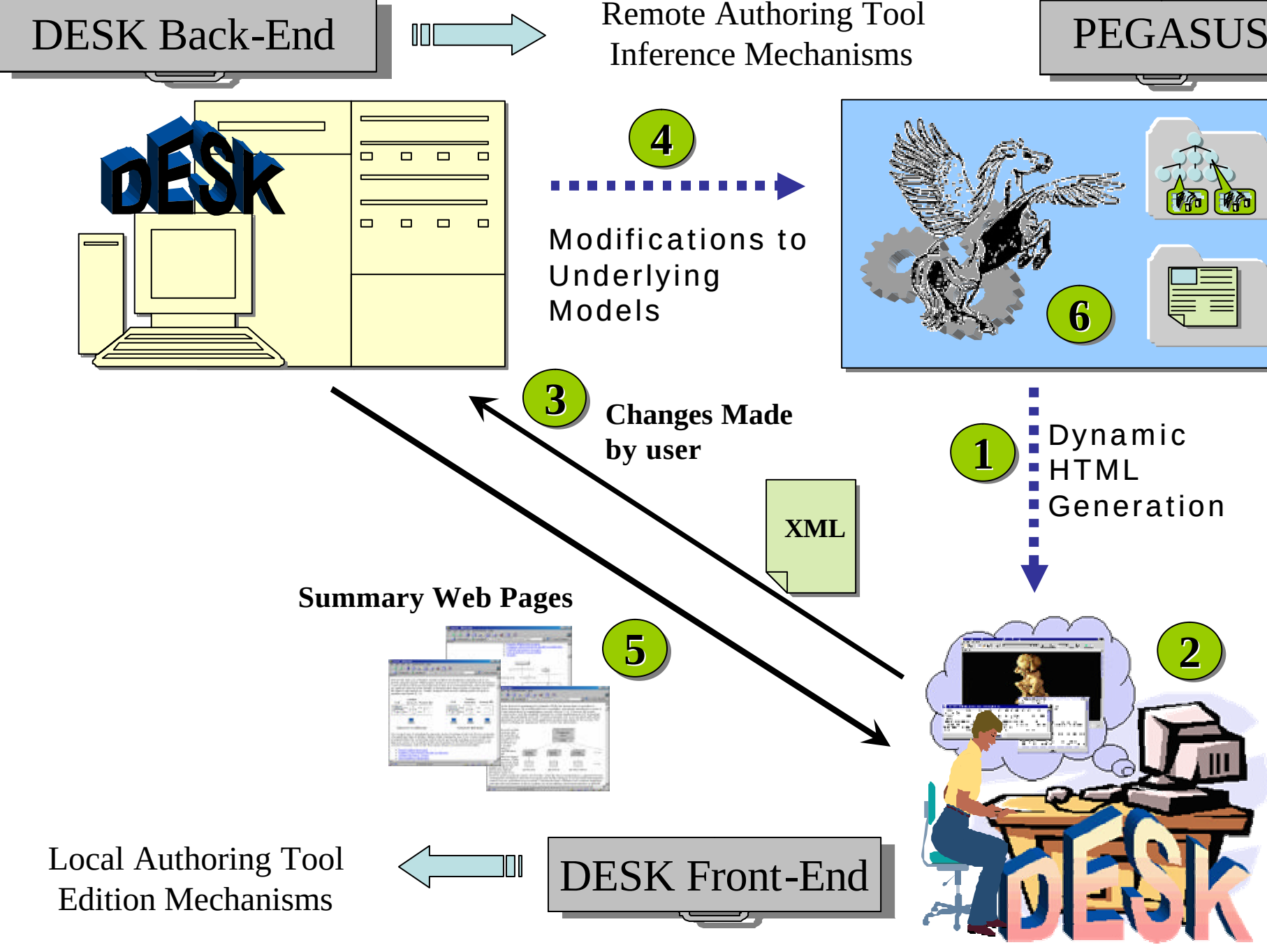


Presentation Model

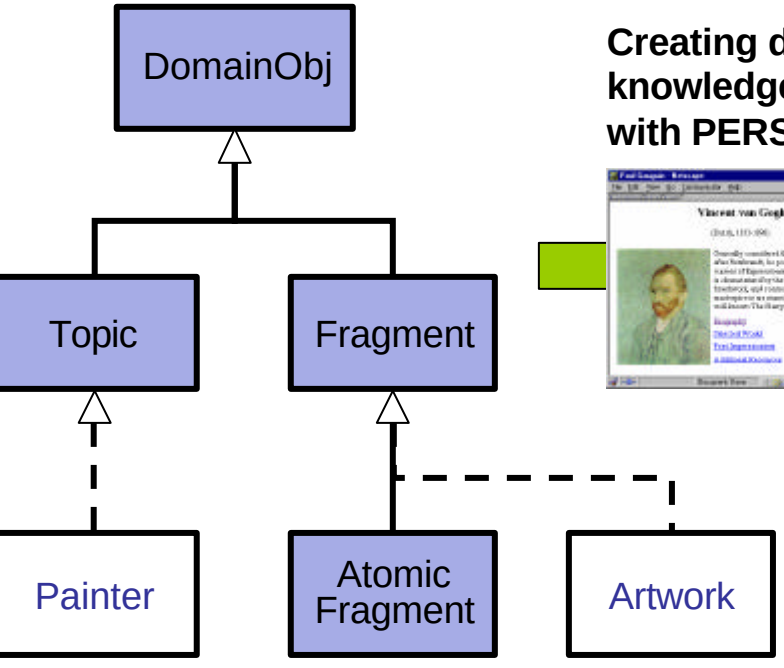
```
<HigherCategory id="Internet">
  <subCategories>
    <HigherCategory ref="Connectivity"/>
    <HigherCategory ref="Communications"/>
    <HigherCategory ref="E-Mail"/>
    ...
  </subCategories>
</HigherCategory>
<HigherCategory id="E-Mail">
  <subCategories>
    <LowerCategory ref="E-Mail Clients"/>
    <LowerCategory ref="E-Mail Parsers"/>
          ...
```

```
<% if (availableSpace > 5) { %>
   <widget type="Table" columns="3"
           dataflow="wrap">
     <list> <%= subcategories %> </list>
   </widget>
<% } else { %>
   <table>
     <tr><td> <%= id %> </td></tr>
     <tr><td> <%= subcategories %> </td></tr>
   </table>
<% } %>
                ...
```

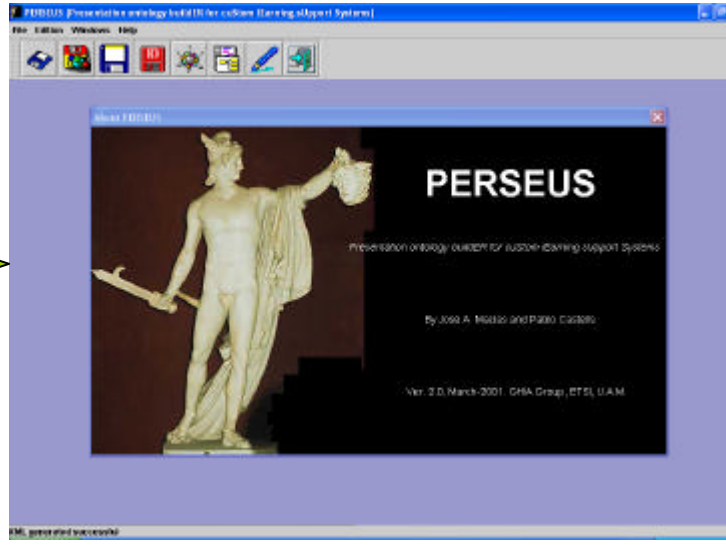
PEGASUS Underlying Models


DESK Back-End
Remote Authoring Tool
Inference Mechanisms
PEGASUS
DESK
4
Modifications to
Underlying
Models
6
3
Changes Made
by user
1
Dynamic
HTML
Generation
XML
Summary Web Pages
5
2
DESK
Local Authoring Tool
Edition Mechanisms
DESK Front-End

PERSEUS



Creating domain knowledge with PERSEUS



DESK

- WYSIWYG environment for dynamic web page design
  - Allow for changes to page appearance
  - Allow for authoring domain knowledge
- AI-based techniques
  - The end user provides an example of what s/he expects, the authoring tool infers changes in page generation procedure
  - Detection of patterns by means of a specialised assistant (agent) that tracks the user's actions
- DESK runs under PEGASUS
  - PEGASUS is the dynamic page generation system
  - DESK does the inverse path
  - Uses PEGASUS models for disambiguation

Conclusions

- GUIs have become an important concern as time goes by
- It’s necessary to provide mechanisms and tools in order to specify, create and automatically maintain GUIs
- MBUI techniques provide conceptual separation between the different aspects of a GUI
- Dynamic User Interface is a result of information adaptivity and automatic generation
- It’s hard to describe procedural information visually, so authoring Dynamic Web-Based User Interfaces become a complex task
- Some authoring tool have been provided, mainly focused on static aspect
- PEGASUS and DESK tools allow for automatic dynamic web page generation, providing also with easy-to-use mechanisms for dynamic web page authoring

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  - DESK
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  - PEGASUS
    - http://astreo.ii.uam.es/~castells/pegasus/