Master’s Thesis

u-Annotate
-- An Application for User-Driven Freeform Digital Ink Annotation of E-Learning Content

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Outline

• Introduction
• Goal
• Related work
• Requirements
• Architecture
• Implementation
• Screenshots
  – u-annotate Demo
• Evaluation
• Conclusion & Outlook
Introduction

• The Problem
  – Paper-and-pen paradigm
  – Problem with paper-notes

• The Solution
  – Annotations directly on the content
  – Need for alternate input devices
  – Different types of annotations
  – “Mark-up” annotations
  – Why Annotate?

• Personalization & Meaning in Context
  – PROLEARN, WP1 – Personalized Adaptive Learning

Authors enrich
Learners extend teaching material
Mode of communication
Goal of *u*-Annotate

- **Enter *u*-Annotate – *user*-driven Annotations**
- **u-Annotate the result of our endeavor to**
  “develop a system conducive to enabling the *corporate learner* and the *academic learner* to annotate the e-Learning content, delivered as HTML Pages, with *freeform digital ink* with the aid of *alternate input/pointing devices* in order to achieve *personalized learning*”

- **Cooperation betwixt**
  - Informatik V, RWTH Aachen
  - bureau42 GmbH, Cologne
  - Open University, Heerlen, Netherland
  - F-IT, Bonn
Storyboard
State of the Art – Markup Annotation

- **Evaluation basis**
  - Support for overlays
  - Freeform Digital Ink
  - Browser dependence
  - Variety of Annotation tools
  - Method of Integration
  - Unloadable
  - Commercial Nature of the Application
  - Storage of Annotations
State of the Art – Markup Annotation

XLibris
(FX Palo Alto Laboratories)

YAWAS
(Yet Another Web Annotations System)
(Syscom, Université de Savoie, France)

Avaya Prototype
(Avaya Labs Research, USA)

iMarkup®
(http://www.imarkup.com)
### State of the Art – Comparison

<table>
<thead>
<tr>
<th>Systems</th>
<th>Features</th>
<th>Web</th>
<th>Overlays</th>
<th>Freeform</th>
<th>Browser Ind.</th>
<th>Scope</th>
<th>Deploy</th>
<th>Unload</th>
<th>Nature</th>
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Requirements

• **Requirements from u-annotate**
  − Support for overlays
  − Freeform Digital Ink Annotations
  − Browser Dependence
  − Variety of Annotation tools
  − Shareable Annotations
  − Customizable tools
  − Hiding annotations
  − Storage & Fast retrieval of Annotations
  − Low Imprint
  − Easy Deployment
Requirements

UI
- Freeform Digital Ink
- Overlay Drawing Canvas
- Choice of Tools & Customizability
- Hide/Unhide annotations
- Custom Cursors
- Fast Storage & Retrieval
- Export / Import of Annotations
- DOM Binding
- Small File Sizes
- Validity Checks

Backend
- Instant Rendering
- Smooth Curves
- Annotation Management

Rendering

Technology
- Support for Overlays
- Low Imprint
- Browser Independence
- Deliverable Module
- Secure
Implementation

- **Tools**
  - Development
    » Adobe Systems Flash
  - Backend Storage
    » Flash Local Shared Objects (LSOs)
    » XML File storage

- **Browser Compatibility**
  - All browsers

- **Deliverable**
  - Flash SWF file
  - JavaScript file
  - Configuration file (config.xml)
Implementation
Screenshots

(a) $u$-Annotate embedded in Mozilla Firefox

(b) $u$-Annotate embedded in Opera

(c) $u$-Annotate embedded in Microsoft Internet Explorer
Screenshots
u-Annotate, Demo

Demo Video
u-Annnotate, Demo

End of Demo
Evaluation

• **Cross-section of International Evaluators**
  – 14 Feedbacks received
  – Students from RWTH
  – Students from IGNOU, New Delhi, India
  – Software Engineers, TCS/HCL, Bangalore, India

• **Based on Success Model**
  – Questionnaires
  – Quantitative & Qualitative benefit analysis
Conclusion & Outlook

• Conclusion
  – *u*-Annotate: An application for User-Driven Freeform Digital Ink Annotation of E-Learning Content
  – Potential to replace learner dependence on pen-and-paper for Annotation needs
  – Treatise accepted as a full paper at ICALT 2006, Kerkrade, Nederland.

• Outlook
  – Digital Whiteboard, real-time sharing
  – Extension into the audio-visual domain
    » Support for learners with special needs
  – Feedback from ICALT ‘06
Thank you!
Screenshots

<table>
<thead>
<tr>
<th>Point of Interest</th>
<th>DOM Element</th>
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<tbody>
<tr>
<td>P1</td>
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<tr>
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<td>P3</td>
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<tr>
<td>P4</td>
<td>nicht</td>
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<td>P5</td>
<td>Ihnen</td>
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<td>P7</td>
<td>Gründungshürden</td>
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<td>P8</td>
<td>Absicherung</td>
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Evaluator Feedback

\[ u\text{-Annotate: Concluding Remarks} \]

<table>
<thead>
<tr>
<th>User Response</th>
<th>Cross Browser Experimented</th>
<th>Potential to replace Pen-and-Paper</th>
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<tbody>
<tr>
<td>Yes</td>
<td>9</td>
<td>10</td>
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<tr>
<td>No</td>
<td>5</td>
<td>4</td>
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</table>
Evaluator Feedback

Evaluator Profiles

- Academic: 64%
- Corporate: 36%
Evaluator Feedback

- e-Learning exposure
  - Yes: 43%
  - No: 57%
Evaluator Feedback

Highlighting Paper Content

- Yes: 11 users
- No: 3 users
Evaluator Feedback

Importance of Annotating e-Learning Content directly on Screen

- Not at all: 0
- Of Little Importance: 1
- Somewhat Important: 5
- Important: 5
- Very Important: 3

Number of Users

Importance
Evaluator Feedback

Usability, UI and Toolbar feedback

<table>
<thead>
<tr>
<th>Level of User Satisfaction</th>
<th>Number of Users</th>
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<tr>
<td>Not Satisfactory</td>
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<tr>
<td>Does the job</td>
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<tr>
<td>Somewhat Satisfactory</td>
<td>2</td>
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<tr>
<td>Satisfactory</td>
<td>7</td>
</tr>
<tr>
<td>Very Satisfactory</td>
<td>5</td>
</tr>
</tbody>
</table>

Legend:
- Blue: Usability, General Feel of the Device
- Red: User Interface
- Yellow: Toolbar Conspicuity
Evaluator Feedback

\[ u - \text{Annotate: Functionality – Tool Selection} \]

- Freehand Drawing tool: 65%
- Text Input: 14%
- Highlighter: 21%

Legend:
- Freehand Drawing tool
- Text Input
- Highlighter
Evaluator Feedback

$u$-Annotate: User Interface

<table>
<thead>
<tr>
<th>User Satisfaction</th>
<th>Tool Labels</th>
<th>Custom Cursors</th>
<th>Help</th>
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<tbody>
<tr>
<td>Yes</td>
<td>13</td>
<td>14</td>
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</tr>
<tr>
<td>No</td>
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Number of Users