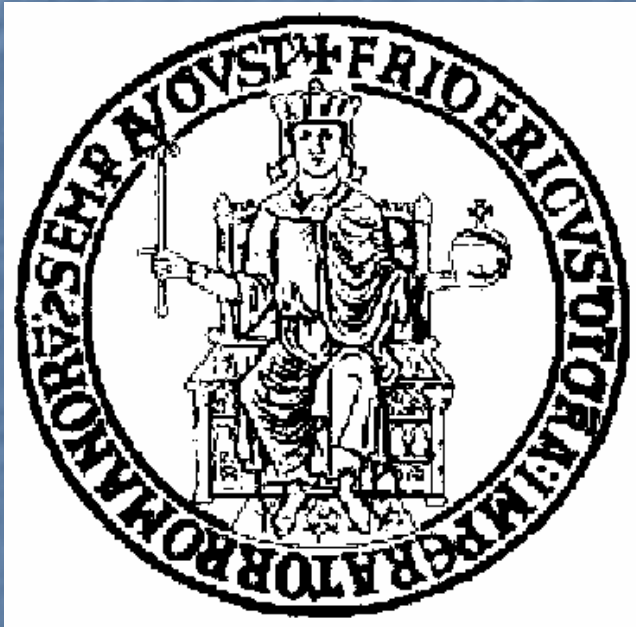


Improving Usability of Web Pages for Blind



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Accessibility of Web Sites

- The World Wide Web has a growing importance in the life of anyone, in particular of people with physical disabilities
 - Web accessibility is a fundamental issue for the development of today's Web sites and applications, stated by the most important international governments and organisations

Accessibility for Blind Users



- Blind users can access textual contents of Web Sites by using Screen Readers
 - The blind user has to listen the full textual content of a Web page in order to obtain the needed information
 - **Aural Web Sites** are optimised for blind users
 - Bolchini et al. stated in 2006 some requirements to take into account for designing Aural Web Sites

Web Site Usability for Blinds

- The most part of the existing Web sites are not Aural Web Sites
 - Blind users experience accessibility and usability problems
 - The Web Sites are organised according to a bi-dimensional layout, while Screen Readers and Braille Readers provide the Web site information just in a linear way, as a mono-directional text
 - The time needed to access some contents can be very long, so that the Web site is not usable for blinds

An example

- IBM ADesigner visually reports the time needed to access information in a Web page.
- The time needed to access Submission information and recent news is more than two minutes!

<p>Special issue</p> <p>Best Papers of WSE 2007 will be invited for a Special Issue of the Journal of Web Engineering. Click here for more information.</p>	<p>The 9th IEEE International Symposium on Web Site Evolution October 5-6, 2007; Paris, France <i>Co-located with the 23rd IEEE International Conference on Software Maintenance (ICSM 2007)</i></p> <p>Since its inception in 1999, the Web Site Evolution (WSE) series of events has provided a forum for researchers and practitioners to present original work on subjects related to the disciplined evolution of large-scale Web sites.</p> <p>Following the previous editions, WSE 2007 aims to attract participants from different research communities, ranging from software maintenance & evolution to Web application engineering and the semantic Web. WSE 2007 will provide researchers and practitioners with an exciting environment to discuss results and exchange ideas.</p> <p>WSE 2007 will be held in Paris, France on October 5 and 6, 2007. It will be co-located with the 23rd IEEE International Conference on Software Maintenance (ICSM 2007). The technical program of WSE 2007 will include invited talks, paper presentations, panels, and working sessions.</p> <p>Topics</p> <p>Topics of interest include but are not restricted to the following aspects of Web based application design, development, maintenance and evolution:</p> <ul style="list-style-type: none"> • Costs and benefits estimation • Documentation • Design and implementation • Empirical studies • Migrating toward semantic Web • Web 2.0 technologies • Models, methodologies, and architectures • Security • Testing and quality evaluation • Tools, environments, and technologies <p>Submission Process</p> <p>The Symposium foresees the submission of research papers or experience report, not exceeding 4000 words (8 pages using 10-point font type), including figures and references. Full paper submissions must be received by Friday, June 15, 2007, and must be in Adobe Acrobat PDF. Papers must be submitted online via the CyberChair system at: http://cyber.rcost.unisannio.it/~wse2007/papers</p>	<p>Latest news</p> <p>Early Registration Closes 2007 146 seconds from top.</p> <p>Technical program is available</p> <p>Hotel Information updated </p> <p>Deadline for camera-ready has been extended to August 2, 9:00 EST</p> <p>Registration is Now Open</p> <p>The camera ready is due by July 31, 2007</p> <p>All the news</p> <p>Location</p> <p>[Paris.]</p> <p>A view of the city of Paris, France where the conference will take place.</p> <p style="text-align: right;">Last update May, 04 2007 </p>	
<p>[IEEE Computer Society.] IEEE Computer Society</p>	<p>[University of Sannio.] RCOST University of Sannio</p>	<p>[Florida Atlantic University.] Florida Atlantic University</p>	<p>[Queen's University.] Queen's University</p>

Auralisation of Existing Web Sites

- In this work, we propose a solution to improve the usability of existing Web Sites, by generating 'on the fly' a summarised version of client pages

- Requirements of the solution:
 1. To minimise the reaching time i.e. the time required to the blind user to get the information which he/she is interested in;
 2. To minimise the computational time and resources needed to transform the original Web page in the auralised one;
 3. To be potentially applicable to any Web page, independently from its structure, layout and topics;
 4. To be tuneable, so that the usability of the auralised page could be further improved by tuning some parameters.

Summarisation Techniques

- Two different summarisation techniques have been proposed:
 - T1) Based on structural analysis of built client pages;
 - T2) Based on the analysis of the textual contents of built client pages

Technique T1 (based on Structural Analysis)

- Two heuristics have been taken into account for weighting the Web page information content importance:

H1) the most important information are highlighted or emphasised by means of particular editing formats, in order to catalyse the attention of the user;

H2) the most important information are usually placed in the higher parts of a Web page (to make them earlier visible to users);

Example

- H2) Contents in the higher part of the Built Client Page
- H1) Enhanced Contents

The screenshot shows the homepage for the 9th IEEE Symposium on Web Site Evolution 2007. The page features a navigation menu, a main content area with a highlighted title box, and sidebars for 'Special issue', 'Latest news', and 'Location'. A red box highlights the main title and date information. A red arrow points from the 'Special issue' sidebar to the main content area. Two blue arrows point from the 'H1) Enhanced Contents' bullet point to the 'Topics' and 'Submission Process' sections.

WSE 2007 The 9th IEEE Symposium on
Web Site Evolution 2007 Co-Located with ICSM 2007
October 5 - 6, 2007; Paris, France

Home | Call for papers | Important dates | News | Submission | Program | Organization | Registration | Contacts | Past events | Venue

Special issue
Best Papers of WSE 2007 will be invited for a Special Issue of the Journal of Web Engineering. [Click here](#) for more information.

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Topics
Topics of interest include but are not restricted to the following aspects of Web based application design, development, maintenance and evolution:

- Costs and benefits estimation
- Documentation
- Design and implementation
- Empirical studies
- Migrating toward semantic Web
- Web 2.0 technologies
- Models, methodologies, and architectures
- Security
- Testing and quality evaluation
- Tools, environments, and technologies

Submission Process
The Symposium foresees the submission of research papers or experience report, not exceeding 4000 words (8 pages using 10-point font type), including figures and references. Full paper submissions must be received by Friday, June 15, 2007, and must be in Adobe Acrobat PDF. Papers must be submitted online via the CyberChair system at: <http://cyber.rcost.unisannio.it/~wse2007/papers>.

Latest news
Early [Registration](#) Closes Sept 7, 2007
[Technical program](#) is available
[Hotel information updated](#)
Deadline for camera-ready has been extended to August 2, 8:00 EST
[Registration is Now Open](#)
[The camera ready is due by July 31, 2007](#)

All the news

Location

A view of the city of Paris, France where the conference will take place.

Last update May, 04 2007

Weighting the contents: heuristic H1

- Any Text Segment (text fragment enclosed in tags) is weighted by taking into account the enhancing effect of the nested tags that influence the visualisation of the text

$$TW(TS) = \prod_{t \in NS(T_i)} [W(t) * W(TStyle(t))]$$

Tag Name	Weight
S, DEL, A, SMALL, STRIKE,	0,25
KBD, H6, CITE, CODE,	0,5
COL, COLGROUP, COMMENT, DD, H5, DEN, DIR, EMBED, EM, THEAD, BUTTON, TFOOT, FIELDSET, FN, FONT, FRAME, FRAMESET, TEXTAREA, DIV, ADDRESS, TT, U, UL, VAR, WBR, XMP, SERVER, SHADOW, SIDEBAR, BODY, ACRONYM, BR, HTML,	1
B, OL, DL, STRONG, MENU, H3, BIG, Q PRE, TH, TR, I, CENTER, CAPTION, FORM,	1,5
TITLE, H2,	2
H1	3

Hiding
Tags: $W < 1$

Neutral
Tags: $W = 1$

Enhancing
Tags: $W > 1$

` <i> Hello World </i> `

$$\begin{aligned} TW('Hello World') &= \\ W('b') * W('i') &= \\ 1.5 * 1.5 &= 2.25. \end{aligned}$$

Weighting the contents: heuristic H2

- Any Text Segment is weighted by taking into account the position of the text in the page

Example: Linear position weighting functions

$$PW(TS) = 1 - \frac{Pos(TS)}{Lenght(P)}$$

The total Weight of any text content is given by the product of the weights:

$$R(TS) = TW(TS) * PW(TS)$$

Given a fixed threshold, a summarised version of the Built client page is obtained by selecting only the contents with a weight that is greater than the threshold

Technique T2 (based on content summarisation)

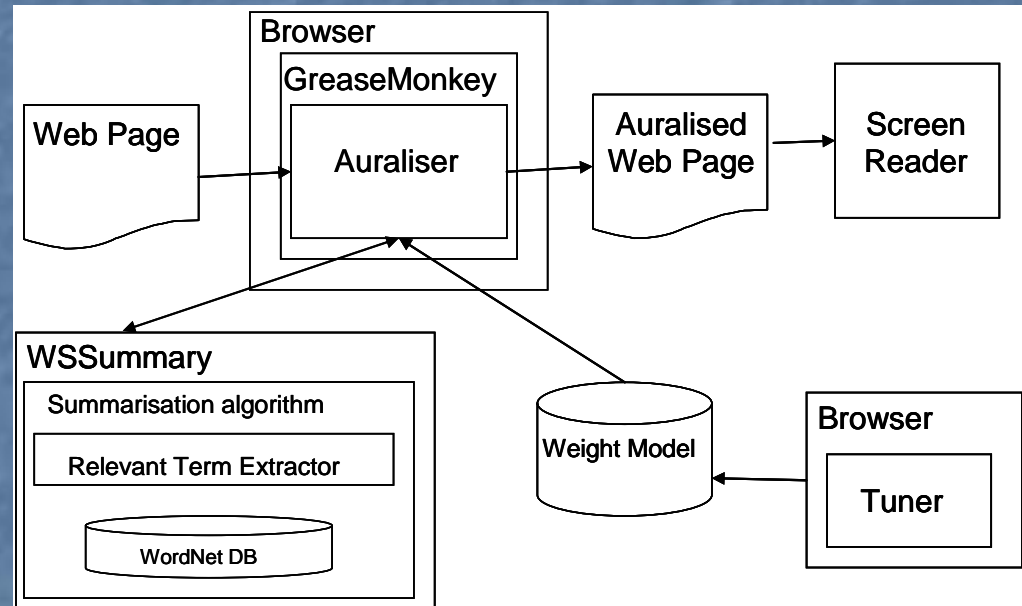
- A summary containing just sentences is obtained by taking into account the relative closeness (on the basis of a semantic net) of the terms they include. [*]
- 1. Nouns contained in the sentences are considered
- 2. A semantic net of this nouns is built by considering synonyms, hypernyms, hyponyms, meronyms
- 3. The relevance of a term in the page is evaluated by taking into account how much times the term appears in the page and how much times its synonyms/hyponyms/meronyms appear
- 4. The relevance of a sentence is the sum of the relevance of its nouns
- 5. The summary is obtained by selecting the most relevant sentences

[*] P.Capasso, C. Cesarano, A. Picariello, L. Sansone, "Content-based News Retrieval on the Web", International Journal on Computer Science and Network Security, 2006, Vol.6, No.5A, pp.68-94

The Auralisation Framework

- The presented techniques have been implemented in a framework:

- Weights needed for the technique T1 are maintained in a repository (Weight Model) and can be modified by the user via a Tuner client application



- The summarisation technique T2 is performed by a Web Service, with the support of WordNet

- The Auraliser is a Javascript client application, executed in the GreaseMonkey environment, generating the textual summary (Auralised Web Page) for the Screen Reader

Case Study

- Some explorative case studies have been carried out in order to assess the eventual increase of the usability of the Web pages
- Usability Measures
 - Let W be the Web page under experimentation and W^* its auralised counterpart
 - Let RC be the set of pieces of information that the user expects to retrieve in the Web page and $RC^* \subseteq RC$ the ones that are sufficiently reported in the auralised Web page
 - The *Relevant Concepts Recall* $RCR = |RC^*| / |RC|$
 - The *Reaching Time* RT is the time after which a Screen Reader user can listen all the Relevant Concepts of RC^* contained in W^* .

Comparisons

- The proposed usability parameters have been evaluated with respect to:
 - the plain text contained in the Web page, without applying any transformation technique;
 - the auralised version obtained by applying the structural analysis technique (T1);
 - the auralised version obtained by applying the proposed summarisation technique (T2).

WSE Case Study

- 5 relevant concepts:
 - name and location of the conference (C1),
 - Special issue call (C2),
 - Introduction (C3),
 - Topics List (C4),
 - Submission Information (C5).

- Technique T1 was executed by fixing the minimum threshold for which the recall $RCR=1$

WSE 2007 Home Page

The screenshot shows the WSE 2007 Home Page with the following content:

- C1:** WSE 2007 The 9th IEEE Symposium on Web Site Evolution 2007 Co-Located October 5 - 6, 2007; Paris, France
- C2:** Special issue: Best Papers of WSE 2007 will be invited for a Special Issue of the Journal of Web Engineering. [Click here](#) for more information.
- C3:** The 9th IEEE International Symposium on Web Site Evolution October 5-6, 2007; Paris, France. Co-located with the 23rd IEEE International Conference on Software Maintenance (ICSM 2007). Since its inception in 1999, the Web Site Evolution (WSE) series of events is a forum for researchers and practitioners to present original work on subjects of the disciplined evolution of large-scale Web sites. Following the previous editions, WSE 2007 aims to attract participants from diverse research communities, ranging from software maintenance & evolution to Web application engineering and the semantic Web. WSE 2007 will provide researchers and practitioners with an exciting environment to discuss results and exchange ideas. WSE 2007 will be held in Paris, France on October 5 and 6, 2007. It will be co-located with the 23rd IEEE International Conference on Software Maintenance (ICSM 2007). The technical program of WSE 2007 will include invited talks, paper presentations, panels, and working sessions.
- C4:** Topics: Topics of interest include but are not restricted to the following aspects of Web based application design, development, maintenance and evolution:
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- C5:** Submission Process: The Symposium foresees the submission of research papers or experience reports exceeding 4000 words (8 pages using 10-point font type), including figure references. Full paper submissions must be received by Friday, June 15, 2007 in Adobe Acrobat PDF. Papers must be submitted online via the CyberChair system at <http://cyber.rcost.unisannio.it/~wse2007/papers>.

Additional page elements include: Home, Call for papers, Important dates, News, Submission, Program, Organization, Registration, Contacts, Past events, Venue; Latest news (Early Registration Closes Sept 7, 2007; Technical program is available; Hotel information updated; Deadline for camera-ready has been extended to August 2, 8:00 EST; Registration is now open; The camera ready is due by July 31, 2007); and Location (A view of the city of Paris, France where the conference will take place).

Results

Expected Concept	Adopted Technique		
	None	T1	T2
RT(C1)	29 sec	15 sec	-
RT(C2)	18 sec	5 sec	-
RT(C3)	68 sec	49 sec	21 sec
RT(C4)	118 sec	89 sec	-
RT(C5)	121 sec	93 sec	27 sec
RT (to reach all the page	121 sec	93 sec	-
Saved RT %	0	23	-
RCR	1	1	0.4

- In this example, Technique T1 reduces the Reaching Time value for any expected concept by applying
- Summarisation technique T2 includes just 2 concepts but they are accessed in a very short time

Discussion

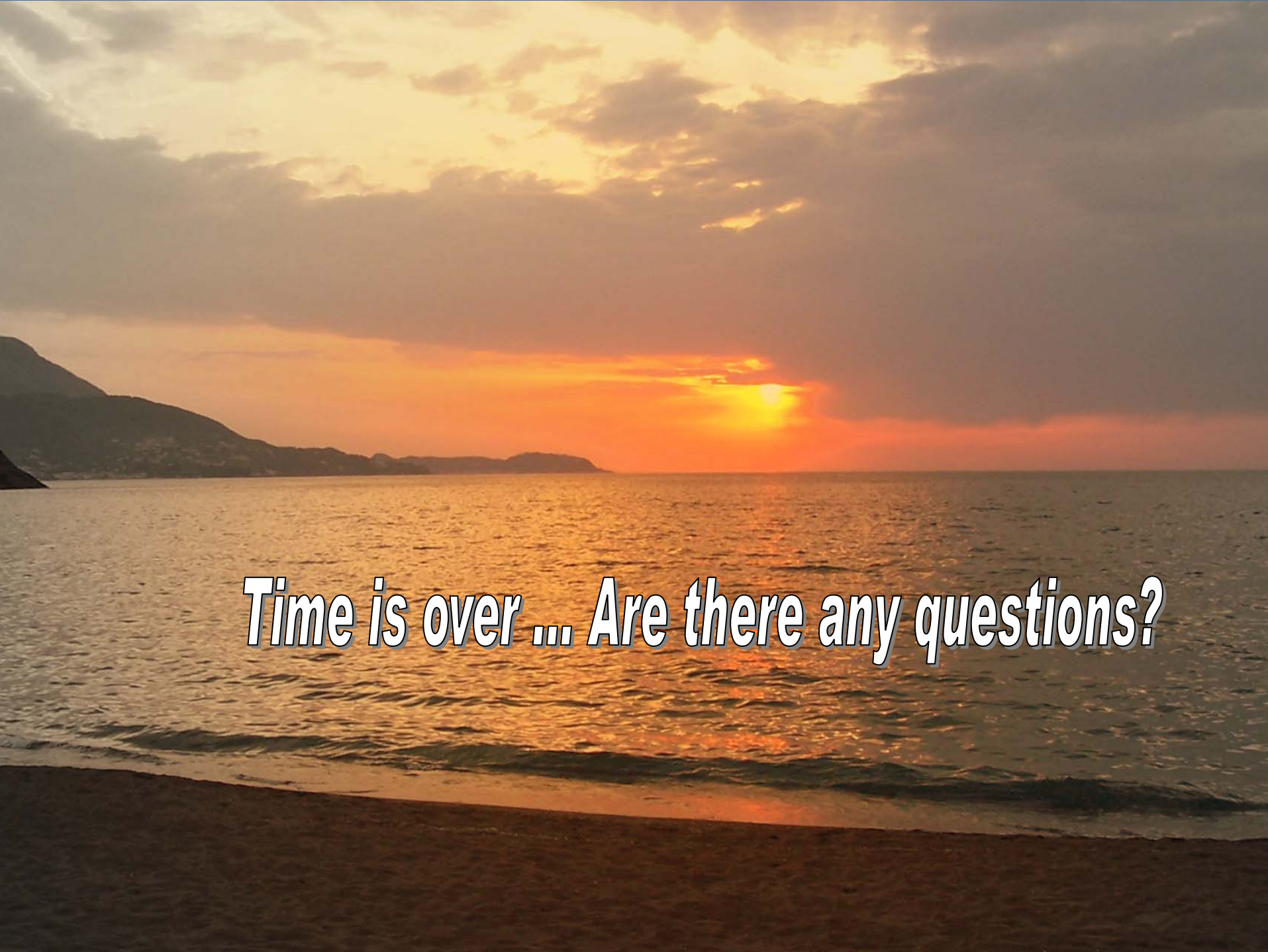
- Although a larger experimentation is needed, the case studies that have been carried out assess that the two proposed summarisation techniques can be adopted to make a Web page more usable to blind users
- Anyway, the two proposed techniques presents some limitations:
 - Technique T1 gives good results if weight models comprehending specific style weights, too, are adopted
 - Weight models could be provided by Web site publisher
 - Technique T2 could be, sometimes too computational expensive, with respect to expected reaching time

Conclusions

- Two different summarisation techniques have been proposed for the generation of Auralised Web pages that reduces the Reaching Time needed to blind users to access contents of a Web Site

Future Works

- Some ideas:
 - Reaching times can be furtherly reduced if the Auraliser inserts internal anchors to the more relevant contents in the built summarised pages
 - Considering hybrid techniques combining T1 and T2
 - Generalising the proposed approach to client pages which contents are dynamically generated (RIAs)

A sunset over the ocean with mountains in the background. The sun is low on the horizon, casting a golden glow across the sky and water. The sky is filled with soft, orange and yellow clouds. The water is dark with a shimmering reflection of the sun. The mountains in the background are silhouetted against the bright sky.

Time is over ... Are there any questions?