7 Glossary

CAPTCHA

Completely Automated Public Turing test to tell Computers and Humans Apart, mechanism used to prevent navigation by bots

CoScripter

A macro-recorder tool for the web that allows users to automate and share web processes.

Functionally-Illiterate

Group of people that present difficulties in reading and understanding portions of texts.

PSI

Pragmatic Script Interpreter, the primary version of WNH

Screen Reader

Software used by blind users to read aloud the contents shown in the monitor

Visually-Impaired

Group of people that present visual impairments such as blindness, low vision or color blindness.

WNH

Web Navigation Helper, system intended to improve web accessibility of blind and functionally illiterate users.

WNH-read

WNH for functionally illiterate users.

WNH-see

WNH for blind users.

WNH-support

WNH for volunteer users.

8 References

Aluísio Sandra M. [et al.] A corpus analysis of simple account texts and the proposal of simplification strategies: first steps towards text simplification systems [Conference]. - Lisbon, Portugal : ACM, 2008. - 978-1-60558-083-8.

Aluísio Sandra M. [et al.] Towards Brazilian Portuguese automatic text simplification systems [Conference]. - São Paulo, Brazil : ACM, 2008. - 978-1-60558-081-4.

Alvarez Eduardo Pathways to Accessibility:Disability and the Physical Environmentin Latin America and the Caribbean [Conference]. - Washington DC, USA : Mimeo, 2004.

Berners-Lee Tim World Wide Web Consortium (W3C) Launches International Web Accessibility Initiative [Online] // W3C - World Wide Web Consortium. - April 7, 1997. - April 14, 2009. - http://www.w3.org/Press/WAI-Launch.html.

Bickmore T. W. and Schilit, B. N. Digestor: Device-independent access to the World-Wide Web [Journal] // Computer Networks and ISDN Systems. - Santa Clara, CA : [s.n.], 1997. - Vol. 29. - pp. 1075-1082.

Brown Carl Assistive technology computers and persons with disabilities [Article] // Communications of the ACM. - [s.l.] : ACM, 1992. - 5 : Vol. 35. - pp. 35-45.

Brudvik Jeremy T. [et al.] Hunting for headings: sighted labeling vs. automatic classification of headings [Conference]. - Halifax, Nova Scotia, Canada : ACM, 2008. - 978-1-59593-976-0.

Buyukkokten Orkut, Garcia-Molina Hector and Paepcke Andreas Seeing the whole in parts: text summarization for web browsing on handheld devices [Conference]. - Hong Kong, Hong Kong : ACM, 2001. - 1-58113-348-0.

CoScripter Simplifying Web-based processes. [Online] // CoScripter. - 2008. - June 15, 2008. - http://coscripter.research.ibm.com/coscripter/about.

Devlin Siobhan and Unthank Gary Helping Aphasic People Process Online Information [Conference]. - Portland, Oregon, USA : ACM, 2006. - 1-59593-290-9

.

Educativa Inst. Paulo Montenegro e Ação 2007–Indicador Nacional de Alfabetismo Funcional. [Online] // INAF-2007. - 2007. - July 05, 2008. - http://www.ipm.org.br/ipmb_pagina.php?mpg=4.02.01.00.00&ver=por.

Educativa Instituto Paulo Montenegro e Ação INAF 2005 [Report]. - [s.l.] : Instituto Paulo Montenegro, 2005.

Eletrônico Governo eMAG - Modelo de Acessibilidade de Governo Eletrônico [Online] // eMAG - Governo Eletrônico. - Maio 07, 2007. - June 15, 2009. - http://www.governoeletronico.gov.br/acoes-e-projetos/e-MAG.

Ferreira Simone Bacellar Leal [et al.] Panorama da acessibilidade na web brasileira [Article] // RCA - Revista de Controle e Administração. - Rio de Janeiro : ENANPAD, 2007. - 2 : Vol. 3.

Ferreira Simone Bacellar Leal and Nunes Ricardo Rodrigues e-Usabilidade [Book]. - Rio de janeiro : LTC, 2008. - 978-85-216-1651-1.

Harper Simon and Patel Neha Gist summaries for visually impaired surfers [Conference] // ACM SIGACCESS Conference on Assistive Technologies. - Baltimore, MD, USA : ACM, 2005. - pp. 90-97.

Hornung Heiko and Baranauskas M. Cecília C. Interaction Design in eGov systems: challenges for a developing country [Conference]. - Rio de Janeiro, RJ : SBC, 2007.

Hull Larry Accessibility: it's not just for disabilities any more [Journal]. - [s.l.] : ACM, 2004. - 2 : Vol. 9. - 1072-5520.

IBGE Censo 2000 [Online]. - 2000. - http://www.sidra.ibge.gov.br/bda/tabela/protabl.asp?z=cd&o=7&i=P.

Instituto Benjamin Constant IBC por dentro [Online] // Instituto Benjamin Constant. - 2009. - May 15, 2009. - http://www.ibc.gov.br/?catid=13&blogid=1&itemid=89.

Junior P. T. A. and Filgueiras L. V. L. A Expressão da Diversidade de Usuários no Projeto de Interação com Padrões e Personas [Conference] // IHC2008. - Porto Alegre, RS, Brazil : Sociedade Brasileira de Computação – SBC, 2008. - 978-85-7669-203-4.

Kvan Thomas Collaborative design: what is it? [Article] // Automation in Construction. - July 2000. - 4 : Vol. 9. - pp. 409-415.

Leshed G., Haber, E. M., Matthews, T., and Lau, T. CoScripter: automating & sharing how-to knowledge in the enterprise [Conference] // Proceeding of CHI '08. . - New York, NY : ACM, 2008. - pp. 1719-1728.

Little Greg [et al.] Koala: capture, share, automate, personalize business processes on the web [Conference]. - San Jose, California, USA : ACM, 2007. - 978-1-59593-593-9 .

Lynx source distribution and potpourri [Online] // Lynx source distribution directory. - June 08, 2009. - http://lynx.isc.org/.

Maglio P. and Barrett, R Intermediaries personalize information streams [Journal]. - [s.l.] : ACM, 2000. - 8 : Vol. 43. - pp. 96-101. - 0001-0782 .

Mahmud Jalal U., Borodin Yevgen and Ramakrishnan I. V. Csurf: a context-driven non-visual web-browser [Conference] // International World Wide Web Conference. - Banff, Alberta, Canada : ACM, 2007. - pp. 31-40.

Melo Amanda Meincke, Baranauskas M. Cecília C. and Bonilha Fabiana Fator Gouvêa Avaliação de Acessibilidade na Web com a Participação do Usuário: Um Estudo de Caso [Conference] // Simpósio Brasileiro de Fatores Humanos em Sistemas Computacionais / ed. Laura Sánchez García Sérgio Roberto P. da Silva. - Curitiba : Anais do Simpósio Brasileiro de Fatores Humanos em Sistemas Computacionais, 2004. - pp. 165-168.

Montenegro C. A. A construção de um novo indicador de qualidade da educação [Online] // Instituto Paulo Montenegro. - 08 05, 2005. - 08 04, 2009. - http://www.ipm.org.br/ipmb_pagina.php?mpg=4.07.01.01.00&num=3&ver=por.

Mozilla Firefox Co. Chapter 2: Technologies Used in Developing Extensions - MDC - Mozilla Firefox [Online]. - 2009. - June 15, 2009. - https://developer.mozilla.org/En/Firefox_addons_developer_guide/Technologies_used_in_developing_extensions.

Mozilla Firefox Co. Extension Theming Guidelines [Online] // Extension Theming Guidelines - MDC. - 2009. - June 05, 2009. - https://developer.mozilla.org/En/Extension_Theming_Guidelines.

NEAd NEAd Raízes Comunitárias [Online] // RESPUC - Rede de Empreendimentos Sociais da PUC-Rio. - 2009. - April 27, 2009. - http://www.puc-rio.br/sobrepuc/admin/vrc/respuc/membros/nead.html.

Petersson Karls Magnus, Reis Alexandra and Ingvar Martin Cognitive Processing in literate and illiterate subjects: A review of some recent behavioral and functional neuroimaging data [Journal]. - [s.l.] : Scandinavian Journal of Psychology, 2001. - 3 : Vol. 42.

Piccolo Lara Schibelsky Godoy and Baranauskas Maria Cecília Calani Understanding iDTV in a Developing Country and Designing a T-gov Application Prototype [Conference]. - Cape Town, South Africa : ACM, 2008. - 978-1-60558-002-9 .

Pinto José Marcelino de Rezende [et al.] Um Olhar sobre os Indicadores de Analfabetismo no Brasil [Article] // R. bras. Est. Pedag.. - 2000. - 199 : Vol. 81.

Pontelli E. Gillan D., Xiong W., Saad E., Gupta G., Karshmer A. I. Navigation of HTML Tables, Frames and XML Fragments [Conference] // ACM SIGACCESS Conference on Assistive Technologies. - Edinburgh, Scotland : ACM, 2002. - 1-58113-464-9.

Prasad Archana [et al.] Exploring the feasibility of video mail for illiterate users [Conference]. - Napoli, Italy : ACM, 2008. - 1-978-60558-141-5.

Ribeiro V. M. Analfabetismo e Analfabetismo Funcional no Brasil [Online] // Instituto Paulo Montenegro. - 04 14, 2006. - 08 04, 2009. - http://www.ipm.org.br/ipmb_pagina.php?mpg=4.07.01.01.00&num=24&ver=por.

Ribeiro Vera Masagão Literacy and Attitudes: Research among Adults in the City of São Paulo, Brazil [Journal]. - [s.l.] : Education for All, 2001. - Vol. 56.

Santos Rogério Santanna dos Pela primeira vez mais da metade da população já teve acesso ao computador.Pesquisa sobre o uso das tecnologias da informação e da comunicação. São Paulo. 2008.CGI.br.35-39 [Article] // Pesquisa sobre o uso das tecnologias da informação e da comunicação. - São Paulo : [s.n.], June 04, 2007. - pp. 35-39. - In cgi.br.

Takagi Hironobu [et al.] Social Accessibility: Achieving Accessibility through Collaborative Metadata Authoring [Conference] // Proceedings of the 10th international ACM SIGACCESS conference on Computers and accessibility. - Halifax, Nova Scotia, Canada : ACM , 2008. - 978-1-59593-976-0.

Tangarife T. and Mont'Alvão, C Estudo Comparativo Utilizando uma Ferramenta de Avaliação de Acessibilidade para Web [Conference] // CLIHC. - New York : ACM, 2005. - pp. 313-318.

Temporini Edméa Rita and Kara-José Newton A perda da visão: estratégias de prevenção. [Journal]. - São Paulo : Arq. Bras. Oftalmol., 2004. - 4 : Vol. 67. - 0004-2749.

Torres Elisabeth Fátima, Mazzoni Alberto Angel and Alves João Bosco da Mota A acessibilidade à informação no espaço digital [Article] // Ci. Inf.. - 2002. - 3 : Vol. 31. - pp. 83-91. - http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0100-19652002000300009&lng=en&nrm=iso. - ISSN 0100-1965.

Vanderheiden Gregg Interaction for Diverse Users [Book Section] // The human-computer interaction handbook: fundamentals, evolving technologies, and emerging applications / book auth. Julie A. Jacko Andrew Sears. - [s.l.] : Lawrence Erlbaum Associates, 2003.

Vargas Centro de Políticas Sociais - Fundação Getúlio Mapa da Exclusão Digital [Report] : Survey / FGV. - [s.l.] : FGV, 2003. - p. 37. - http://www2.fgv.br/ibre/cps/mapa_exclusao/apresentacao/Texto_Principal_Parte1.pdf.

W3C Accessibility Evaluation Tools [Online]. - http://www.w3.org/WAI/ER/tools/.

W3C Introduction to Web Accessibility [Online] // WAI. - June 04, 2009. - http://www.w3.org/WAI/intro/accessibility.php.

W3C WAI [Online]. - http://www.w3.org/WAI/ER/tools/.

W3C/WCAG Web Content Accessibility Guidelines [Online] // WCAG. - June 05, 2009. - http://www.w3.org/TR/WCAG10/.

WAI Web Accessibitlity Initiative [Online]. - http://www.w3.org/WAI/guid-tech.html.

Walton M. and Vukovic, V. Cultures, literacy, and the web: dimensions of information "scent". [Article] // interactions 10, 2. - March 2003. - pp. 64-71.

9 Appendix A – Consent Terms Read Aloud to the Blind

Você foi convidado(a) pelo SERG – Semiotic Engineering Research Group –, um laboratório de pesquisas em Interação Humano-Computador, do Departamento de Informática da PUC-Rio, para participar de uma entrevista sobre o tema Acessibilidade na Web.

Por esta razão, solicitamos seu consentimento para a realização desta entrevista. Para tanto, é importante que você tenha algumas informações:

1) As informações contidas na entrevista destinam-se estritamente a atividades de pesquisa e desenvolvimento. Somente os pesquisadores do SERG terão acesso aos dados da entrevista.

2) A equipe do SERG tem o compromisso de divulgar os resultados de sua pesquisa em foros científicos e/ou pedagógicos. A divulgação destes resultados pauta-se no respeito à privacidade dos usuários, e o anonimato dos mesmos é preservado em quaisquer documentos que elaboramos. Queremos dizer com isso que seus dados estarão sempre anônimos.

3) O consentimento para a entrevista é uma escolha livre, feita mediante a prestação de todos os esclarecimentos necessários sobre a pesquisa.

4) A realização da entrevista pode ser interrompida a qualquer momento, segundo a disponibilidade do participante. Neste caso, a equipe se compromete a descartar a entrevista para fins da avaliação a que se destinaria.

5) A equipe do SERG encontra-se disponível para contato através do site www.serg.inf.puc-rio.br

De posse destas informações, gostaríamos que você se pronunciasse a respeito da entrevista.

( ) Dou meu consentimento para sua realização.

( ) Não autorizo sua realização.

10 Appendix B – Experiment Scenario for the Blind

“Já faz bastante tempo que você pensa em comprar sua casa própria, e acha que talvez esse momento de crise mundial seja uma boa hora para dar entrada num cantinho. Você decide então falar com um corretor do seu bairro que te diz que tem um apartamento excelente, por um preço super em conta. Você decide então conhecer o lugar e, se realmente gostar, vai tentar ficar com ele.

Não deu outra: você curtiu o apartamento! Agora é a hora de realizar esse sonho. Amanhã mesmo você vai entrar com um pedido de financiamento na Caixa Federal, e, para fazer isso, começa a juntar todos os documentos necessários. Um dos documentos exigidos é a CND, ou seja, Certidão Negativa de Débito, que comprova que você não possui dívidas junto a órgãos públicos.

Você decide então tentar emitir essa certidão pela Internet, no próprio site da Receita Federal. Mas antes de começar, você lembra que seu amigo Robson tinha mencionado algo a respeito de uma ferramenta que tornava a navegação na Internet muito mais rápida. Você decide então ligar para o Robson, explica a ele o que está precisando e pergunta como usar essa ferramenta. Ele te responde: “Seguinte, vou te passar um link pra você instalar essa ferramenta no seu navegador, e aí não tem mistério. Pelo que lembro, é só ir no site da Receita e a ferramenta vai te guiar na emissão dessa certidão. Se você estiver batendo demais a cabeça, me liga que tento te salvar, ok?”

“Beleza, Robson, se depois de 20 minutos eu não conseguir nada, peço socorro!”. – você responde. Você tenta então se virar sozinho, instala a ferramenta, vai para o site da Receita e já está pronto para usá-la. Qualquer coisa, se em 20 minutos nada acontecer, você liga para o Robson e ele te salva dessa!

Você então senta em frente ao computador, onde o browser já aponta para o site da Receita, e começa as suas tentativas.”

11 Appendix C – Consent Term for the Functionally-Illiterate

1) Um laboratório da PUC está fazendo uma pesquisa e gostaria de fazer uma entrevista com você.

2) Queríamos que você soubesse que:

   a. Não vamos usar essas informações para outros fins

   b. Não vamos colocar seu nome.

   c. Se você não estiver se sentindo à vontade na entrevista, ou por qualquer outra razão, você pode interromper quando quiser

   d. Você pode nos procurar depois para qualquer pergunta

3) Queremos saber se você concorda em participar. Sim ou Não?

4) Seu nome completo é:

5) A data é:

12 Appendix D – Experiment Scenario for the Functionally-Illiterate

"Já faz uma semana que o carnaval terminou, e você não encontra sua carteira de identidade de jeito nenhum! Você comenta isso com sua amiga Valéria, e ela diz: "Ih, você deve ter perdido em algum bloco! Por que você não procura na Internet pra ver se alguém encontrou? Sabia que dá pra ver isso no site do DETRAN?".

Você gosta da idéia de procurar na Internet, e pede pra Valéria te ajudar. Ela te diz para dar uma passada no trabalho dela, onde tem um computador com um programinha esperto que ajuda a navegar mais rápido na Internet. Você decide ir e quando chega lá ela te diz: "Tenta usar este programa aqui, olha, que aparece no lado esquerdo desta tela de navegação. Está vendo? Uma colega daqui do trabalho disse que com ele você consegue verum monte de coisas que dá para fazer no site do Detran muito mais rápido do que indo pela página normal, aqui no lado direito. Tenta fazer sozinha e vê se dá. Eu vou ter que resolver um negócio aqui ao lado. Daqui a 20 minutos estou de volta, aí te ajudo se você não tiver conseguido, tá bom?"

Como a Valéria está com pressa e não te deu muitas dicas, você resolve tentar usar o tal programa esperto, ver se dá para entender como é que ele funciona, ver se consegue fazer a consulta da sua identidade por lá sozinha mesmo. Se em 20 minutos você não conseguir, a Valéria vai chegar para te ajudar. Então não tem muito problema – você só quer mesmo adiantar.

Você então senta em frente ao computador e começa as suas tentativas."

13 Appendix E – Short Paper Presented at IHC2008

Using Web scripts to improve accessibility

Chantal Intrator
Clarisse Sieckenius de Souza

ABSTRACT

This paper is about how added functionality to CoScripter, a macro recorder for the Web, can potentially improve accessibility for certain types of web sites. CoScripter enables its users to share automated web processes, and by so doing also share their interests in different sites. We propose a new web navigation approach based on CoScripter; with it users can browse shared scripts associated to various sites and decide which ones perform a task of interest. The ability to execute such scripts has the potential to not only accelerate web navigation (and showcase the services provided by the sites), but also the potential to be used for enhanced web accessibility. The paper reports the results of our preliminary studies on the path to turning CoScripter into a web accessibility resource.

Author Keywords

Web Accessibility, Scripting, Collaboration.

ACM Classification Keywords

K.4.2 Computers and Society: Social Issues - Assistive technologies for persons with disabilities.

INTRODUCTION

Accessibility comprises a large set of domains. In this paper, our domain of interest is specifically the Web. Web accessibility awareness has been increasing and many efforts have been done in this direction. Nevertheless, we are still far from the ideal Web, in which all citizens will have equal and abundant access to all resources, regardless of their personal characteristics or country of origin.

The Web as it is today does not deal well with some easy-to-find differences among users. For example, according to recent statistics, the number

of Brazilian Internet users in 2007 corresponds to 34% of the population, and these are individuals from socio-economic classes A (wealthier), B and C [6]. At the same time, other sources estimate that only 28% of the whole Brazilian population between ages 15 and 64 can be considered fully literate [33]. Given that most of the web content is presented in *textual* form, two questions immediately arise. What percentage of Brazilian Internet users can read and understand textual material on Brazilian web pages? And what is the quality of written material on Brazilian web pages?

Web site designers as well as tools and browsers developers seldom create their products thinking of the whole set of possible users. So, if web designers and information architects don't realize that a considerable part of Brazilian Internet users are likely not to understand textual information on web pages, a significant number of them may be prevented from using most Web resources. But there is yet a larger set of users with special needs. This population also includes visually-impaired users, under-skilled users, users with motor and cognitive disabilities, and even users that simply find it difficult to navigate the Web and/or use computer technologies. As illustrated by Walton and Vukovic [**Error! Reference source not found.**10], the challenge of creating an accessible web goes beyond the interface level. The use of the Web in developing countries directs us to a non-physical kind of disability: the difficulty to understand larger portions of written text.

In this paper we present a system that may be used to help with accessibility options, and show how this can be done in the context of our current research. The system is CoScripter, a macro recorder for the web developed at IBM Research in Almaden [2,4]. Our research goal is to take CoScripter's macros as a source of knowledge and information to be used in supportive technologies for users with special needs. In Section 2 we present CoScripter, and in Section 3 we discuss how CoScripter can be used to deal with some accessibility issues, presenting some supportive evidence for our proposal. In Section 4 we discuss related work, and finally in Section 5 we present our conclusions and future work.

COSCRIPTER

"CoScripter is a tool that brings together known ideas in a novel combination: (1) it allows end-user automation of procedures through recording and scripting, and (2) it stores scripts on a shared central wiki." [4]. CoScripter enables users to record interactive tasks carried out with a browser and to play them back later. This is a nice-to-have functionality, especially when dealing with processes that

are frequently performed or are too long to be manually repeated. Once recorded, scripts can be easily reproduced. Filling in forms, clicking on buttons, navigating to specific URLs are some of the actions that can be easily automated through CoScripter, currently implemented as an extension to the Firefox browser. Figure 1 shows CoScripter's sidebar executing one of its actions.

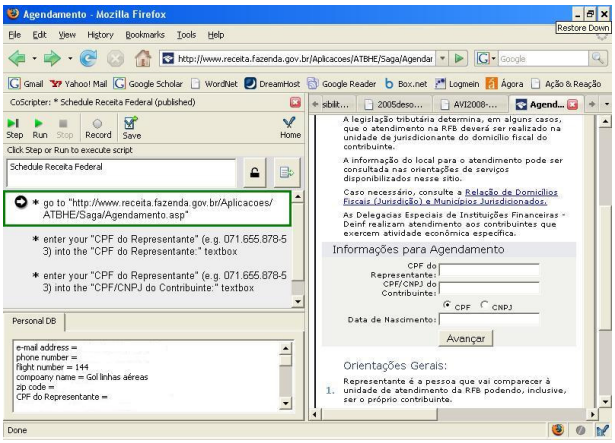

Figure 1. CoScripter Sidebar in the Mozilla Firefox Browser

CoScripter is freely available to Mozilla Firefox users, and access is provided upon registration. This enables users to become members of the CoScripter's forum and wiki, and to share scripts with all the other members.

The set of actions recorded by each user is saved in a *script*, and every script is associated to the URLs in it. So, for example, if a script automates the login process of a user to Gmail, this script is immediately associated to www.gmail.com. Also, when creating a new script, the user may define it as *private* or *public*. Public scripts can be seen and used by other members of the CoScripter community, while private scripts are kept unseen by all except their creators. When visiting a site, CoScripter users are able to see the list of all public scripts related to that site, as illustrated at the bottom-right corner of Figure 2. Should they wish to run a script, all they have to do is click on it.

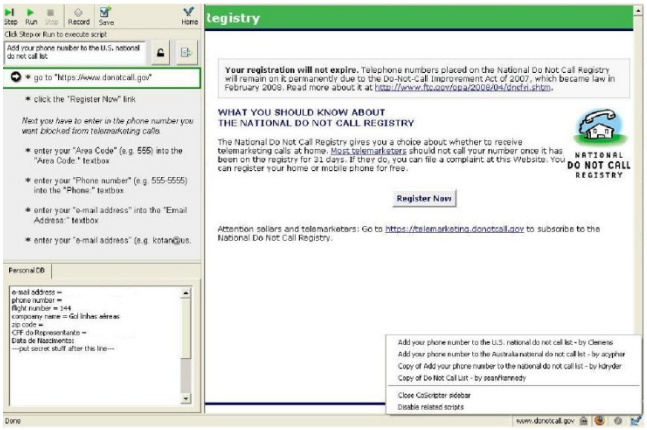

Figure 2. Shareable scripts in CoScripter

The collaborative aspect of CoScripter is of major significance to this work. Users can benefit from shared scripts since they don't need to create their own script to perform these actions. They may use somebody else's scripts. However, while running scripts created by others saves the user time and facilitates his/her navigation, it requires that some other amount of time be spent trying to find a script that performs the desired tasks. Identifying the actual purpose of scripts, what it does, may not always be easy. How can users tell which script, from the list associated to the page they are visiting, does the task they wish to do? Although the user has some important hints, such as the script's title and the script's execution steps, not all users are able (or willing) to decode what a series of interface actions is actually doing with respect to the web site where the script is running. So, in order to help users locate and understand useful scripts, we have developed the initial prototype of a *pragmatic script interpreter*, which will be explained in the next section.

COSCRIPTER'S PRAGMATIC SCRIPT INTERPRETER

As mentioned above, one of the collaboration challenges in CoScripter is to help users decide whether a script associated to a web site of interest is actually performing the task they need to do. Although short scripts (*e. g.* with less than 5 instructions) are likely to be easy to understand, longer scripts – which may be even more useful, because they capture more complex processes that take longer to execute manually and are also more error-prone – may not be so easy to interpret. Long scripts are also likely to involve a series of input values provided by the user during script execution (or directly read from the user's *personal database*, as shown in Figure 1). Thus, the purpose of our Pragmatic Script Interpreter (PSI) is twofold: (a) it should provide useful descriptions of what scripts do (especially longer scripts); and (b) it should inform users about the kinds of input that will be required for the script to execute.

PSI is an extension to CoScripter. The interpreter takes a script as input and runs over its steps collecting information about visited URL's, required input data, and interface actions, and then interpreting their meaning. It can thus produce descriptions of what the script is doing in the form of natural language phrases or short texts. By the same token, it can answer certain kinds of questions, like: "Do I need a login and password to do this task?". More specifically, users could retrieve from the interpreter such information as:

- A list of all personal data the site requires in order to accomplish the whole script process (which is a nice thing to know before engaging in long interactive processes, if there is a risk that information required at the very last steps is not at hand, or available, at the time of interaction);

- The identification of repetitive patterns in the script that might be the cue for certain implicit intentions, such as for instance picking up prices for the same product in 3 or 4 websites in order to make a comparison, or visiting different theater websites in search of viewing hours for the same movie, etc.;

- A natural language summary of the main purpose of the script (for both explanatory purposes and for indexing/retrieving, for example), as exemplified below:
    a. This script provides flight number, date and time, and retrieves ticket prices from the web site: www.tam.com.br.
    b. This script compares book prices from the web sites: www.amazon.com and www.barnesandnoble.com.
    c. This script logs into email provider www.gmail.com.

An interesting by-product of PSI for accessibility is that it provides the infrastructure for an oral read-out of such descriptions and information retrieval. Thus, visually-impaired users might benefit from having a wider range of available information about the web sites they visit, not to mention the possibility of executing (with more or less guidance) the steps of useful scripts associated to the site.

Clearly, all this infrastructure may be quite valuable to users: PSI not only provides them with comprehensible information about the purposes of scripts, but it also helps them locating useful scripts or deciding if a particular script should be run or not.

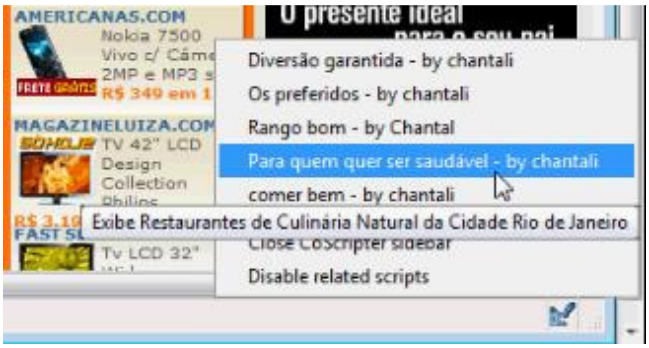

Figure 3. Hints about scripts

In its current initial version, PSI generates short descriptions of what the script is doing. The information for question-answering is represented in Prolog code, but the dialog interface has not yet been developed. In order to run PSI in a specified web site, one must first accomplish all CoScripter installation requirements. Also, the user should have the CoScripter sidebar enabled and ensure that the option related scripts is set to enabled. Once this functionality is active, the user will be presented with all shared scripts for a visited web site. By positioning the mouse over one of the listed scripts, PSI will run its interpreter and present the user with a hint about what the script is doing. The way this hint is visualized is similar to a tooltip text, appearing just below the text selected, as shown in the dotted box in Figure 3.

Once we finish the implementation of enhanced natural language descriptions and question-answering (partially designed at the time this paper was written), we hope not only to facilitate Web navigation processes for general users, but also to enhance accessibility for visually-impaired users and for users who need more guidance and explanations to interact with web sites.

Preliminary Test

In order to measure how users could benefit from PSI, we conducted a pilot experiment in ´Wizard of Oz´ style with eight participants. We chose a group of adults already familiar with the Web, and presented CoScripter's main features to them. Then we asked them to perform two different tasks T1 and T2 in distinct computers "A" and "B", respectively. Computer "A" had CoScripter on it, while computer "B" CoScripter and a PSI mock up (namely, a set of manually-generated short text spans based on information systematically derived from PSI). In both tasks T1 and T2, participants were asked to visit the site www.terra.com.br, which presented five shared scripts. The shared scripts of task T1 were distinct from those in task T2. Task T1 consisted of locating which script,

amongst the shared ones, displays a list of the comedy movies showing in Florianopolis city. Task T2 on the other hand consisted of locating which of the five shared scripts displays a list of Japanese restaurants in Rio de Janeiro city.

During the realization of these two tasks, we observed that:

- Participants showed similar behavior while running in both computers: they browsed the list of scripts trying to guess their purpose out of their titles, and when not able to draw enough information from the titles, they loaded the scripts in the CoScripter sidebar. Some of them analyzed the scripts' code, while others ran them in order to understand what they do.

- One participant, while running in computer "B", didn't load any scripts in the sidebar. He seemed to be satisfied by the hints suggested by the PSI mock up when moving the mouse over each script.

Once the tasks were accomplished, we asked participants if they had noticed any difference between the two interactions. Seven did not notice. The one that was helped by the tooltip in "B" noticed this difference. To those that didn't notice any difference, we showed them the tooltip in "B" and asked if they thought it would help performing the tasks. All of them agreed.

From this experiment we observed that the tooltip is not easily noticed by users. One of the participants suggested it to be shown together with the title, as a continuation of it. We also observed that PSI-derived hints would significantly help in identifying the scripts' purpose.

Of course this pilot test gives us only initial tangible hint of one of the benefits of PSI for generic users. However, it serves to show that, first, users are likely to understand and use descriptive information associated to scripts, and that this can accelerate their decisions. Second, it serves to show that we can proceed using the current integration strategy between PSI and the CoScripter interface to develop question-answering and explanatory dialogues about scripts (and therefore about web sites), and to implement guided script execution for users with special needs.

RELATED WORK

Many tools and devices have been developed to support users with visual disabilities in Web navigation. To perceive and access web resources, blind users rely mostly on screen readers (which produce audible output) and Braille

transliteration devices (which produce tangible output). Low-vision or partially-sighted users, on the other hand, may use other devices and mechanisms to improve their sight, such as screen magnifiers, extra large monitors and page style customization, among others.

Although with the aid of screen readers blind users are able to navigate the Web, their obstacles have not been totally overcome yet, as shown in a case study carried out by Melo, Baranauskas and Bonilha [5]. They performed an experiment where a blind user was asked to locate four specific resources in a Web site. Users with no major visual impairment would easily locate these resources, but the blind user showed many difficulties in performing these tasks. The reason for that lies mostly on how the Web page was built. Unfortunately most of the pages on the Web are not built to be fully accessible to users with visual disabilities. According to Tim Berners-Lee, director of the *World Wide Web Consortium* (W3C), there are more than 750 million people with disabilities worldwide [1]. Also, because digital space is the most traversed road by people with Internet and computer accesses in search of information, as pointed out by Torres, Mazzoni and Alves [8], the need of an accessible web is evident. The *Web Accessibility Initiative* (WAI) was launched on 1997 by the W3C to "…promote and achieve Web functionality for people with disabilities"[11]. WAI developed guidelines and techniques describing accessibility solutions for Web software and Web developers [11]. Accessibility Evaluation tools were then created to check the conformity of the Web sites with these guidelines [7] ,[9]. But using web scripts to improve accessibility hasn't been explored yet.

CONCLUSION AND FURTHER WORK

PSI integrated to CoScripter has the potential to improve web accessibility. Our pilot test showed that users already familiar with CoScripter found that PSI is an improvement to CoScripter's efficiency and efficacy. Moreover, the interpretive functions of PSI also have the potential to support users with special needs. In particular, there is a promise for visually-impaired users, because script descriptions can be read out to them and thus tell them more (and more directly) about certain web sites' services and how to get them. Scripts can also be executed, helping visually-impaired users perform tasks that may otherwise be difficult or nearly impossible to do. There is also a promise for users who find it difficult to understand textual instructions on certain web-sites. PSI interpretive functions may help us design guidance and explanations for such users to interact with government web sites, for example. This might be an important step toward more inclusive e-government projects. However, these are future steps in

our research. In particular, we plan to improve the prototype and run experiments with disabled users and collect their preliminary appreciation of the PSI-CoScripter tool. Another important research step for us is to investigate the nature, frequency, and usefulness of longer web scripts.

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REFERENCES

1.Benners-Lee, T. (s/d) http://www.w3.org/Press/WAI-Launch.html

2.CoScripter. *Simplifying Web-based processes*. http://services.alphaworks.ibm.com/coscripter/browse/about.

3.INAF,2007–*Indicador Nacional de Alfabetismo Funcional. Instituto Paulo Montenegro e Ação Educativa.* Inst. Paulo Montenegro e Ação Educativa. (http://www.ipm.org.br/ipmb_pagina.php?mpg=4.02.01.00.00&ver=por, last visited on 05/JUL/2008)

4.Leshed, G., Haber, E. M., Matthews, T., and Lau, T. 2008. CoScripter: automating & sharing how-to knowledge in the enterprise. In *Proceeding of* CHI '08. ACM, New York, NY, 1719-1728.

5.Melo A. M., Baranauskas M. C. C., Bonilha F. F. G. "Avaliação de Acessibilidade na Web com a Participação do Usuário: Um Estudo de Caso". *In Anais do VI Simpósio sobre Fatores Humanos em Sistema, 2004*. SBC. Porto Alegre, RS. pp. 165-168

6.SANTOS, R. S. Pela primeira vez mais da metade da população já teve acesso ao computador. In: CGI.br *Pesquisa sobre o uso das tecnologias da informação e da comunicação 2007*. São Paulo, 2008, pp. 35-39.

7.Tangarife, T. and Mont'Alvão, C. "Estudo Comparativo Utilizando uma Ferramenta de Avaliação de Acessibilidade para Web". *In Proceedings of CLIHC '05.* ACM, New York, NY. pp. *313-318.*

8.Torres, E. F., Mazzoni A. A., Alves, J. B. M. "A acessibilidade à informação no espaço digital". *In Ci. Inf, 2002. SciELO Brasil.i* doi: 10.1590/S0100-19652002000300009

9.W3C. Accessibility Evaluation Tools http://www.w3.org/WAI/ER/tools/

10.Walton, M. and Vukovic, V. 2003. Cultures, literacy, and the web: dimensions of information "scent". *interactions* 10, 2 (Mar. 2003), 64-71.

11.WAI Web Accessibitlity Initiative http://www.w3.org/WAI/guid-tech.html