Int. J. of Computers, Communications & Control, ISSN 1841-9836, E-ISSN 1841-9844
Vol. V (2010), No. 4, pp. 477-482

The Avatar in the Context of Intelligent Social Semantic Web

A. Braşoveanu, M. Nagy, O. Mateuţ-Petrişor, R. Urziceanu

Adrian Braşoveanu
Lucian Blaga Univeristy of Sibiu, Romania
E-mail: adrian.brasoveanu@gmail.com

Mariana Nagy
Aurel Vlaicu University of Arad, Romania
E-mail: mnagy62@yahoo.com

Oana Mateuţ-Petrişor, Ramona Urziceanu
Agora University, Oradea and R&D Agora Ltd.
Cercetare Dezvoltare Agora Oradea, Romania
E-mail: ganearamona2002@yahoo.com, oana_mateut@yahoo.com

Abstract: When the first articles about the Semantic Web (SW) appeared, there were hardly any signals that the next revolution would be related to social networking. Social networking services (SNS) have grown after MySpace, LinkedIn and Facebook were launched in 2003-2004 and combine text, images, movies, music, animations and all sorts of lists to create personal presentation pages for users, means to connect to real or virtual friends from all over the world and recommendations based on trust.
The rise of the Social Semantic Web and the convergence of different media to create rich experiences is one of the most interesting paradigm shift in the last decades because the probable effect of this movement is the fact that in one day virtual meetings will become legitimate in all aspects of our daily lives (if they are not already). The most important question in this context (the one that we try to answer in this paper) is related to how people will try to shape and use their avatars. In order to understand this, we will study the links between multimodal ontologies, affective interfaces, social data portability and other recent findings.
This paper starts with a survey of the current literature of the field, examines some social semantic web mechanisms that changed the way we think about SNs and in the end discusses some methods of connecting emotions with the social semantic web which pose some interesting questions related to the use of avatars. Between conclusions, one of the most interesting is the one that states that the use of affective interfaces adds value to the multimodal ontologies, while another suggests that the avatar must be a mediator between different technologies.
Keywords: avatar, Semantic Web (SW), social networking services (SNS), affective interfaces, Human-Computer Interaction (HCI).

1 Introduction

The semantic web (SW) has evolved into a technology we use on daily basis, sometimes without even being aware of this, but dreams like those described by World Wide Web creator Timothy Berners-Lee and his collaborators in the 2001 article [4] are still not common place. This is often the case when new technologies are presented to the general public while still in their infancy. The original article has been revised 5 years later [5] and Berners-Lee admits that we are still very far from his original vision of agents replacing humans for several tasks like buying tickets or making appointments to the doctor.

Almost a decade later, the web has changed and the information is no longer presented through classic text and pictures. Social networking services (SNS) like Facebook, LinkedIn, MySpace combine text, images, movies, music, animations and all sorts of lists to create personal presentation pages for users, different means to connect to real or virtual friends from all over the world and recommend things based on trust. These days even the way we make a search is going through a paradigm shift, because it is widely believed that the recommendations of a

circle of trusted friends are more valuable than those of a search engine. This is clearly a human response to the strategies of increasing the ranks of the pages in search engines.

As it was stated by Berners-Lee, the original vision of the Semantic Web was to "enable machines to comprehend semantic documents and data, not human speech and writings" [4]. Because of the chaotic developments of the last decade, machines will not only need to comprehend human speech and writings, but will also need to be capable to search through videos almost in the same way we do. Such capabilities go well beyond the initial meaning of the Semantic Web, imply reasoning and emotions and since they are similar to the way we think, allow us to use the term "Intelligent" before the terms "Social Semantic Web".

In this paper we will try to see how the developments in different areas like HCI, SNS or SW reshape old concepts on the fly. We have chosen the avatar in order to express some of our thoughts.

2 Rationale and Approach: Why the Avatar?

To explain the rationale behind choosing the avatar for presenting some of our ideas, we have to examine a brief history of the links between the Semantic Web and social networking. We will also need to look at the trends from these areas and HCI.

Constraints force us to think creatively, is the mantra of the agile development community (and of Ruby on Rails in particular), but also the phrase that defines the last decade in the IT industry. When we look back to the year 2001, we do not see WTC but rather a fragile industry which tried to recover from the "dot com bubble". In this climate of uncertainty when the seminal article about Semantic Web by Berners-Lee and his research group [4] was published it sparked a lot of debates and started a series of innovations which did not stop to date. In those days it was almost impossible to predict that any company related to the IT would be sold for half a billion or more, given the fact that many companies failed to bring cash to the investors. Few years later, when MySpace was sold for a considerable amount to NewsCorp and Google acquired YouTube, everybody understood that something changed in the world of IT. Somewhere between 2002 and 2005, without knowing it, the world has become social. Historically social networks were viewed as the preserve of the rich and even as a sort of social divide between the rich and the poor, but with the rise of the social networking services they became useful for everyone [26] [27]. The user centric social network, where everything is a link from or to a friend, is necessary to everyone who tries to find a job or his old friends from college these days. Social networking services added new layers not only to the social interaction but to the Semantic Web as well. Some ideas like Mika's community-based ontology extraction from Web pages [21] would have never emerged without the rising of SNS. The field of ontology was connected with IT for several decades, but the first definition dates back to Gruber's 1993 trial, an ontology being an "explicit specification of a conceptualization" [14]. This definition has been revised several times by different authors [15], but all these revisions are still based on [14]. Between 2001 and 2007 a lot of ontologies have been created with the purpose of connecting different SNS or as extensions to applications that were built around data extraction from web applications [18] [22] [24]. Rich visualization techniques [22] like those generally used in research appeared on the Web with the huge success of the Adobe Flash technology (1998-2005) and the introduction of Ajax and tag clouds (2004-2005). The use of labels for annotating different pieces of information has created a new field for knowledge representation called folksonomies [26]. The use of folksonomies is often linked with the use of ontologies since both concepts aim to offer a way to retrieve information. The folksonomy will give us some ideas about the most valuable words for a certain group of users, while the ontology will also try to model the relations between different topics (as we can see in Figure 1). The various methods of bridging folksonomies and ontologies to enable better knowledge representation are presented in [18].

The links between social networking and Semantic Web are discussed in Berners-Lee revision of [4] in the 2006^{th} article [5] and in [6], while the history of the SNS is examined in [8]. When it comes to SNS we usually agree with the chronology proposed by Boyd in [8], but when we deal with bridging SNS and SW we propose a simple timeline:

- 2001 - 2004: The first attempts to link SW and SNS;
- 2004 - 2007: The explosion of SNS and the first important results in bridging SW and SNS like Katrina PeopleFinder [21];
- 2008 - Present Day: SNS are now present in all aspects of our lives and research is focused on rather more advanced topics like affective interfaces.

Perhaps the most interesting conclusion from the early years of research regarding the links between SNS and the SW (2001-2007) belongs to Mika from his most cited article from [21]:"It seems that ontologies are us: inseparable from the context of the community in which they are created and used". The research in recent years

Figure 1: a) FOAF Ontology visualization with Welkin; b) tag cloud for Facebook.

(2008 - 2010) has rendered Mika's thesis as true. Some interesting problems related to social networking (similarity problems usually phrased like "find all users which share certain interests"; semantic concept clustering and many others) have been modeled on various datasets (from small predefined datasets selected for special topics to large online datasets), but the emergence of the semantic web tools on large scale, mostly in the last six years (in the same time with the sudden growth of interest in the area of SNS), enables us to look at them from new perspectives.

Our approach to the subject consists in making connections between different recent findings in the fields of SNS and SW. The most interesting trends in social software (2008-2009) we investigated are social data portability [7] [23], live social semantics [1], mass interpersonal persuasion also known as MIP [15], and the growth of interest surrounding affective interfaces [10] [19].

Social data portability is a classic problem in the field of social software since its inception. It might have started as something which was interesting only for people with large social networks in real life, but as soon as the companies discovered that SNS had the potential of attracting clients with clear profiles, something that TV or written media does not guarantee, it became the norm to be present on all the major SNS. The growing number of social networking sites in different niches is a problem for the users or companies interested in more than one field of knowledge who want to share their data. Porting data between different SNS or platforms like Facebook and OpenSocial or defining standards for presenting the articles from magazines or blogs is the work of researchers like Uldis Bojars and John G. Breslin from DERI, Ireland, authors of the SIOC Ontology [7].

Live social semantics is a concept proposed by a team of researchers from UK, France and Italy lead by Harith Alani [1]. The main idea is to "integrate data from the semantic web, online social networks, and a real-world contact sensing platform" [1]. Their system which integrated the Social Semantic Web mechanisms with the real world was tested at ESWC 09. Live Social Semantics is something that benefits when being linked with Social Data Portability, because in the same room we will have people connected to more than one SNS in most of the cases.

Mass interpersonal persuasion or MIP is the generic name given to those techniques of persuading millions of people to join to a certain initiative [12]. Before Facebook gathering millions of people was not an easy task, therefore it is not a surprise that in this case the theory appeared only after several applications succeeded. Its creator, BJ Fogg is the same man who introduced captology and coined the term persuasive technology [13]. The main idea behind MIP is that we should design new systems with MIP and the huge social graph in mind if we want to change something in this world. When it comes to MIP, the technology, the topic or the creator's initial intent does not matter much. What is important is that MIP gives to a creator the possibility of reaching a wider than expected audience. Fogg stated that: "we are at the start of a revolution in how individuals and cultures make decisions and take action" [13].

Affective interfaces have been proposed since 1980s but recently there has been a renowned interest. Beyond Fogg's PhD work and his seminal book [13], today affective computing is sometimes related to the Semantic Web. Between the most interesting concepts is the use of multimodal ontologies for describing emotions [10] [19]. The use of affective interfaces adds value to the multimodal ontologies because they improve communicability. Other interesting topic in the field is the way in which emotional experiences from SNS affect us in ordinary life as presented in [22] and [24]. While work in 3D graphics is not necessarily connected with the Semantic Web, when it comes to affective interfaces, the research related to the animation of the emotional facial expressions [25] can very easily be combined with the ontologies for describing emotions [10] [19]. The rise of the Social Semantic

Web and the convergence of different media to create rich experiences is one of the most interesting paradigm shifts in the last decades. One of the effects of this movement is the fact that in one day virtual meetings will become legitimate in all aspects of our daily lives (if they are not already). In such a context the role of the avatar is to replace a human being, as it was supposed to be, but the trends we have examined also suggest new approaches to the concept of the avatar and will also enable us to get closer to the visions described in [4].

3 The Avatar in the Intelligent Social Semantic Web

For the purpose of this paper we use the meaning of the term avatar which represents an agent that is a double for a real person, a double that takes care of our social self, its virtual ego [20]. It can very well be even a pseudo-avatar, not necessarily as it is viewed in Berners-Lee's paper [4]. It can represent a person, an organization or a fictional character that needs to be in the social space and it can also have a graphical representation be it 2D or 3D.

The first question that comes in mind is clear: What is the purpose of the avatar in the Intelligent Social Semantic Web at which all of the concepts presented in the previous section are aimed toward? Are there any links between those concepts?

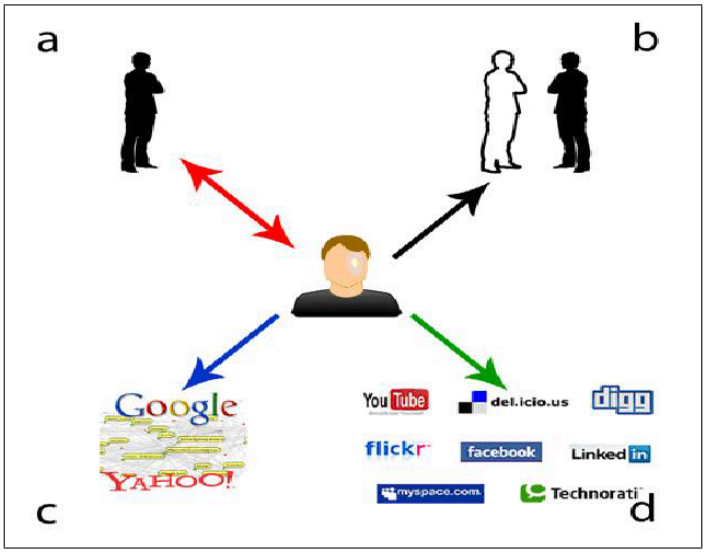

Figure 2: Some of the functions of the avatar in the Intelligent Social Semantic Web: a) maintain communication with its human counterpart (or organization); b) act as replacement for the human in virtual meetings; c) use the web, ontologies and other sources to find out news about the master's fields of interest; d) update the social network or the sites of its human counterpart.

One link was already shown in the previous section by connecting Social Data Portability and the Live Social Semantics. Another one is the idea that only emotional agents are believable [13], proposed by Fogg. But why would we need an avatar that is an emotional being? Even though the work presented in [11] [12] [16] [18] [25] is good for avatars that represent human beings, which are emotional in the real world, it is debatable if the same can be applied to organizations. Advertising is often misleading because a firm only uses emotions to sell products - to produce emotional reactions which can lead to the decision of choosing a certain brand - not because it really has emotions. People that work for a certain organization do have emotions, but the organization itself does not. There should be clear differences between the avatars that represent organizations and the avatars that represent human beings, but these are not in our sights for the moment. An avatar that represents an organization uses SNS to achieve MIP. Without MIP and the targeted advertising social networking has no value for organizations. The main philosophical problem that arises when the avatars try to use MIP is related to trust and it is expressed very well in [3]: "Whereas trust is generic to human communication and implies evaluative aspects, social presence is aiming at mediated communication and is more descriptive by nature".

We can build different associations between the research areas we have mentioned in the previous section, but it should be enough to analyze the parts of the expression from the title (Intelligent Social Semantic Web) to

understand the purpose of the avatar in this medium. SNS represent the Social part of the equation, while the SW is represented through ontologies and their applications, so it should be clear that the avatar should be a part of the Intelligence. In fact it is in the same time a part of the Intelligent side of the equation, as well as of the Social part (if we limit ourselves to the meaning of the avatar in the current SNS like Facebook, MySpace, LinkedIn).

For each major field of interest of a human person or organization several ontologies already exist or will be developed. The main problem that an avatar will face will be to wisely choose those ontologies or even perform ontology matching [11] [16] and use them to extract the meaningful data from the web (like in [28]) or create content that could help us (humans or organizations) to fulfill our objectives. It has to work for us when we sleep and alert us when something critical for our activity happens. The avatar will be credible only if it will be emotional, because it's not easy to wake up a man at 3:00 am and tell him that in other part of the world something happened and it will change his life. In any other way it would be impossible to have any impact in an open dynamic environment [2]. We might also need to change the way we design socio-technical systems [9] in order to enable the avatars to automate different tasks. When we will have this, the vision from [4] will be closer to us than ever, if not reality [17].

4 Conclusions and Future Work

Predicting the future is not an easy task as we have seen. Any technology needs several iterations before achieving its goal so we should not be surprised that it will take some time until the results of our work will be implemented and validated.

The avatar of the future will have some difficult tasks to solve (like choosing the proper ontologies) if we are to benefit from its use. It will also need to have emotions if we want it to be believable because the use of affective interfaces improves communicability. The problem of differentiating between the avatars of the real persons and the avatars of the organizations will remain an open problem until the use of avatars will be the subject of standards committees or international law.

The future work will consider implementing new mechanisms for linking the multimodal ontologies and affective interfaces with recent research in Semantic Web and HCI in a 3 years interval (during the PhD studies of the first author). The objectives are to be fulfilled involving European teams of researchers interested in this kind of projects.

Acknowledgements

This work was partially supported by the strategic grant POSDRUI88I1.5ISI60370 (2009) on "Doctoral Scholarships" of the Ministry of Labour, Family and Social Protection, Romania, co- financed by the European Social Fund - Investing in People.

Bibliography

[1] H. Alani, M. Szomszor, C. Cattuto, W. Van den Broeck, G. Correndo, A. Barrat. *Live Social Semantics*. In: 8th International Semantic Web Conference (ISWC), October 2009, US, 2009.

[2] I. Dzitac, B.E. Bărbat. *Artificial Intelligence + Distributed Systems = Agents*. International Journal of Computers, Communications & Control, IV, 1, 17-26, (http:llwww.britannica.comlbpsl additionalcontentl18l36182542lArtificial-Intelligence-Distributed-Systems-Agents), 2009.

[3] G. Bente, S. Ruggenberg, N. C. Kramer, F. Eschenburg. *Avatar-Mediated Networking: Increasing Social Presence and Interpersonal Trust in Net-Based Collaborations*. Human Communication Research 34 (2008) 287-318.

[4] T. Berners-Lee, J. Hendler, O. Lassila. *The Semantic Web*. Scientific American, May 2001, pp. 34-43.

[5] N. Shadbolt, W. Hall, T. Berners-Lee. *The Semantic Web revisited*. IEEE Intelligent Systems, pages 96- 101, MaylJune 2006.

[6] T. Berners-Lee, W. Hall, J.A. Hendler, K. O'Hara, N. Shadbolt, D.J. Weitzner. *A Framework for Web Science*. Foundations and Trends in Web Science, 1 (1), pages 1-130, 2006.

[7] U. Bojārs, A. Passant, J.G. Breslin, S. Decker. *Social Networks and Data Portability Using Semantic Web Technologies*. The 2nd Workshop on Social Aspects of the Web (SAW 2008) at the 11th International Conference on Business Information Systems (BIS 2008), Innsbruck, Austria, May 2008.

[8] D. M. Boyd, N. B. Ellison. *Social network sites: Definition, history, and scholarship*. In Journal of Computer-Mediated Communication, 13(1). http:lljcmc.indiana.edulvol13lissue1lboyd.ellison.html, 2007.

[9] V. Bryl, P. Giorgini, and J. Mylopoulos. *Designing socio-technical systems: From stakeholder goals to social networks*. Requirements Engineering, 14(1):47-70, 2009.

[10] I. Cearreta, J. M. Lopez, N. Garay-Vitoria. *Modelling multimodal context-aware affective interaction.* Proceedings of the Doctoral Consortium of the Second international conference on ACII'07. Lisbon, Portugal. Pages 57-64, 2007.

[11] J. Euzenat, P. Shvaiko. *Ontology Matching*, Springer, 2007

[12] B.J. Fogg. *Persuasive Technology*. Morgan Kaufmann, San Francisco, 2003.

[13] B.J. Fogg. *Mass interpersonal persuasion:An early view of a new phenomenon*. In H.Oinas- Kukkonen et al. (Eds.). Persuasive 2008, LNCS 5033 (pp.23-34). New York, Springer, 2008.

[14] T. R. Gruber. *A Translation Approach to Portable Ontologies*. Knowledge Acquisition, 5(2):199- 220, 1993.

[15] N. Guarino, D. Oberle, S. Staab. *What is an Ontology?* In S. Staab and R. Studer (eds.), Handbook on Ontologies, Second Edition. International handbooks on information systems. Springer Verlag: 1-17, 2009.

[16] Harth, S. Kinsella, S. Decker. *Using Naming Authority to Rank Data and Ontologies for Web Search*. In Proc. International Semantic Web Conference, ISWC'09, Washington, USA, October 2009, 2009

[17] D. J. Lewis. *Intelligent agents and the Semantic Web. Developing an intelligent Web*. Retrieved from http:llwww.ibm.comldeveloperworkslwebllibrarylwa-intelligentagel. 2008. Accessed: December 2009.

[18] F. Limpens, F.Gandon, and M. Buffa. *Linking folksonomies and ontologies for supporting knowledge sharing: a state of the art*. Technical report, EU Project, ISICIL, 2009.

[19] J. M. Lopez, R. Gil, R. Garcia, I. Cearreta, N. Garay. *Towards an Ontology for Describing Emotions*. WSKS (1) 2008: 96-104.

[20] P. Messinger, X. Ge, E. Stroulia, K. Lyons, K. Smirnov, M. Bone. *On the relationship between my avatar and myself*. Journal of Virtual Worlds Research 1 (2). http:lljournals.tdl.orgljvwrlarticlelviewl3521. (Accessed December 2009)

[21] P. Mika. *Social Networks and The Semantic Web*, Springer, 2007

[22] D. Petrelli, S. Mazumdar, A-S. Dadzie, F. Ciravegna. *Multivisualization and Dynamic Query for Effective Exploration of Semantic Data*. In Proc. International Semantic Web Conference, ISWC'09, Washington, USA, October 2009, 2009.

[23] L. Răzmeriţa, M. Jusevičius, Rokas Firantas. *New Generation of Social Networks Based on Semantic Web Technologies: the Importance of Social Data Portability*. In: Workshop on Adaptation and Personalization for Web 2.0, UMAP'09, June 22-26, 2009.

[24] C. Sas, A. Dix, J. Hart, S. Ronghui. *Emotional Experience on Facebook Site*. In: CHI '09: CHI '09 Extended Abstracts on Human factors in Computing Systems, 4-9 April 2009, Boston, MA.

[25] R.J.S. Sloan, M. Cook, B. Robinson. *Considerations for believable emotional facial expression animation*. 2nd International Conference on Visualization, Barcelona, Spain, 2009.

[26] T. VanDerWall. *Folksonomy Coinage and Definition*. 2007. Retrieved from http:llvanderwal.netlfolksonomy.html. Accessed: December 2009.

[27] M. Webb. 2004. *On Social Software*. http:llinterconnected.orglhomel2004l04l28l.

[28] S.Y. Yang. *Developing an Ontological FAQ System with FAQ Processing and Ranking Techniques for Ubiquitous Services*. Proc. of The First IEEE International Conference on Ubi-media Computing, Lanzhou, China, 2008, pp. 541-546.