Recognizing Cultural Differences on Food

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Abstract. Cultural differences play a very important role in matching ICT interaction to the expectations of users from different national and cultural backgrounds. But to date, there has been few research as to the extent of such differences, and how to produce software that takes into account these differences. Considering the third wave of HCI research on context, involving the intangible aspects of the interaction with users and ICT solutions, like culture, we are studying these issues using a unique resource: Common Sense knowledge bases in different languages. We have knowledge bases containing millions of sentences describing people and everyday activities, collected from volunteer Web contributors, in three different cultures: Brazil, Mexico and the USA. It is described the experiences with these knowledge bases. Though preliminary, we hope that our work will contribute to software that takes better account of such differences, and fosters inter-cultural collaboration.

Keywords: Cultural differences, common sense, human-computer interaction.

1   Introduction

Envisioning the future of our society based on pervasive and ubiquitous ICT systems supporting our life style [18], we are seeing increasing the new wave of HCI, based on context [16], and context being understood as having a broader meaning, embracing the intangible aspects of the interaction with users and ICT solutions, like sociality, emotion, experience, culture [17]. Many researchers have pointed that cultural differences should be considered in the design of interactive systems [1,2]. AS Marcus states, user-interface developers may need to go to "culture class" in order to minimize culture clashes in their designs [1], once that is not clear how to access, consider and design cultural values [19]. Culture is a shared meaning system which forms a framework for problem solving and behavior in everyday life. Individuals communicate with each other by assigning meaning to messages based on their prior beliefs, attitudes, and values [2]. The cultural differences express the "world vision" a group of people have. This vision is expressed in the simple activities that people do everyday.

Arguably the most general and widely applicable kind is knowledge about the everyday world that is possessed by most people in a given culture — what is widely

called 'common sense knowledge'. While 'common sense' to the ordinary people is related to 'good judgment' as a synonymous, the Artificial Intelligence community uses the term `common sense` to refer to the millions of basic facts and understandings that most people have. For example, the lemon is sour; to open a door, you must usually first turn the doorknob; if you forget someone's birthday, they may be unhappy with you. Common sense knowledge, thus defined, spans a huge portion of human experience, encompassing knowledge about the spatial, physical, social, temporal and psychological aspects of typical everyday life. Common sense is acquired from the interaction with the environment. Changing the environment changes the perception of common sense and is one of the reasons why different and diverse cultures exist. This conception of common sense is building ontology about everyday life based on the shared experiences of a community [3].

In this context, the main purpose of this work is to evaluate how the cultural differences can be recognized in the databases that store common sense. For that, we select a theme that frequently appeared in the Brazilian knowledge base – food. Considering that eating habits express culture and common sense affects eating habits, we could say that common sense expresses culture.

To demonstrate that common sense is reflected in eating habits, we collected and compared semantic relations about food from the Brazil, Mexico and USA common sense databases. Also, we must consider the potential use of these knowledge bases: by those who want to develop systems focusing on a specific user group (e.g. a maitre that wants to prepare a menu to celebrate a certain country or a centain group of costumers who consults the common sense database to prepare a specific dish); by those who want to develop systems which use the cultural knowledge stored in the knowledge bases (e.g search engines that consider the cultural context); and by those who want to facilitate communication between people, providing mutual knowledge about their cultures.

This article is divided as follows: section 2 presents how data are collected in the Open Mind Common Sense bases, section 3 presents the comparison realized, section 4 discusses the use of the cultural differences knowledge for he three developer profiles presented previously; and in section 5 some conclusions and future works are discussed.

2 The Open Mind Common Sense approach for gathering and using common sense facts

Since every ordinary person has the common sense that computers lack, why not involve everyone in building the knowledge base that is necessary to give computers what they need to be able of common sense reasoning? Nowadays, it is easy to reach lots of people through the Internet. Also, considering advances in the natural language processing area, it is possible to elicit common sense facts in natural language so that the users don't need technical to enter facts in the system [4,5]. Parsing and semantic net mining technologies can convert natural language into a form usable by computer

interfaces. In this way, the Open Mind Common Sense Project gathered common sense knowledge, as depicted in Figure 1.

For gathering the common sense data some Open Mind Common Sense websites were built. As the name suggests, the Open Mind Common Sense sites are open. Everyone who wishes to help can access them and contribute with his or her knowledge.

After registering and logging onto the system, users have access to several activities that are proposed to gather different kind of common sense knowledge. Some of those activities are template-based like "People ____ when they _____". and others allow the user to provide entries in free form language. Filling out the activities results in growing the common sense facts database.
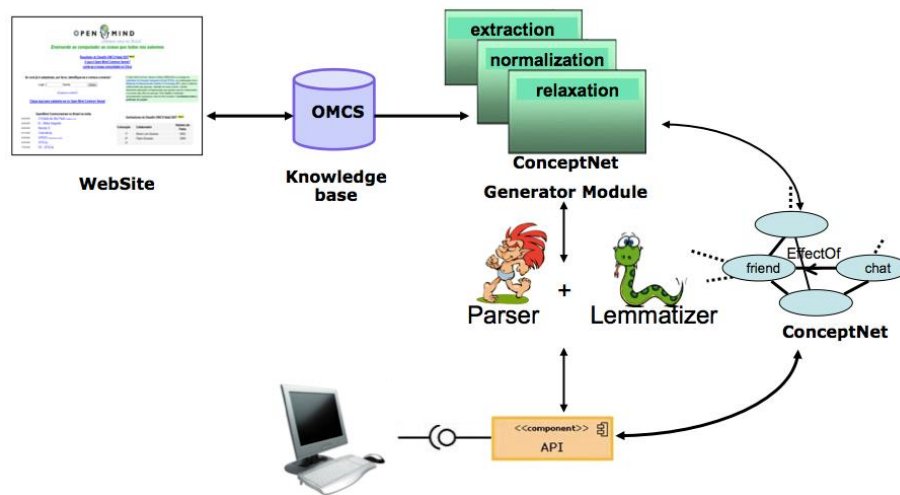

Figure 1. Open Mind Common Sense Project Approach for Gathering and Using Common sense facts.

The data are stored in the Open Mind Common Sense database as simple statements in natural language. However, for machine use, it is necessary to put them in a representation that allows machines to make practical inferences and analogies. For that, the data are submitted to a natural-language parser that generates a set of normalized nodes that are semantically related, composing a semantic network. A better understanding about how this semantic network is generated is presented by Liu [3].

Once the semantic network is ready, applications can be developed using the common sense knowledge provided by different users.

3   Common Sense and Eating Habits

To demonstrate that common sense affects eating habits the first step was the selection of facts related to food, for example: "People eat salami when they drink beer" or "You generally want a hot dog for lunch".

Considering the redundancies in our data, we selected categories that appeared in higher frequency in each base. The categories are: at what time people have their meals, what people eat for each meal, kinds of food, food for special occasions as parties and Christmas and ingredients used to make some kinds of food.

Analyzing these categories we registered some aspects that we believe are related to some cultural values.

Time for meals

One of the themes about food that commonly appears in the knowledge bases is the time for meals. Table 1 shows what is considered common sense for most of the collaborators

Table 1.Time for meals that typically people would consider .

	Brazil	Mexico	USA
Lunch	11:30 to 13:00	14:00 to 16:00	12:00 to 14:00
Dinner	18:30 to 20:00	20:00 to 21:00	18:00 to 19:00

Here it is interesting to note that meals in Mexico are the latest one. Although in Brazil and USA meals happen in similar hour in Mexico it seems to be common to have lunch after 14:00.

Kind of food

Also, many facts about types of food are usual in the bases. The inferences "something is food" is also usual. Table 2 shows the most cited kind of food.

Table 2. Types of food people remember most.

Brazil	rice, bean, fruit
Mexico	burritos, chilaquiles, taco, escamoles
USA	pancakes, hamburger, hot dog, pizza, sandwich, pumpkin pie, apple pie, ice cream, cheese cake

A curious thing is that in Brazilian database, fruits are cited as food many times and also many kinds of fruits were inserted. In Mexican and USA bases it doesn't happen.

What do people eat in each meal?

Differences between what is eaten in each meal also can be noticed. Table 3 shows what seems to be considered common sense about what to eat in each meal.

Table 3. What do people eat in each meal?

	Brazil	Mexico	USA
Breakfast	bread	tamales, eggs with hot sauce	pancakes, bagels
Lunch	rice, bean, meat, salad, egg	chicken with mole, roast meat, pastes, chilaquiles, barbacoa, tacos	fluffer Nutters, hamburger, hot dog, pizza, sandwich, wafers
Dinner	rice and bean, soup, salad, sandwich	tamales and atole, quesadillas, coffee and cookies, bread with bean	steak and eggs, bake chicken, clam chowder, mash potatoes
Dessert	ice cream, fruit, candy	rice with milk, churros with chocolate, nuts with honey (crowbar), sweet coconut	pumpkin pie, apple pie, ice cream, cheese cake

It is possible to notice that Brazilian people prepare lighter food at breakfast. Also Mexican people seem to like food make with flour.

About desserts, Brazilian people associate ice cream to something cooling, what leads to the situation where companies have problem on selling ice cream during winter time, because commonsense says that ice cream is a summer related food, although our winter time has temperatures around 22 degrees Celsius. On the other hand, American people seem to prefer pies for dessert.

Food for special occasions

Christmas and parties were topics that collaborators remembered too. Table 4 shows the main types of food cited for these occasions.

Table 4. Food for special occasions.

	Party	Christmas	Birthday
Brazil	Salted snacks (salgadinhos), candy (docinhos), cake, meat (barbecue), beer	turkey, pork, lamb	Cake with candles
Mexico	beer, tequila	romeritos, codfish, spaghetti	Cake with candles

USA	beer, vodka	cranberry sauce, pineapple salad, frozen Christmas Pudding	Cake with candles

For Brazilians, party is about drinks and food. For Mexican and North Americans, they are happy in a party with drinks only. It is interesting to notice that in Brazil and México seem to be common have salty food for Christmas while in USA sweet dishes seem to be more appreciated. Turkey, typically associated to Thanksgiving in USA, is a typical Christmas dish in Brazil. To celebrate birthday, you can't go wrong choosing a cake with candles. And beer seems to be appreciated in parties anywhere.

Expressing food preferences and Age

As we get old, our capacity of analysis, observation and criticizing become more accurate, we review up our standards and our preferences become more detailed. That is a fact that is expressed in the OMCS-Br knowledgebase when people with distinct age talk about food and their descriptions. Table 5 shows how young people name dishes in general and how mature people comment about their preferences in Brazil.

Table 5. Age and Food description.

Age	Food description
Teenagers (from 13 to 27)	food, fish, rice, meat, fruit, bread, salad, beer
Adults (above 60)	Baked Meat, green salad, hot sandwiches, traditional candies, milk pudim, various snacks, botle of wine, bowl of fruit, special soup, jarr of juce, bowl with fried potatroes, terrine with baked meat, botle of champaing, chicken with spice dressing, trail with snacks, baked fish dish, jarr with water, plate with fried eggs, dish with oisters, dish with meat and potatoes

In summary, all these results show how important food is as an expression of culture, values and life style for people no matter where they are from, and how values are attached to the food people choose to eat in different occasions.

4   Cultural Differences and the Uses for Common Sense

We believe the cultural differences stored in the common sense bases can be helpful in such a variety of situations:
- Helping those who want to consider these differences in the development of interactive systems;
- Facilitating the interaction of different users by applications that use this common sense;
- Facilitating the communication between people.

The next sections point out how developers involved in the situations cited above can use the cultural differences stored in common sense knowledge bases.

Developing systems considering cultural differences

Computer Human Interaction research raises further questions about how to understand culture and how it can and should affect user-interface design. Attributes as attraction, dynamism, activity, level of expertise, faith, intentions, locality, social validation, preferences, and scarcity have different weightings in different cultures [6]. Consequently, user-interface developers face further challenges [1].

Many questions still persist while talking about considering cultural differences in the design of interactive systems. Marcus[1] raises some questions: Are our notions of usability culturally biased? How should culture differences relate to persuasion and establishment of trust in Web sites and Web-based applications? How should culture dimensions relate to established dimensions of intelligence and change your thinking about online help, documentation, and training? How do culture differences relate to new insight about cognition differences? Do these differences change your thinking about user search strategies, mental models, and navigation?

The only consensus seems to be that these attributes have different values and are key characteristics of the cultures to which they belong [7].

Despite the importance of these questions, some developers still face an uphill battle to get budgets for culture-oriented research and development accepted, to find and allocate the necessary human resources, and to achieve project success [1].

In this context, considering cultural aspects in the design of interactive systems is not an easy task. Besides, the beliefs, attitudes and values of a group of people change with time. Collecting these "world views" and making them available for everyone that wants to develop a user-interface, can be expensive and laborious.

The common sense databases store the cultural knowledge that is being created and modified all the time. The use of the Internet and the collaboration of millions of people allows knowledge bases to reflect actual cultural knowledge without cost, as anyone can have access to the database at the sites.

Developing systems which consider cultural differences

As the complexity of computer applications grows, it may be that the only way to make applications more helpful and avoid stupid mistakes and annoying interruptions is to make use of common sense knowledge. Cellular telephones should know enough to witch to vibrate mode if you're at the symphony. Calendars should warn you if you try to schedule a meeting at 2 AM or plan to take a vegetarian to a steak house. Cameras should realize that if you took a group of pictures within a span of two hours, at round the same location, they are probably of the same event [8].

In the web context, the necessity of using common sense knowledge becomes even more evident. The number of web pages available on Internet increases day after day, and consequently, finding relevant information becomes more and more a difficult task [9]. Also, Web Search tools do not do a very good job of discerning individuals' search goals [10]. However, when we consider communities of people with common interests, it is possible to improve the quality of the query results using knowledge extracted from common sense databases and observing behaviors of peo-

ple of same culture. When a user submits a query, the cultural aspects suggest specific information exploiting previous observations about the behavior of other users when they asked similar queries. Different users may merit different answers to the same query [9].

A comparative study shows differences in Web searching by U.S. and European users [11]. Specifically, the results suggest some differences in the topics searched and searching behaviors. The paper also suggests interesting differences in search behavior and in topics searched by U.S and European users. For example, U.S users are more focused on e-commerce search topics [11]. These cultural and social differences represent a major challenge to search engines. Search engines will be more effective if they support cultural information about the user.

As cultural differences can be detected in common sense bases, search engines that attempt to leverage common sense have a great opportunity to reflect cultural differences in their results. Communication between people from different cultures is a field which presents many interesting aspects and is being explored in Brazil using the OMCS-Br knowledgebase like, Contexteller, FamilySense, What is it? and TapSense [20,21,22,23].

Developing systems which facilitate communication between people by showing cultural differences

Communication between people from different cultures is a field which presents many interesting aspects. To show that common sense can help showing the cultural differences, some tools using the OMCS-Br knowledgebase were developed like e-Rural and C2C [24,25]. These applications use the knowledge base and agents that keeps watching what the user types, while make suggestions from the knowledgebase for translation and simplification on the content to help users' understanding the content. The systems also make analogies for concepts that evoke the same social meaning in those cultures.

5   Conclusions

This paper discuss the possibility of using the common sense knowledge stored in Open Mind Common Sense bases, specially OMCS-Br, to verify cultural differences and consider the differences during designing for the third wave of HCI, looking for culturally contextualized ICT solutions. We explained how common sense is collected and manipulated. Facts from Brazil, Mexico and the USA were compared considering the eating habits domain.
Preliminary analyses point to Open Mind Common Sense bases express cultural differences. These differences should be considered by those who want to develop systems focusing on a specific user group; by those who want to develop systems which use the cultural knowledge stored in the knowledge bases; and by those who want to facilitate communication between people, providing mutual knowledge about their

cultures, considering better suited ICT solutions allowing adoption and appropriation of such solutions [26] by users.

As future works we are going to investigate cultural expressions in Open Mind Common Sense considering a larger number of facts. Also other domains are being studied in order to verify the cultural differences besides eating habits domain.

We hope developers of interactive systems use the knowledge about culture stored in Open Mind Common Sense databases in order to facilitate human-computer interaction. For that, a cultural filter for the Brazilian OMCS-Br knowledgebase was developed and is available for developers interested on embracing the challenge of developing culturally contextualized ICT solutions.

6   Acknowledgements

References

1. Marcus, A. Culture Class vs. Culture Clash. *Proc. Interactions 2002 (June, 2002)*, 25 p.

2. Khaslavsky, J. Integrating Culture into Interface Design. *Proc CHI 1998 (April, 1998)*, p 365-366.

3. Liu, H; Singh P. ConceptNet: A Practical Commonsense Reasoning Toolkit. BT Technology Journal, v. 22, n. 4, p. 211-226, 2004. http://web.media.mit.edu/~push/ConceptNet-BTTJ.pdf. Last visited in September, 2005.

4. Singh, P. The OpenMind Commonsense Project. KurzweilAI.net, 2002. Available in: :< http://web.media.mit.edu/~push/OMCSProject.pdf>. Last accessed in September, 2005.

5. Liu, H.; Singh, P. Commonsense Reasoning in and over Natural Language. Proceedings of the 8th International Conference on Knowledge-Based Intelligent Information & Engineering Systems. KES, 2004. Available in: :<http://web.media.mit.edu/~push/CommonsenseInOverNL.pdf>. Last accessed in September, 2005.

6. Bailey, B.P., Gurak, L.J., and Konstan, J.A. An examination of trust production in computer-mediated exchange. *Proc. Seventh Human Factors and the Web 2001 Conference (Madison, WI, June 4, 2001).* Available at www.optavia.com/hfweb/7thconferenceproceedings.zip/bailey.pdf. Last accessed in September, 2005.

7. Choi, B., Lee, I., Kim, J., Jeon, Y. A Qualitative Cross-National Study of Cultural Influences on Mobile Data Service Design. *Proc. CHI 2005 (Portland, Oregon, USA, April 2-7, 2005).*

8. Lieberman, L., Liu, H., Singh, P., Barry, B. Beating Common Sense into Interactive Applications. American Association for Artificial Intelligence, 2004, p 63-76

9. Birukov, A., Blanzieri, E, Giorgini, P. Implicit: An AgentBased Recommendation System for Web Search. *Proc. AAMAS'05 (July 25-29,2005, Utrecht, Netherlands).*

10. Teevan, J., Dumais, S. T., Horvitz, E. Personalizing Search via Automated Analysis of Interests and Activities. *Proc. SIGIR '05 (August 15–19, 2005, Salvador, Brazil).*

11. Spink, A., Ozmutlu S., Ozmutlu H.,Jansen B. J. U.S. VERSUS EUROPEAN WEB SEARCHING TRENDS. SIGIR Forum. Fall 2002, Vol. 36, No. 2, p 32-38

12. Liu, Hugo and Singh, Push. OMCSNet: A Commonsense Inference Toolkit. MIT Media Lab Society Of Mind Group Technical Report SOM02-01. (2002) 272-277.

13. Liu, Hugo. MontyLingua: An End-to-End Natural Language Processor for English. (2003)

14. Cohen, William W. WHIRL: A word-based information representation language. Artificial Intelligence (2000) 163-196.

15. Falkenhainer, B., Gentner, D. The Structure-Mapping Engine. Proceedings of the Fifth National Conference on Artificial Intelligence. (1986)

16. Boedker, S. When Second Wave HCI meets Third Wave Challenges. In: NordiCHI 2006: Changing Roles, 14-18 October 2006, Oslo, Norway.

17. Odom, W.; Pierce, J.; Stolterman, E.; Blevis, E. Understanding Why We Preserve Some Things and Discard Others in the Context of Interaction Design. In: CHI 2009 - Sustainability 2 April 7th, 2009. Boston, MA, USA.

18. Karray, F.; Alemzadeh, M.; Abou Saleh, J.; Arab M.N. Human-Computer Interaction: Overview on State of the Art. International journal on smart sensing and intelligent systems, vol. 1, no. 1, march 2008.

19. Anacleto, J. C. ; Lieberman, H. ; Tsutsumi, M. ; Neris, V. P. A.; Carvalho, A. F. P. de; Espinosa, J. ; Zem-Mascarenhas, S. ; Godoi, M. de S. (2006a). Can common sense uncover cultural differences in computer applications?, In: *Artificial Intelligence in Theory and Practice II*, Bramer, M. (Ed.), pp. 1-10, Springer, ISBN: 978-0-387-34654-0, Germany.

20. ANACLETO, J. C; FELS, S; VILLENA, J. M. R. Design of a web-based therapist tool to promote emotional closeness. In: **ACM Conference on Human Factors in Computing Systems (CHI 2010),** 2010, Atlanta. 2010. v. 1. p. 3565-3570.

21. SILVA, M. A. R.; ANACLETO, J. C. **Promoting Collaboration through a Culturally Contextualized Narrative Game.** In: Filipe, J.; Cordeiro, J. (Org.). Enterprise Information Systems - ICEIS 2009. 1 ed. Berlin, 2009, p. 870-881

22. ANACLETO, J. C; SILVA, D. D. ; SANTOS, V. H. B. R ; VILLENA, J. M. R. ; SILVA, M. A. R. ; PORTO, J. C. Experiencing a process to create a multimedia game and validating results application in a socio-cultural environment. In: **28th ACM International Conference on Design of Communication (SIGDOC 2010),** 2010, São Carlos. Proceedings of the 28th ACM International Conference on Design of Communication. New York : ACM Order Department, 2010. p. 1-8.

23. Bueno, A. O.; Anacleto, J. C. Allowing software developers to develop culture-sensitive applications by providing them the omcs-br cultural knowledgebase. In *CHI'13 Extended Abstracts on Human Factors in Computing Systems* (pp. 379-384). ACM. Paris, 2013.

24. MAGALHAES, V. M. A. ; ANACLETO, J. C. ; BUENO, A. O. ; SILVA, M. A. R. ; FELS, S.; Balbino . e-Rural: A Framework to Generate Hyperdocuments for Milk Producers with Different Levels of Literacy to Promote Petter Quality Milking. In: **Interact 2011**, 2011, Lisboa. 13th IFIP TC13 Conference on Human-Computer Interaction, 2011. v. 6947.

25. SUGIYAMA, B. A; ANACLETO, J. C; FELS, S; CASELI, H. M. Using cultural knowledge to assist communication between people with different cultural background. In: **28th ACM International Conference on Design of Communication (SIGDOC 2010),**

2010, São Carlos. Proceedings SIGDOC. New York : ACM Order Department, 2010. p. 183-190.

26. ANACLETO, J. C. ; FELS, S. Adoption and Appropriation: A Design Process from HCI Research at a Brazilian Neurological Hospital. INTERACT2013.

27. BUENO, A. O.; ANACLETO, J. C. Releasing the OMCS-Br Knowledgebase: facilitating insertion of Brazilian Culture into Applications. In: International Conference on Software Engineering and Knowledge Engineering, SEKE2013, Boston, USA. 2013.