Expressive Icons for the Communication of Intentions

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Abstract: The mutual understanding of intentions is essential to human communication. A web-mediated communication lacks elements that are natural in face-to-face conversation. This fact requires treating intentions more explicitly in computer systems. Literature hardly explores design methods and interactive mechanisms to support users in this task. In this article, we argue that icons representing emotions play a central role as means for aiding users to express intentions. This research proposes a method to determine and refine icons aiming to represent and communicate the users' intentions via computer systems. The work explores a theoretical framework based on Speech Act Theory and Semiotics to analyze different classes of intention. The method is experimented in a case study with 40 users and the obtained results suggest its feasibility in the process of filtering, selecting and enhancing icons to communicate intentions.

1 INTRODUCTION

During a communication act, humans rely on various resources for better expressing their ideas, intentions and emotions. These resources include gestures and facial expressions, which indicate how to interpret the communication acts.

A key aspect of communication refers to the shared understanding of intentions. Illocutions (acts performed by a speaker in producing an utterance) may result in different pragmatic effects depending on the interpretation of the speaker's intentions. For example, the phrase "please, leave the room" can be interpreted as an order/command or a gentle request. This might depend on the situation, intonation and corporal expressions. Although some words can characterize intentions, such as, "suggest", "ask", "expect" and "apologize", in many situations the speaker's intentions are formulated in an implicit way, without explicit use of words that indicate the real intentions.

In computational systems, in which communication remains predominantly based on text, intentions are not always clearly stated and shared. In some cases, the involved parts are unable to perform a successful communication. Thus, inadequate design solutions can imply in various interaction barriers, resulting in several cases of misunderstandings and disagreements between the participants (Hornung *et al*., 2012).

These problems can create difficulties for users to manage, retrieve and interpret the available content, as well as interact effectively and satisfactorily with others. A possible solution would be to automatically capture and infer the intentions by using natural language processing techniques. However, this task is extremely complex, once the interpretation is highly dependent on social and cultural patterns.

Although recent research literature has addressed some pragmatic aspects in interaction design (Hornung and Baranauskas, 2011), there is still a lack of interactive solutions and techniques to allow users to explicitly declare their intentions using computer systems. Our previous investigations preliminarily studied ways of supporting users dealing with these issues (Jensen *et al.*, 2015). Nevertheless, novel techniques and concrete design solutions are still required to enable users to express their intentions directly.

Whereas the use of so-called emoticons in interactive interfaces has been exploited to support the expression and transmission of emotions (Huang *et al*., 2008), we argue that icons can also bring benefits to the communication by supporting users in expressing their intentions.

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This study proposes a method to select, adapt and design icons to express different classes of intentions and thoroughly experiment it based on a case study. We call these expressive icons created or selected with the proposal of representing and emphasizing users' intentions "*intenticons*". This work makes the following contributions:

- Define a method, based on experiments with users, aiming to associate emotional icons with intentions;
- Present a case study applying the proposed method aiming to select and adapt groups of icons to express each class of intention.

This research adopts Semiotics (Peirce, 1958) and Speech Act Theory (SAT) (Searle, 1969) as frames of reference. The two theories provide means to structure and classify intentions according to different dimensions of the illocutions, as proposed by Liu (2000). Based on this referential, the proposed method includes several steps to select icons with the users' participation. The designers and users also discuss and propose improvements in the icons design in a participatory way.

We tested the method with 40 subjects, including undergraduate students in a Bachelor in Information Systems course. The results point out the quality of the association between icons and classes of intentions and reveal the effectiveness of the proposal to achieve representative icons.

The article is organized as follows: section 2 presents the related work; section 3 defines the theoretical framework; section 4 describes the proposed method and the case study; section 5 presents the results and discusses them; section 5 finally draws conclusions and future work.

2 EMOTICONS IN COMPUTER-MEDIATED COMMUNICATION

According to Huang *et al.* (2008), Computer Mediated Communication (CMC) brings additional difficulties in sharing emotions due to limited means of expressing them. One way to mitigate these difficulties is by introducing special icons named emoticons. These icons contribute to the creation of a new language to express emotions in CMC environments.

Studies of Huang *et al.* (2008) indicate positive results highlighting the value of emoticons for improving the CMC effectiveness and users' satisfaction. The authors pointed out that, when compared with text-based communications, integrating resources such as emotive expressions and gestures enhance the quality of information. This may refer to the possibility of emoticons to change the users' perceptions and interpretation of the received messages.

Users might feel more comfortable to express emotions in interfaces with informal style. In this sense, emoticons also contribute to increase the level of interpersonal interaction, as they improve the capacity of expressing emotions.

There are numerous studies about the representation of emotions in CMC. These researches indicate various advances in computer communication mechanisms. Derks *et al.* (2008) present an extensive review of studies that reveal differences and potentials of CMC compared to face-to-face communication. Based on the analyzed studies, Derks *et al.* (2008) emphasize the richness of emotions in CMC.

Emoticons are vastly disseminated in instant message interfaces and social networks. However, they can also be explored in professional settings, such as professional discussion forums. Luor *et al* (2010) investigated the effects of using emoticons on the communication of instant messages about professional tasks at the workplace. Their results point out the potential of emoticons to increase the expressiveness of text messages. The authors reported that workers recognize the utility of emoticons at the workplace. Other studies explored the use of emoticons in various working situations. For example, Thoresen and Andersen (2013) studied the effects on the use of emoticons in the organizational communication from a socio-psychological perspective.

In this context, a relevant issue is how to choose an icon suitable to communicate a felling on a specific situation. Urabe *et al.* (2013) present a system for recommending emoticons. Their results demonstrate the effectiveness of a system for recommending icons for 10 categories of emotions. Their experiments also highlight users' difficulties in selecting an emoticon to represent the emotion that they want to express.

Carretero *et al.* (2015) analyzed the use of expressive speech acts by students during online interactions. The study covers 13 types of expressive acts, *i.e.*, acts to express their feelings and emotions. The results reveal that the use of typography resources and emoticons can improve the expressiveness in various situations, *e.g.*, to thank or apologize.

The surveyed studies mostly stress the importance of emoticons for expressive CMC interactions. Although users' intentions are often associated with emotions, the communication and expression of intentions are hardly addressed in literature. In contrast, our work focuses on the use of icons to inform intentions.

Studies of Dresner and Herring (2010) adopted Speech Act Theory to analyze the linguistic role of emoticons in CMC. The authors emphasized that emoticons do not always work as "emotional icons"; they are also associated with other signs, which do not have the primary role of transmitting emotions, *i.e.,* they are indirectly related to emotions. In particular, Dresner and Herring (2010) investigate the roles that the emoticons take as signs to express approaches and intentions. Their results indicate that emoticons assign the desired "illocutionary force" within the related text.

Our research aims to further explore the process of selection and design of emoticons when considering their role of assigning illocutionary force. We contribute with techniques to the design and selection of suitable and expressive icons for the communication of intentions.

3 THEORETICAL FRAMEWORK

In order to associate users' intentions with icons, we adopted the conceptual framework of Liu, which is based on Speech Act Theory and Semiotics (Liu, 2000).

Semiotics is a discipline that studies signs, their meanings and meaning-making processes. A sign is something that represents something to someone in some respect or capacity (Peirce, 1931-1958). Among others, people use signs to share meanings and express intentions. While Semantics studies the relations between signs and objects, Pragmatics studies the relation between signs and the behaviour of sign-using agents (Peirce, 1931-1958).

The communication between a "speaker" and a "hearer" can be studied with Speech Act Theory (Liu, 2000). Speech Acts (Searle, 1969) are utterances that have performative functions in language and communication. Searle proposes four types of Speech Act: locutionary acts, illocutionary acts, propositional acts and perlocutionary acts. In this work, we focus on locutionary and illocutionary acts.

A locutionary act refers to the act of uttering an expression. An illocutionary act carries the speaker's intentions that are to be perceived by the hearer. The effects of an illocutionary act on the hearer are called perlocutionary effects. Perlocutionary effects comprise changes of sentiments or mental states, and perlocutionary acts are not necessarily linguistic.

A speech act or message can be distinguished into two parts: the function and the content. The content manifests a message's meaning. Meaning and interpretation are dependent on the environment, in which the message is uttered, *i.e.,* they depend on the speaker and the hearer. The function specifies the illocutions and reflects the speaker's intentions.

Inspired by Speech Act Theory and based on Semiotics, Liu (2000) proposed a framework for classifying illocutions using three dimensions. One dimension distinguishes between descriptive and prescriptive "inventions", another between affective and denotative "modes", and the last one between different "times", namely past/present and future.

If an illocution is related to the speaker's personal modal state mood, it is called affective, otherwise denotative. If an illocution has an inventive or instructive effect, it is prescriptive, otherwise descriptive. The classification of the "time" dimension is based on when the social effects of the message are produced, *i.e.*, in the future or the present/past.

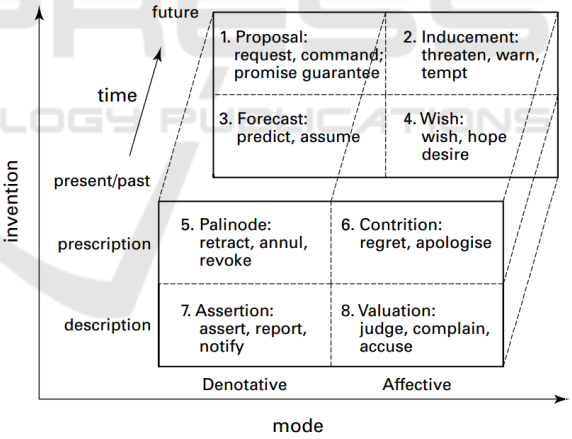

Figure 1: Classification of illocutions by Liu (2000).

The three dimensions result in eight different classes (Figure 1): 1. ***Proposal*** (future, prescription and denotative) — ask for something, order, promise; 2. ***Inducement*** (future, prescription and affective) — encourage someone, threat, suggestion; 3. ***Forecast*** (future, description and denotative) — anticipate, suspect, imagine; 4. ***Wish*** (future, description and affective) — plan, hope, desire; 5. ***Palinode*** (present/past, prescription and denotative) — undo, remove; 6. ***Contrition*** (present/past, prescription and affective) — act of regret, excuse,

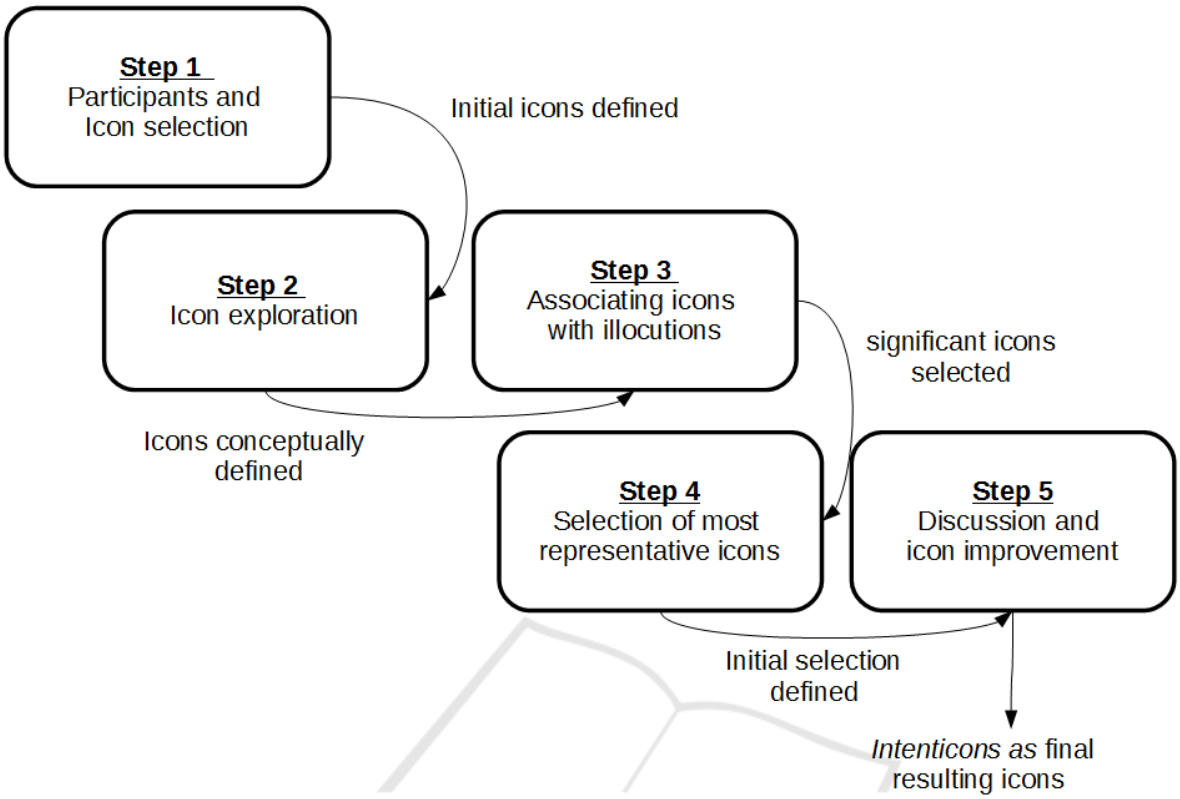

Figure 2: Five-step method defined.

justification; 7. ***Assertion*** (present/past, description and denotative) — confirm, support, inform, declare; 8. ***Valuation*** (present/past, description and affective) — assign value to something or someone.

4 METHOD AND CASE STUDY

Based on the theoretical framework outlined in the previous section, we propose a method to determine *intenticons*. Furthermore, we conduct a case study applying the method in order to experiment it.

4.1 Proposed Method

The five-step method is inspired by the participatory method "Icon Design Game" (Rocha and Baranauskas, 2003) for supporting designers in the creation of icons and other graphical user interface elements. The general objective of this method is to identify the "best" graphical representation of a concept.

Figure 2 illustrates the five steps. First, participants and an icon set are selected. Second, participants explore the icons and freely associate concepts (short phrases). Third, participants associate icons with classes of illocutions. Fourth, participants choose the most representative icons from step three. Fifth, participants discuss and possibly adapt the icon selection.

In the following, we describe the five steps in more detail.

Step 1. Participants and Icon selection

1. Choose between 15 and 20 participants. According to the authors' experience, this number has shown to be adequate for this kind of activity.
2. Designers propose the initial set of candidate icons.
3. Designers explain the objectives and the process of the activities to the other participants.

Step 2. Icon exploration

1. Participants describe concepts they associate with the icons on sticky-notes. At this point, the participants do not know yet the framework presented in section 3, *i.e.,* concepts expressed by the participants are uninfluenced by the definition of illocution classes.

2. This process is iterative, one icon at a time. After each icon, facilitators collect the created sticky-notes.

Step 3. Associating icons with illocutions.

1. Designers create scenarios that illustrate the illocutions.
2. Designers present classes of illocutions, one at a time, using previously created illustrative scenarios to exemplify illocutions in the context of participants.
3. Participants individually write on sticky-notes the identifiers of the icons they think best denote the illocution, informing up to three icons in decreasing order of significance.

Step 4. Selection of most representative icons.

1. Designers distribute lists of illocutions and the respective icon set proposed during the previous step.
2. Participants individually choose a unique icon they think is most representative for each class of illocution.

Step 5. Discussion and icon improvement.

1. Designers present the results of the previous steps and conduct a debriefing with the participants. Discussion topics include, but are not limited to: possible changes in the association of illocution and icon; additional icons, in case no or few adequate icons where identified for an illocution; ambiguities/conflicts of icon-illocution association; removal of icons.
2. At the end of the discussion, the designers present the final set of *intenticons*.

4.2 Case Study

The proposed method was applied during a case study in the Informatics lab at the IASP faculty in April 2015. The participants of the study included 2 HCI researchers with experience in interaction design, who were responsible for the conduction of the method, 1 graphic designer who designed the initial icon set, 2 local lecturers who acted as facilitators and 40 undergraduate students of an Information Systems course.

All 40 students — aged 20 to 61, 12 female — were in the seventh semester. The students and facilitators participated of the activities during two different days. On the first day, steps 1 to 4 were conducted; during the second day, step 5 was conducted using the focus group method.

The research materials such as annotation forms were situated within the domain of software programming. Sample phrases to represent illocution classes were taken from an online forum about Web development. For instance, a phrase to represent the illocution class “proposal” (request, command, promise, guarantee) was, “You might want to take a look at HTML Media Capture”. For all illocution classes, there was at least one representative phrase previously selected by the researchers.

5 RESULTS AND DISCUSSION

The presentation and analysis of results explore the following topics:

1. Selection and initial design of icons;
2. Theory-free assignment of concepts to icons;
3. Analysis of quantitative distribution of icons for each class of illocution and initial selection;
4. Analysis of detected ambiguities;
5. Proposal of improvements in icons and debriefing sections;
6. Final selection of *intenticons*

5.1 Selection and Initial Design of Icons

The initial icons were derived from preliminary studies (Jensen *et al.*, 2015) and from web searches associated with keywords extracted from the classes described in Figure 1. The goal was to obtain a limited initial set; the selection criteria included the relevance in making explicit intentions according to the classes of illocutions. To this end, designers selected images that had descriptions matching one of the eight classes, and that were judged as representing the respective class to some degree. A graphic arts professional redesigned the icons to maintain a uniform visual quality. Figure 3 shows the initial set of obtained icons numbered from 1 to 34.

Figure 3: Initial icon set numbered from 1 to 34.

5.2 Theory-free Assignment of Concepts to Icons

Table 1 shows the three most frequent concepts that participants assigned to each icon during the "icon exploration" (step 2 of the method proposed in section 4.1). These results also consider an analysis performed by the involved researchers to detect the most representative concepts for each icon.

Table 1: Concepts associated to the icons.

1	hopeful anxious timidity	18	cool small wink smartness
2	suspicious watching over keep an eye on	19	oracle guessing Forecasting
3	thoughtful doubtful imagining	20	Optimistic idea light
4	fear silent secret	21	frightening angry raging
5	underdog sad agonized	22	doubt thoughtful analytical
6	Deception Disappointed disapproved	23	Regretful sheepish mistake
7	kidding playing mocking	24	Attention Stopped! Stop!
8	It was not me! doubt confusion	25	OK! sure agreement
9	Apologies sorry Pardon	26	Yes sir! prepared Copy that
10	happy Fake smile forced laugh	27	greeting great Nice
11	suspicious thoughtful questioned	28	astonished frightened scared
12	Yes sir Copy that determined	29	deluded in love wishing
13	vanity seductive sensual	30	ashamed Sorry my love! Pardon
14	passionate dreaming gentle	31	Disappointed unmotivated upset
15	fear apprehensive worried	32	sarcastic laughs guffaw
16	happiness wonder Beauty!	33	deep sadness crying depressed
17	aid help lonely	34	inattentive carefree tedium

The results indicate that various used concepts and terms depict people's ordinary language. Several

verbs are used in the gerund form to portray the action represented by the icon, *e.g.,* crying.

5.3 Analysis of Quantitative Distribution of Icons for Each Class of Illocution and Initial Selection

In order to determine the most relevant icons for each class of illocution, we examined different frequencies of participants' assignments of icons to illocution classes. Three separate analyses were performed to understand the influence of icons defined as the most significant and most representative in Steps 3 and 4.

During analysis 1, we focused on how many times an icon appeared with the highest priority during Step 3 (Prio1). For analysis 2, we computed how many times an icon appeared in any of the three slots used during Step 3 (Top3). In analysis 3, we counted how many times an icon was chosen as the most representative for an illocution class during Step 4 of our method (MostRep).

Assertion. Figure 4 shows results to the class *Assertion*. Analysis 2 (Top3) indicates a small set of icons that quantitatively differ from all others (*e.g.*, icons 11, 25 and 27). For several icons, results of Analysis 1 (Prio1) remain consistent with the Analysis 3 (MostRep) because icons with higher frequency in Analysis 1 are also those indicated with greater frequency in Analysis 3.

Contrition. Figure 5 shows the results for the class of illocution *Contrition*. Analysis 2 (Top3) highlights a higher frequency of a few icons like 9 and 23. The significant difference with other icons can indicate that icons 9 and 23 refer to potential candidates to represent *Contrition*.

Wish. Figure 6 shows the results for the class of illocution *Wish*. Aligned with the obtained results of Analysis 2 (Top3) concerning *Assertion*, icons 25 and 27 are more frequently observed. In contrast, we can indicate the icons 16 and 18 since they appear more frequently than in the *Assertion*.

Inducement. Figure 7 shows the results for *Inducement*. We can observe that icons with higher frequency in Analysis 2 (Top3) also appear in Analysis 1 (Prio1) and Analysis 3 (MostRep).

Forecast. Icons 11, 20 and 22 are the most frequent in Analysis 2 (Top3) as shown in Figure 8. Icon 22 is the most frequent in *Forecast*, and only in *Forecast*, although it appears with a higher or similar absolute frequency in assertion, proposal and valuation.

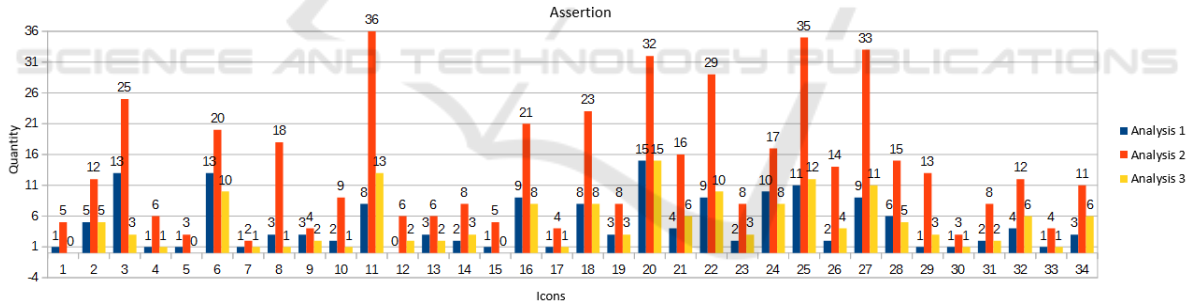

Figure 4: Frequency distribution of assigned icons for the class of illocution Assertion.

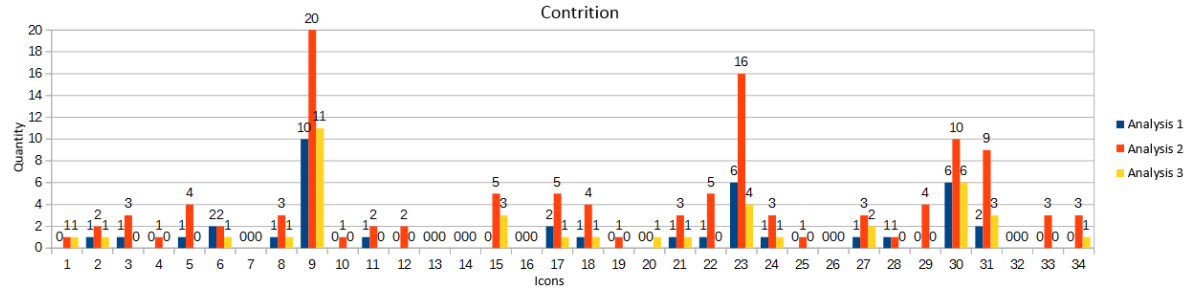

Figure 5: Frequency distribution of assigned icons for the class of illocution Contrition.

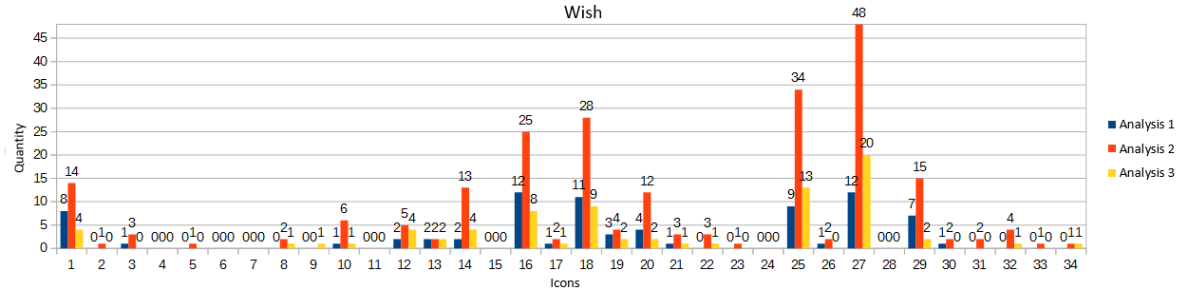

Figure 6: Frequency distribution of assigned icons for the class of illocution Wish.

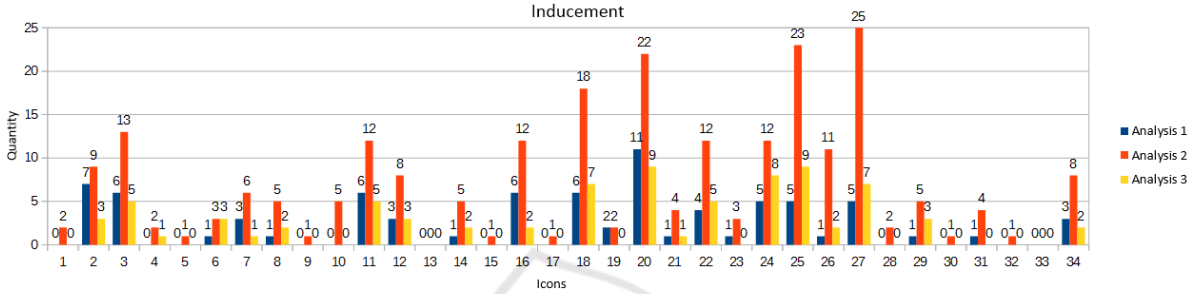

Figure 7: Frequency distribution of assigned icons for the class of illocution Inducement.

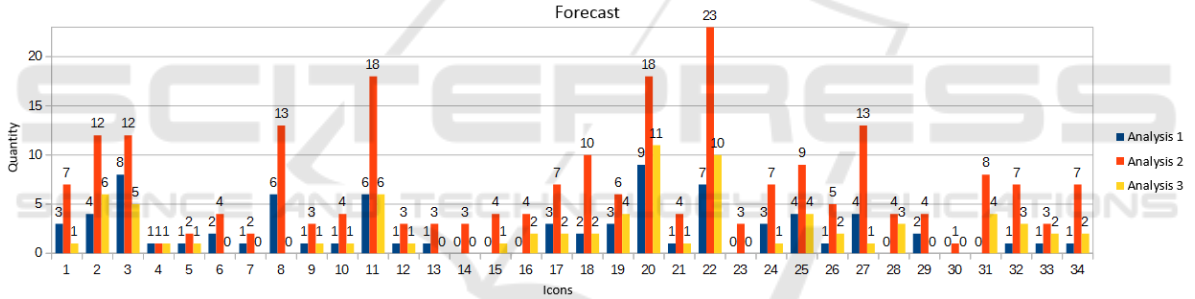

Figure 8: Frequency distribution of assigned icons for the class of illocution Forecast.

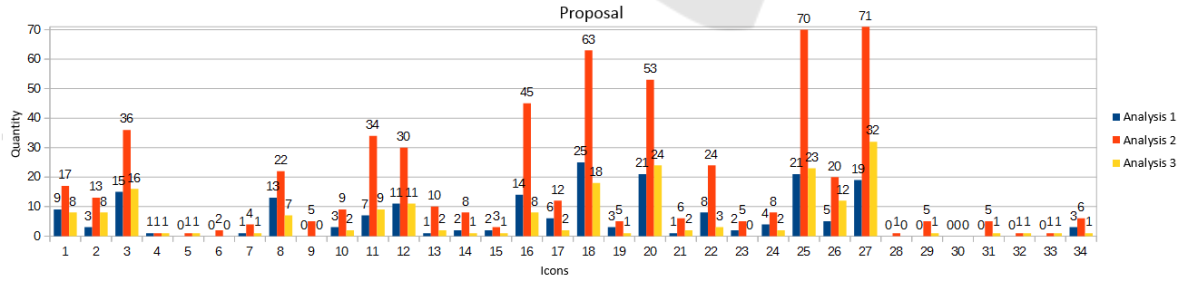

Figure 9: Frequency distribution of assigned icons for the class of illocution Proposal.

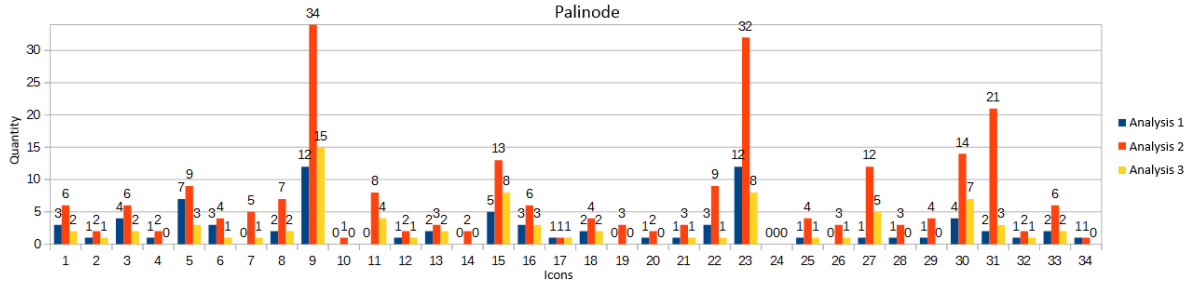

Figure 10: Frequency distribution of assigned icons for the class of illocution Palinode.

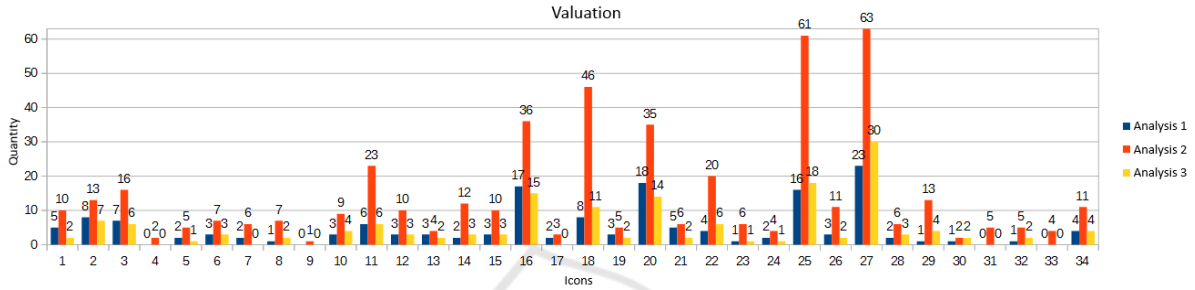

Figure 11: Frequency distribution of assigned icons for the class of illocution Valuation.

Proposal. In Figure 9, icons 25 and 27 appear with the highest frequency in Analysis 2 (Top3). These icons also appeared relevant mostly in the analysis for *Wish* and *Inducement*. Results allow discarding less frequent icons, *e.g.*, 4, 5 and 6.

Palinode. Results in Figure 10 for *Palinode* show a great similarity with the distributions found for *Contrition*, whose icons 9, 23 and 30 are more frequent in Analysis 2 (Top3).

Valuation. Results for the illocution class *Valuation* (Figure 11) are similar to those of *Proposal* (Figure 9). Further analyses are required taking users' comments into account to elucidate these differences (addressed in the next steps).

According to the quantitative analyses, designers selected an initial set of *intenticons* for each illocution class (Table 2), using the results from Analysis 2 (appearance of the icons in the three slots of step 3) as the main selection criterion.

5.4 Analysis of Detected Ambiguities

Table 2 indicates a repetition of several icons for different classes of illocution, which potentially reveal ambiguities among icons. In particular, we observe that the participants deemed icons 27, 25, 20 and 18 as appropriate for the illocution classes *Proposal, Inducement, Desire* and *Valuation*. This result suggests the need of reworking these icons because they present difficulties in their interpretation.

Similarly, the icons 11 and 20 appear as representative of both *Forecast* and *Assertion*. Considering the dimensions in the illocution classification framework *(cf.* Figure 1), even though these two classes of illocution are organized into different periods in the time dimension, they are in the same invention and mode dimension, *i.e.,* both are denotative and descriptive. This scenario justifies the qualitative debriefing that can further clarify possible misunderstandings identified and mitigate these issues.

Table 2: Intenticons initially selected.

Illocution	***Intenticons***
Assertion	11; 27; 25; 20; 22
Contrition	9; 23; 30; 15; 22
Wish	27; 25; 18; 16; 01
Inducement	27; 20; 25; 24; 18
Forecast	22; 11; 20; 03; 02
Proposal	27; 25; 18; 20; 03
Palinode	9; 23; 30; 15; 27
Valuation	27; 25; 18; 16; 20

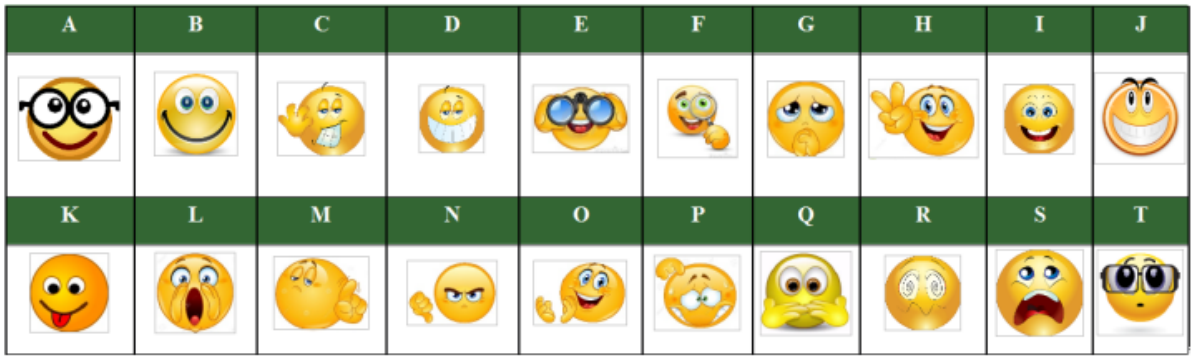

Figure 12: Additional Intenticons explored.

5.5 Proposal of Improvements in Icons and Debriefing Sections

During Step 5, designers also introduced a new icon set to encourage discussion (Figure 12). The new icons are identified with letters from A to T. The aim was to expand the diversity of choices for the representation of classes of illocution. The results of quantitative analyses informed the design of the new icons, where alternatives were defined aiming to minimize ambiguities.

This step involves a debriefing section based on the results obtained from the previous steps. Firstly, designers chose the five *intenticons* to represent each class of illocution (Table 2). They presented to the participants the *intenticons* to make an overview of the different illocution classes. Prompted about the detected ambiguities among illocution classes, the participants reported that they had realized that many icons were out of context for some classes of illocutions.

The designers discussed the ambiguous *intenticons* with the participants. Subsequently, based on the initial selection of *intenticons* (Table 2), and considering the ambiguities as well as the additional icons (Figure 12), the participants selected at least three ambiguity-free *intenticons*.

More specifically, in the debriefing section, designers passed through each *intenticon* asking the participants to which extent each icon represented the class of illocution. They then took into account the participants' opinion to make additions and removals of icons in each class. Successively, they carried out discussions concerning all *intenticons* available. If any inaccurate case was detected, the choices were jointly revised and decided which category the icon best fit.

5.6 Final Selection of *Intenticons*

Table 3 shows the outcome of the selection of *intenticons* based on the debriefing section developed with the participants. We found that while for some classes of illocution the initial selection of icons remains in the final set (*e.g.*, *Proposal*), for some other classes, the selected icons were fully reviewed. This may be due to the organization of the debriefing section conducted, where designers did not impose any restrictions to maintain icons in one class or other. Figure 13 presents an example of the final selection of *intenticons* to the class of illocution *Inducement*. This result revealed the choice of new icons that did not appear in the first selection.

Table 3: Final selection of Intenticons.

Illocution	***Intenticons***
Assertion	26; 12; O; A; D
Contrition	P; R; N; 33
Wish	29; 14; 1
Inducement	16; J; G
Forecast	22; 11; 20; 03; 19; F
Proposal	27; 25; 18; C; H
Palinode	9; 23; 30; 31
Valuation	I; K; 6; 10

Figure 13: Final selection of icons for the class of illocution Inducement.

5.7 Discussion

This research explored a way of facilitating human communication in computer systems. While literature has studied icons to represent emotions, few empirical studies exist for elaborating explicit visual means to express intentions.

Results indicate the potential of the method to identify and evaluate icons that represent intentions. The initial steps of the method allow participants to preliminarily experience the icons, and enable designers to understand how users make sense of the originally proposed icons. Furthermore, the method enables a refinement of icons. The final selection reached via debriefing sections might vary from the initial selection. The initial selection is based on a quantitative analysis, which might result in ambiguous icons. The debriefing step is thus required to improve icon selection.

Ambiguities might be related to several factors: (i) participants might superficially interpret the icons; (ii) the proposed icons might not be specific enough; and (iii) participants might have difficulties in understanding the illocution classes. In other words, participants might not be able to make the necessary distinctions between the existing classes (*e.g.*, between *Palinode* and *Contrition*), which can influence the assigned icons during the execution of the case study.

Therefore, further studies should address the impact of these icons in specific application contexts. The influence of user's profiles in the obtained results also requires additional investigation, since this work focused on computer science students as subjects in the case study. As validation process, we plan to involve a second user population, distinct from the participants of this study. We aim to examine the extent to which the obtained *intenticons* are relevant to different communities and situations of communication.

The conducted quantitative analyses are likely to affect the initial selection of *intenticons*. Future research might investigate to what extent they can influence the initial collection and the final results. We also plan to study the impact of the context in which *intenticons* are expressed with their interpretation by users during communication tasks.

6 CONCLUSIONS

The sharing of intentions plays a key role in human communication. Users require effective ways to express their intentions more explicitly in computer systems in order to enhance communication between people. In this article, we argued that icons expressing emotions can help users communicate their intentions. We proposed a method to associate icons with intention classes, through several steps, representing a systematic approach to determine the most appropriate *intenticons*. The method was experimented in a case study yielding encouraging empirical results. The proposed technique was effective in selecting icons and enabled the detection of ambiguities. The foreseen debriefing sections were relevant for improving the selection and mitigating inaccurate cases. Future studies involve further quantitative and qualitative analyses that can contribute with improvements to the method. We aim also to conduct a thorough validation of the obtained *intenticons* considering a distinct group of users.

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REFERENCES

Carretero, M., Maíz-Arévaloa C., Martíneza M. A. 2015. An analysis of expressive speech acts in online task-oriented interaction by university students. In *32nd Int. Conference of the Spanish Association of Applied Linguistics* (AESLA), pp. 186 – 190.

Derks D., Fischer A. H., Bos, A. E. R. 2008. *The role of emotion in computer-mediated communication: A review.* Computers in Human Behavior, 24, 766–785.

Dresner E. & Herring S. C. 2010. *Functions of the Nonverbal in CMC: Emoticons and Illocutionary Force*. Communication Theory, 20, 249 – 268.

Hornung, H., & Baranauskas, M. C. C. 2011. *Towards a conceptual framework for interaction design for the pragmatic web.* In J. A. Jacko, Human-Computer Interaction. Design and Development Approaches. Heidelberg: Verlag - Springer. pp. 72 – 81.

Hornung, H.; Pereira, R.; Baranauskas, M. C. C.; Bonacin, R.; Dos Reis, J. C. 2012. *Identifying Pragmatic Patterns of Collaborative Problem Solving*. IADIS International Conference WWW/Internet. Madrid, Spain, pp. 379 – 387.

Huang, A. H; Yen, D. C. & Zhang, X. 2008. *Exploring the potential effects of emoticons*. Information & Management, pp. 466 – 473.

Jensen, C. J.; Dos Reis, J. C.; Bonacin, R. 2015. *An Interaction Design Method to Support the Expression of User Intentions in Collaborative Systems*. In 17th International Conference on Human-Computer Interaction (HCII'15). Los Angeles, CA, USA. LNCS, Springer International. Vol. 9169, pp. 214 – 226.

Liu, K. 2000. *Semiotics in Information Systems Engineering*. Cambridge University Press.

Luor T., Wu L., Lu H., Tao Y. T. 2010. *The effect of emoticons in simplex and complex task-oriented communication: An empirical study of instant messaging.* Comp. in Human Behavior. 26, 889 – 895.

Peirce, C. S. 1931-1958. *Collected Papers*. Cambridge. Harvard University Press.

Rocha, H. V., & Baranauskas, M. C. C. 2003. *Design e Avaliação de Interfaces Humano-Computador*. Campinas: NIED/UNICAMP.

Searle, J. R. 1969. *Speech Acts: An Essay in the Philosophy of Language*. Cambridge University Press.

Thoresen T. H. & Andersen H. M. 2013. *The Effects of Emoticons on Perceived Competence and Intention to Act*. BI Norwegian Business School.

Urabe Y., Rzepka R., Araki K. 2013. Emoticon Recommendation for Japanese Computer-Mediated Communication. *IEEE Seventh International Conference on Semantic Computing*, pp. 25 – 31.