Design Methods for Personified Interfaces

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Abstract: Recent advances in natural language processing, computer graphics, and mobile computing are driving a new wave of interfaces, called here *personified interfaces*, which have clear and distinctive human-like characteristics. The paper argues that personified interfaces need to portray coherent human traits, deal with conflict, and handle drama, driving a need of new design methods. Using theoretical frameworks drawn from different disciplines, concisely described in the paper, four design methods are presented to support the design of personified interfaces, merging traditional design techniques with the use of personality models, improvisational theater techniques, comics-inspired storyboards, and even some ideas from puppetry and movie animation. The design methods are exemplified with results from three student workshops aimed at designing a service recovery interface for e-commerce.

1 INTRODUCTION

From the beginning of the 2010s computer interfaces based on speech, chat, and avatars have started to reach everyday consumers. Personal mobile assistants such as *Siri* and *Cortana*, voice-activated speakers such as *Echo* and *Google Home*, and chatbots of all kinds and purposes have left the laboratories and have become a part of people's daily conversations. At the same time, humanoid robots such as *Nao* and *Pepper*, conversational toys, and automotive systems have incorporated interactive speech and voice capabilities.

In most of those cases the interfaces exhibit typical human traits such as personality, gender, sentiments, and even the appearance of consciousness. Although research has shown that there is almost always some level of humanization in any interaction with computers (Reeves and Nass, 1996), the introduction of speech, chatting capabilities, and humanoid embodiments seem to trigger behaviors from users resembling those used to deal with other human beings. Users greet, thank, yell at, mock, curse, and play with those interfaces in a way quite different from when they use a traditional point-and-click interface.

We use the term *personified interfaces* to describe interfaces which display human traits such as personality, gender, and character; and the term *personified machines* to name the systems which employ personified interfaces. In our view, the key novelty is that personified interfaces tend to elicit typical human-to-human behaviors from their users which are not usually seen in traditional interfaces.

However, most principles and practices used today in interface design assume that users are interacting with pure machine systems and not with personified machines. The goal of this paper is to discuss how different should be designing a personified interface and to propose principles, theoretical frameworks, and some design methods to address the challenges of this context for designers. In this paper, we argue that personified interfaces need to be designed to **convey coherent human traits and personality**, to **engage in sound social behaviors,** to **be embodied through consistent actions**, and to **be able to participate in dramatic stories** co-created with their users.

This work adapts and expands some early work we did in the design of service systems (Pinhanez, 2014). Because service providers have a tendency to be personified by their users, in that work we proposed a design methodology to improve service quality by understanding the personification issues and address them in the design of the service processes of the interface, but without personifying it. Here we apply some of the same methods to meet the design requirements of a personified interface.

We start by discussing what we see as the main requirements which distinguish the design of

personified interfaces from traditional interfaces. We argue that personified interfaces must exhibit coherent human traits, must deal with conflict with their users, and must be able to handle drama. We then explore theoretical frameworks to support the design of the human traits of the personified interface and its embodiment, personality, and social behaviors; and to enable the interface to manage conflict and fulfil dramatic roles. We then explore four design methods inspired by the ones proposed in (Pinhanez, 2014), using examples from the student workshops conducted in the original paper.

Our aim is to construct personified interfaces which create rich, meaningful, and trustable interactions with the user. Unfortunately, many of the personified interfaces designed to date seem to portray something like a caricature of a human being. At the best, some of those personified interfaces are cute; at worst, they become annoying after a couple of interactions (like *Clippy*, the infamous interface character introduced in *Microsoft Office* in the 1990s).

2 PERSONIFIED INTERFACES

The discussion throughout this paper is based on three fundamental requirements we believe most personified interfaces need to meet:

1. personified interfaces must exhibit coherent human traits and social behaviors;
2. personified interfaces must be able to deal with conflict with their users;
3. personified interfaces must handle dramatic narratives created by their users.

It is not the goal of this paper to provide empirical evidence of the validity of each of the three requirements but instead to explore how we believe they guide the design process in theory and practice. The requirements can be treated as our working hypotheses for this paper and we will not try to validate them experimentally here. We acknowledge that this validation is needed, using, for instance, methods such as structured interviews, focus groups, user surveys, and experiments such as the ones described in (Reeves and Nass, 1996) but this validation is beyond the scope of this paper.

In the conversations we have had with design professionals about those requirements, most of them found them relevant and agreed that they are likely to be present in most scenarios of personified interfaces. The main point of content we got from designers has normally been how those requirements

can be met by the design process. But before we explore this issue, it is necessary to clarify better what we mean by each of three requirements.

2.1 Coherent Human Traits

Users have a strong tendency to attribute human characteristics to objects, places, and machines, and change interaction patterns accordingly (Reeves and Nass, 1996). In the cases where machines produce voice or text, users have shown to recognize gender, personality, and race in spite of being aware that they are interacting with machines (Nass and Brave, 2005). Moreover, users of conversational systems exhibit social behaviors typically associated with other human beings, such as *similarity attraction* (Tajfel, 1981). For instance, Lee et al. (Lee et al., 2000) showed that not only male users liked more interacting with "male" computers but also that they trusted them more (and vice-versa).

Many experiments have shown that people react negatively when faced with a personified interface with incoherent human traits (Nass et al., 2006). In (Nass and Najmi, 2002), subjects listened to descriptions of products recorded by Caucasian Americans and first-generation Koreans, which were cross-matched with faces of Koreans and Caucasian Australians. When subjects heard descriptions with Korean accents matched to Caucasian faces they react negatively, and vice-versa, not only disliking the voices but also rating less favourably the products described.

The reality is that most personified interfaces today are designed without regard for those principles and ideas. In the absolute majority of cases, the human traits of personified interfaces are not addressed in the design process and left to be created by the user's imagination during the interaction process. To avoid this, we believe that a personified interface should be coherently structured around clear definitions of its gender, race, level of schooling, personality, etc., designed with the help of some of the methods described later.

2.2 Dealing with Conflict

As (brilliantly) pointed out by Daniel Dennett, the complexity of most (pure) computer systems is better dealt with by the *intentional stance*, in which the user understands the system and predicts its behavior not by knowing how it works but *"... by ascribing to the system the possession of certain information and supposing it to be directed by certain goals, and then by working out the most*

reasonable or appropriate action on the basis of these ascriptions and suppositions." (Dennett, 1981), pp. 224.

In personified interfaces users have additional reasons to adopt the intentional stance right away as the framework for the interaction. If a machine talks to a user or has a humanoid body, human beings have a hard time not thinking that the machine has its own intents and desires, and feel compelled to respond taking that fact in account. Personified interfaces tend to intensify the adoption of the intentional stance by their users.

However, quite often the intents and goals ascribed by the user to the personified machine are different from the user's own intents and goals. For instance, when the interfaces are part of the interaction with an organization (such as in a corporate chatbot), there is often a clear and real difference in the goals of the machine/organization and the user, as we discussed at length in (Pinhanez, 2014). We believe that this gap between the goals of the user and the perceived goals of the machine breeds conflict.

Studies of actual interactions with today's conversational systems often portray cases of conflict and frustration. In a qualitative study of Apple's *Siri*, (Luger and Sellen, 2016) found many instances where failures of a conversational agent where perceived as its stubbornness. Similarly, most people believe that the phone answering systems do not understand them purposefully in many situations, such as when closing a service account.

In personified interfaces, we expect that the tendency for the machine to be perceived as in conflict with the user is likely to more pronounced than with non-personified systems. We believe that we will see users regarding machines as mean, stubborn, selfish, and arrogant as they argue with them or see them pursuing goals different from theirs. The important question for designers is how this conflict can then be managed and, if possible, mitigated. For that, we propose to look into how human-human conflicts are dealt with, that is, through social norms and constructs, and apply conflict resolution techniques to the design of personified interfaces.

2.3 Handling Drama

One way people use to make sense of their interactions with other people in life is to mentally represent their interactions as dramatic narratives. By making themselves heroes or victims and by rendering other people as gods or villains, people

can more easily make intentions, values, and goals explicit. And by using narrative structures such as causation, succession, and counterpoint, the representation of the complex temporal patterns of our social life becomes more manageable.

Similarly, we have seen that interaction with personified machines tends to be dramatized in a narrative by the user. The idea of narratives as representations or cognitive foundations for interaction is not new to HCI theory as, for example, in (Laurel, 1991). The key difference in the case of personified interfaces is that the narrative almost always becomes dramatic: personified machines can easily take the role of friends, gods, villains, or sidekicks in the narrative.

For instance, users often report their initial experiences with speech-based personal assistants as a story of high expectations and deceit (Luger and Sellen, 2016). They start asking really difficult questions to the machine, get disappointed with basic mistakes, resort to ask for jokes or other form of play, and finally use it for menial tasks. We contend that to make a personified interface work in the real world requires designing it to survive (and possibly break) this first tale where the personified interface is made to play the roles of a fortune teller, an idiot, a jester, and finally a servant.

Handling of dramatic structures in personified interfaces is an important requirement whose need often only surfaces in longer, more complex, or more conflicting interactions. Nevertheless, we believe personification dramatically changes the users' perception of the actions and responses of a personified machine and therefore designers should try to prepare the interface to deal with the stories their users are likely to co-create to explain and represent their sequence of interactions.

3 THEORETICAL FRAMEWORKS

If personified machines need to have coherent human traits, deal well with conflict, and handle drama, an important set of questions arise for personified interface designers. To what extent the personified interface must be constructed to be perceived as an "artificial" human being, that is, how much do they need to personify the interface? Which are the human traits and characteristics more often perceived and are needed by the users? When and how do users treat — and would like to treat — personified machines with courtesy? How to design

interfaces which highlight particularly desirable human traits? How can the interface drive the drama behind the interaction process constructed by the user and better participate in it?

To address those issues, we introduce the concept of the *interface persona* which is simply the "human being" personified by the interface. The interface persona is the result of the combination of the personified interface's visual appearance, its style of speaking and writing, its action affordances, and the internal processes which are responsible for generating and controlling the interface.

We postulate here that for a personified interface to meet the requirements discussed before, adequately *designing* the interface persona is a fundamental part of the process. That is, the (coherent) human being perceived by the users in their interaction with the personified machine must be the object of a targeted design process using specific design methods such as those described in section 4.

However, human beings are complex creatures and therefore we should not expect that designing interface personas and constructing effective personified interfaces to be a simple task. Also, bad persona interface design is as easy to recognize as a poor characterization or bad acting in theatre or movies. To tackle those challenges, we propose to ground the design process in solid and tested theoretical frameworks which have been used in other disciplines to understand and, in some cases, "create" human beings (such as in theatre). We explore here some of those frameworks which we believe can be useful foundations for conceiving, designing, and constructing personified interfaces and their interface personas.

3.1 Human Traits in Interaction

As mentioned before, there is a lot of evidence that users tend to assign human traits such as gender, personality, and emotions to all kinds of systems, including cars, television sets, and traditional computer systems (Reeves and Nass, 1996). In particular, research has shown that people perceive gender even in the absence of explicit cues, for instance, from the writing style (Newman et al., 2008). Gender is important because people have biases for specific genders to help them in specific tasks. For instance, Lee et al. (Lee, 2003) showed that subjects in a shopping task prefer to take advice from computers with male voices about cars and from female voices about beauty products. Experiments have also shown that people have

similar reactions towards perceived race and place of origin in conversational systems (Giles and Scherer, 1979). All this point towards the need to clearly define to which gender and race an interface persona belongs.

Pursuing neutral instances of gender and race seems to be a path to be avoided. Studies in psychology have shown that people who manifest inconsistent personalities and traits are often perceived by their interlocutors as incapable, unpredictable, or liars, and the same has been demonstrated for computer systems and in particular, for conversational systems (Nass and Brave, 2005). (Nass and Najmi, 2002) describes experiments where users, when interacting with conversational systems with inconsistent personas, tend to not only to dislike more those systems (in comparison to coherent personas), but also that inconsistency is extremely impactful to the accomplishment of the task by the users.

A further complicating issue is the tendency of people to like people who are similar to them, as discussed in (Tajfel, 1974), subsequently expanded to what is generically known as *similarity attraction* (Tajfel, 1981). The principle applies also for interfaces: male users tend to prefer "masculine" conversational systems, while women are more likely to prefer "feminine" system personas (Nass and Brave, 2005, Reeves and Nass, 1996); extroverted people prefer "extroverted" systems (Nass and Lee, 2001); and similarly to race, ethnicity, emotions, and education — although this effect is sometimes moderated by type of task and cultural biases. A key consequence of similarity attraction is that in many cases there is not a right gender, race, or other human trait for a given system. Those human traits should match the corresponding traits in the user, stressing the need of some form of choice or personalization of the interface persona.

3.2 Character Embodiment

When the personified interface employs a visual, humanoid embodiment, such as in virtual humans or robots, all the issues discussed in the previous section seem to apply, if not made stronger (Li et al., 2016, Breazeal, 2003), and therefore we will not explore them again in the context of embodiments.

We focus here in the issue of how embodied personified machines move, gesture, speak, and act, as a way to express their human traits, sentiments, and goals. To help the design and construction of personified interfaces, we are exploring and using techniques used in arts and entertainment for

character embodiment, such as the *Stanislavski's system*, *willing suspension of disbelief*, *and illusion of life*. Such concepts and techniques address how to make the interface persona look real, inspire trust, and play effectively its personality, social behaviors, and story role.

Stanislavski's system is the name associated with the methods of Konstantin Stanislavski who is often credited as the pioneer of modern acting techniques in theater. Departing from the tradition of reliance on facial expressions, excessive gesturing, and voice manipulation, Stanislavski focused on physical action: *"Acting is doing."* The best embodiment of a character does not pretend to be the character through facial expressions or display of emotions: they perform actions which manifest their emotions and goals (Stanislavsky, 1949). Considering this, personified machines should not display sad faces in case of failures: regret is better expressed with acts of repair and renouncing, such as giving a voucher to compensate for a service failure. Acting is doing.

An alternative body of knowledge can be used borrowing from concepts and techniques from puppetry and movie animation, whose fundamental quest is to vent humanity onto inanimate objects and drawings. Puppetry deals almost always with the physical limitations of the puppet, with its inability to speak, to move, to have facial expressions, and to perform complex gestures. The key lesson from puppetry is to choose stories and roles which can be conveyed by the affordances of the puppet. Hand puppets convey most of their character through head, torso, and arm movements, and by occasionally transforming the body into a hand, so they are not suited for narratives with long dialogues or require facial expressions; shadow puppetry uses the flat borders between black and white worlds to convey the intricacy and beauty of the characters, so it works best for contexts rich in singing or poetic soliloquies.

At the same time, puppetry shows that it is surprisingly easy to make audiences believe that there is an intelligent, emotional human being inside every puppet (Blumenthal, 2005). By matching carefully the story (or interaction) to the right, albeit minimal, set of affordances, it is possible to portray characters who look alive, caring, loving, hating, and interacting with other puppets and the public. Less is sometimes more in embodied personified interfaces.

Puppetry takes to extremes the key dramatic notion of *willing suspension of disbelief* (proposed as the center of storytelling by poet Samuel Coleridge in 1817). Audiences must suspend their disbelief that the puppets are not real people. A technique often used in puppetry to help the suspension of disbelief is the exposition of the materials and inner workings of puppets, making them move in non-realistic ways, or openly showcasing the puppeteer on the stage as in *bunraku* theatre (a traditional Japanese puppet art). Doing so, puppeteers amplify the need of *willing suspension of disbelief* and in the process, create larger empathy between audience and characters. An example of this principle in a chatbot is when it displays alternative understandings of an utterance from the user, and ask the user to choose the option that best represents what he or she means. By exposing (instead of hiding) its limitations such chatbot not only improves the overall interaction but also increases the confidence and trust of the user in it.

Similarly, there are lessons to be learned from movie animation which have similar challenges in animating drawings to convey emotions and humor. In the quest for what is referred to as the *illusion of life*, a set of 12 fundamental principles of animation was compiled by *Walt Disney's* animators in the 1930s (Thomas and Johnston, 1981). For example, the *anticipation principle* states that *"[the audience] must be prepared for the next movement and expect it before it occurs. [...] Before Mickey reaches to grab an object, he first raises his arms as he stares at the article, broadcasting the fact that he is going to do something with that particular object."* (Thomas and Johnston, 1981), pp. 52.

In personified interfaces, we can apply anticipation by making sure that an important action such as charging a credit card is clearly anticipated by actions which potentially could be stopped by the user: after the user agrees verbally, there can be a depiction of the preparation for charging which allows one more chance for the user to change her mind. Other fundamental principles of animation such as *staging*, *follow through* and *overlapping action*, *arcs*, *secondary action*, *timing*, *exaggeration*, and *appeal* (Thomas and Johnston, 1981) may also be applied in the design of personified interfaces. We do not explore them further in this paper due to space restrictions.

3.3 Personality Archetypes

There is a vast number of proposed personality models of human beings, well beyond what could be explore in the context of this paper. We have been employing *personality theory*, a general name for psychological models which assign archetypal categories of personality to human beings, aiming to help predict the effects of having each archetype in a

context or how each archetype normally interacts with people of the other archetypes.

There are two basic streams of personality archetypes. The first stream is based on the *Lexical Hypothesis* of Sir Francis Galton and has been applied to fundament the use of five broad dimensions to describe personality traits, commonly known as *Big Five* or *OCEAN* for their initials (Norman, 1963): *Openness*, *Conscientiousness*, *Extraversion*, *Agreeableness*, and *Neuroticism* (or *Need for Stability*). *Openness* is a dimension that describes how much the person is attracted to new experiences. *Conscientiousness* describes how much the individual can control his or her impulses and emotions. *Extraversion* relates to how much the person can communicate and engage with others. *Agreeableness* describes the ability to befriend and cooperate with other people, and to be concerned with their well-being. *Neuroticism* refers to the level and need of emotional stability.

The second stream of personality archetypes has its origins in Jung's *Psychological Types* (Jung, 1976) which influenced, among many, the works of Myers and Briggs, who created the *Myers-Briggs Type Indicator* (MBTI) (Myers, 1998) which classifies individuals along four dichotomies: *Extraversion* vs. *Intraversion* (E-I), the preferred mode to acquire energy and motivation; *Sensing* vs. *iNtuition* (S-N), determining the preferred mode to obtain information; *Thinking* and *Feeling* (T-F), referring to the decision-making mechanism of choice; and *Judging* vs. *Perceiving* (J-P) indicating the preferred mode to relate to the world, using *T-F* or *S-N* channels, respectively. The four preferences define the 16 MBTI types: *ESTJ*, *ESTP*, and so on.

More popular personality archetypical methods are *horoscope signs*, of which the most known are based on the *Sun sign* astrology (*Leo*, *Virgo*, etc.) and on the Chinese zodiac (*Rabbit*, *Monkey*, etc.). Let us not get distracted here by the validity of whether stars and planets can influence the personality of person and what will happen to her. The reality is that horoscope signs are an interesting compendium of 12 basic human archetypes which most people are extremely familiar with, and therefore can comfortably use in the design process of the personality of the interface persona. Describing an interface persona as being *Leo* is, for most people, simpler to understand than saying it has a *INFJ* type.

Personality theory can make concrete and communicable to the different stakeholders in the design process the personality traits that should be present in the interface persona. For instance, if a chatbot should be perceived as nurturing, patient, pragmatic, loving, methodical, dedicated, and flexible, it may be just simpler to say its interface persona is a *Virgo*.

3.4 Social Behaviors and Emotions

Psychology has a long tradition of debating the relative importance, differences, and relationships between the personal and social aspects of the individual. *Social psychology* is one of the disciplines we can draw ideas and concepts from. It focuses on how social context affect human beings and how people perceive and relate to each other, therefore providing a theoretical framework to examine the interactions between users and personified machines. With the risk of some oversimplification, we can say that there are two basic currents in social psychology, coming from the psychological and sociological traditions respectively. For lack of space in this paper, we only examine basic ideas of the psychological stream, often associated to Kurt Lewin's work (Lewin and Gold, 1999).

Social psychologists from this tradition divide the social phenomena into two spheres: *intrapersonal* and *interpersonal*. *Intrapersonal* phenomena of interest include the study of *attitudes*, or basic likes and dislikes; *persuasion*; *social cognition*, or how people collect, process, and remember information about others; *self-concept*, or how people perceive themselves; and *cognitive dissonance*, the feeling that someone's behavior or self-concept are inconsistent. For instance, *cognitive dissonance* increases whenever people voluntarily do activities they dislike to achieve a goal. Paradoxically, doing this cause the perception of the value of the goal to be increased. For instance, when users must work with a difficult interface they value the accomplishment of the task more than if they were using an easy interface (somewhat contracting the whole goal of the interface design), as noticed in some studies on the use of voice-based personal assistants (Luger and Sellen, 2016).

Among *interpersonal* phenomena studied in social psychology which may be relevant to the design of personified interfaces, we can list: *social influence*, or how conformity, compliance, and obedience manifest themselves; *interpersonal attraction*, including propinquity, familiarity, similarity, physical attractiveness, and social exchange; and *interpersonal perception*, which includes issues related to the accuracy, self-other agreement, similarity, projection, assumed

similarity, reciprocity, etc. For example, in interpersonal attraction, it is often true that the more someone interact with a person, the more likely she is to become emotionally engage with that person, or the *propinquity effect*. Personified systems which are often interacting with the users, such as one-button smartphone assistants or always-on ubiquitous speakers, will tend to be better perceived by human beings than an app-based personified interface which must be launched every time is used.

Another important aspect of the social behavior is related to how emotions are used to convey and mediate social interaction between human beings. *Emotional communication theory*, which aims to understand how emotions are used in the context of interpersonal communication, is therefore an important source of models for the design of social behavior of personified machines. Although research on emotions goes back to Darwin in the 19th century, the field experienced an extraordinary growth in the 1990s (Andersen and Guerrero, 1998). Several categorizations of emotion types have been proposed, including Ekman's (Ekman and Friesen, 1975) which proposed *happiness*, *sadness*, *fear*, *surprise*, *anger*, and *disgust* as the most basic emotions, expressed and recognized in almost any cultural group on Earth. A more complete model to use is Plutchik's *sentiment wheel* (Plutchik, 1980) which adds *anticipation* and *trust* as basic emotions, describes variations of intensity in each emotion, and assigns colors to them. For instance, the *anger* scale starts with *rage*, passes through *anger*, and softs with *annoyance*, going from a deep red to pink.

3.5 Narrative Theory

We all construct in our minds dramatic stories to better explain the world and the behavior of the people around us. We believe the same applies in this context, that is, users have a strong tendency to construct and justify their relationship and actions with a personified machine by means of a "made-up" dramatic story the users and the machine are part of, and in which they play different characters.

To model this process, we employ a dramatic framework called *narrative theory*, initially laid down by Vladimir Propp, a Russian formalist who collected and studied hundreds of folktales and proposed that there is a common typology of narrative structures (Propp, 1968). It is based on common subsequences of 31 basic steps and the identification of 8 basic roles played by what he calls *dramatis personae*, or the characters involved in a typical plot: *hero*, *villain*, *donor* (who prepares the hero for his journey), *helper*, *princess*, *princess' father*, *dispatcher* (who sends the hero off), and the *false hero/anti-hero/usurper*.

Propp claims that all folktales have similar characters and narrative structures, given and take some characters and plot steps. Similar claims can be found in the work of Joseph Campbell on mythology and mythical heroes (Campbell, 1996), which identifies similar structures across mythologies around the world; and in Vogler's discussion of Campbell's work (Vogler, 2007) which is extensively used in character and narrative development by the entertainment industry (for instance, by George Lucas in the *Star Wars* saga).

We believe that the interaction of a user and personified machine is often constructed cognitively and emotionally as a dramatic narrative where the user sees herself as the *hero*. The key question for the designer is which role(s) the interface persona should aim to portray in such a narrative. The interface persona could be the *donor*, the *helper*, or even the *princess' father* (the gatekeeper to the user's goals), although, in many times, it inevitably becomes the *villain*.

To help, *character theory* has some of the concepts necessary to understand not only how to construct the story character but also to define the different roles of the interface elements in the "fairy tale" encounter with its user. Character theory provides designers with a structure for human interaction with the personified interface based on powerful, deeply engrained psychological structures built on people from their childhood.

To finalize this discussion of dramatic models it is important to point out that many of the discussed techniques for character, story creation, and enactment aim to maximize conflict, which is a major engine of drama in theater and entertainment. However, in the context of personified interfaces, we may find often that the desirable interface persona is the one precisely with the opposite property, that is, an interface that minimizes conflict with the user. In that sense, it may be necessary to repurpose the discussed dramatics models to arrive at models that are more appropriate for less conflict-prone interface personas.

4 DESIGN METHODS FOR PERSONIFIED INTERFACES

After having presented and discussed some key requirements personified interfaces have and

explored fundamental theoretical frameworks, we present here some design methods we have been developing to address those specific requirements in the design process of personified interfaces. We firmly believe that many of the traditional design methods used in computer-human interaction are also applicable to personified interfaces, since there are many interface challenges which are basically related to the communication media. We implicitly assume here that the overall personified interface design process must also apply traditional concepts, methods, and steps of a user-centered design such as, for example, the construction of *user personas* (Pruitt and Adlin, 2006).

However, the methods discussed in this section exemplify in concrete terms the need of additional work to systematically expose and target the intrinsic difficulties of creating personified interfaces. Inspired by the frameworks techniques from social sciences, theater, puppetry, and social psychology discussed in section 3, we describe here four design methods: *personality workshop*, *conflict battle*, *comics workshop*, and *puppet prototyping*.

The design methods were inspired in previous work on service design (Pinhanez, 2014). They were originally developed to address issues in the design of computer interfaces to service systems, specifically the process of personification of the service provider which often occurs during service recovery. Service recovery is often a very conflicting process where users see themselves battling against (personified) corporations. In this paper, we repurpose those methods in the more general context of personified interfaces.

We have explored those service design methods in three workshops with students in the context of designing the service recovery interface for a self-service e-commerce website. Although we have not yet used the repurposed design methods in *de facto* contexts of design of personified interfaces, we include here some of the results of those workshops because they do a great job in exemplifying the methods and the kind of results we are seeking.

The service design workshops were structured as follows. First, participants were presented with the problem of designing the service recovery interface of a web-based delivery failure system for an imaginary small website for expensive, fashionable sneakers called *powersneakers.com*. As part of the input to the participants, a list of *user personas*, representative of the typical customers of the sneaker store was provided, as well as a list of typical service failures such as failing to deliver the

Figure 1: Handout and results of a *personality workshop*.

product, the product was incorrect or had defects, etc.

The workshops were conducted in distinct locations and in different contexts. The first workshop was executed in a service design school with about 10 service design students in three sessions of 4 hours. The other two workshops were conducted in one day each involving 2 groups of 15 students, mostly from computer science backgrounds. As mentioned before, the workshop results are included in this paper only to better illustrate the design methods proposed and not as validation of the usefulness or efficacy of the design methods.

4.1 Personality Workshop

The first of the proposed methods, called *personality workshop*, is where designers, potential users, and stakeholders try to establish the main characteristics of the personality of the interface persona. Participants explore individually and in group the personality traits by using one of the frameworks discussed earlier. In our workshops, we asked participants to use the *Myers-Briggs* framework to construct the personality of the interface. To accomplish this, we provided them with a table of typical service failures as rows and the user personas as columns, and asked them to explore which *MBTI* personality would best work in each case if a human being was interacting with the user. We then

collected the opinion of everyone on a drawing board (see Figure 1).

Figure 2: Photo and handout of a *conflict battle*.

Often, participants in a personality workshop disagree about the appropriate *MBTI* for each case and user persona, what could lead to an interface persona with multiple personalities. The facilitator should work on the drawing board to identify the most common personality types, trying to converge to a single, most useful personality type which could handle well most cases and users. In some cases, it may be necessary to settle for two or more candidate personalities which can then be explored further during the rest of the design process. For instance, in the workshop depicted in Figure 1, participants preferred an extroverted personality to handle cases of failed delivery (possible to assertively assure that a new delivery was scheduled) but considered an introverted personality as more effective in the case where the product shipped was incorrect (perhaps to apologize better for what is a basic mistake).

4.2 Conflict Battle

The second design method we propose juxtaposes a given personality of the interface persona with the user personas in specific scenarios of conflict. In this method, called *conflict battle*, participants enact physically a conflict scenario by taking turns playing the role of the personified interface and the user personas. This design method employs several theatrical methods to expose the root causes of the and to amplify it. It is easier to create better ways to handle conflicts when all participants understand their good, band, and ugly components.

The main result of the conflict battle is a series of *conflict skits*, short theatrical plays which depict the social behaviors and emotions involved in actual conflict scenarios (see Figure 2). We use both techniques of *improv* (Johnstone, 1981) and *pantomime* (Barba and Savarese, 1991) to foster theatrical interplay, summarized in the following "rules of engagement":

1. Agree (respect what your partner has created).
2. Not only say "Yes." Say "Yes, and...".
3. Make statements.
4. There are no mistakes... only opportunities.
5. Exaggerate... and then a little more.
6. React only to what happened.
7. Think aloud to the audience.

Rules 1 to 4 are typical of improvisational theatre while rules 5 to 7 aim to externalize emotions as commonly seen in pantomimes. Also, the workshop facilitator can employ techniques used by theatre directors such as stopping the action, silencing temporarily one of the players, switching actors, or even suggesting possible developments to courses of action. The goal is to have every skit representing vigorously the complexity of each conflict scenario. "Actors" should not take notes or write scripts but instead "record" in memory the skit as a scene which can be re-enacted at any moment of the design process.

While some of the participants are acting out the scenarios and creating the conflict skits, others take notes on the *conflict observation sheet* of the social behaviors (such as aggression, altruism, empathy) and the emotions being exhibited by users and the personified machine (see Figure 2). In our workshops we employ the standard list of emotions based on Ekman's theory (Ekman and Friesen, 1975): happiness, sadness, fear, surprise, anger, and disgust, and allow observers to include others as they judge necessary. We also ask participants to record interpersonal social behaviors related to social influence, group dynamics, pro- and anti-social behaviors, attraction, and self-deception.

The conflict battle also explores ways to mitigate conflicts. After the conflict skits have been developed and the emotions and social behaviors discussed, the participants explore variations of the conflict scenarios where conflict is either reduced or better resolved. This is accomplished by the

participants re-enacting segments of the conflict skits using alternative personalities for the personified interface. For instance, they can try to
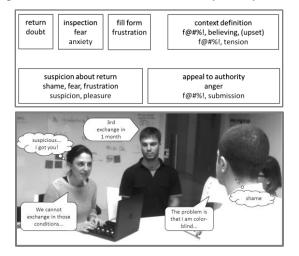

Figure 3: Interaction script and comics storyboard of a *comics workshop*.

make the personified machine to be more subservient, shy, or talkative; and to change the narrative role the personified machine plays, for instance, to stop acting as a *villain* and try to become a *princess in distress*.

4.3 Comics Workshop

To better register the results of the conflict battles we developed a design method using a hybrid between a comics story (more precisely, a *photo novel*) and an interaction storyboard which we call a *comics storyboard*. It is an enriched version of the traditional storyboard used in interface design where we included photos of the participants enacting the conflict pantomimes accompanied with typical markings from comics such as balloons which explicit the inner thoughts and emotions of the user and the personified machine (see Figure 3).

As an initial step towards the creation of the comics storyboard, participants are asked first to create an annotated *interaction script* which is a summary in written form of the main actions of the corresponding conflict pantomime and their associated emotions and social behaviors. This script is used as a guide in the construction of the comics storyboard to ensure that emotions and social behaviors are clearly displayed.

The comics storyboards produced in the workshop are then analyzed in terms of character consistency, clarity, enjoyment, and quality of conflict resolution. We found that the production of

the annotated interaction script, prior to the comics storyboard, is quite helpful in gathering the basic structure of the pantomime and its main components. After that, groups or individuals work separately crafting subsets of the frames of the comics storyboard. The overall result is a very rich representation of key aspects of the interaction, its main conflicts, the characters and subtext of the narrative, and the emotions and social behaviors involved.

4.4 Puppet Prototyping

Having explored the range of human exchanges, emotions, and social behaviors during the *conflict battles* and registered them in the *comics storyboard* format, the goal of *puppet prototyping* is to transform the comics storyboards into concrete interface actions which can express the mitigating social behaviors and emotions. For this, participants go back to the conflict skits they developed and work using a variety of methods to transform dialogue and human actions into appropriate interface actions.

Figure 4: Photo of an *action pantomime* and an *interface comics*.

For this we employ the theatrical action-based methods of the *Stanislavsky's system*, and techniques from puppetry and movie animation as discussed before. Using those ideas and principles, participants are first asked to create *action pantomimes*, a version

of the conflict skits where emotions and social behaviors are eventually expressed through interface actions. They start by re-enacting the conflict skits using *constricted dialoguing techniques*. For example, they act the conflict skits using only very short sentences, or only gestures, or not facing each other, or pretending to be animals. The goal is to explore the limits of human expression to find mechanisms which convey the social behaviors and emotions of the conflict skits and their mitigating solutions. The actions found in the process take the place of or augment the original dialogue in the conflict skits and are also recorded in the corresponding comics storyboard transforming it in what we call an *interface comics* (see Figure 4). By putting them together, participants can then critique the interface actions considering the human actions, emotions, and social behaviors they should be expressing. We then iteratively refine the interface comics by doing, as necessary, more exploratory work with constricted dialoguing or by considering alternative interface actions.

At the end of the puppet prototyping workshop, the interface comics should contain a complete interface storyboard to guide the actual implementation of the interface. Notice that the interface comics goes further than traditional storyboards by serving as a documentation also of the actions, emotions, thoughts, and social behaviors of the users and of the personified interface.

5 DISCUSSION

This paper presents new methods and techniques to design personified interfaces and explores their foundational theoretical frameworks. We argue here that designing personified interfaces is challenged by three key requirements: coherent human traits, dealing with conflict, and handling drama. Inspired by the service design methodology proposed in (Pinhanez, 2014), we described and discussed four design methods to improve the design of the personified interfaces, illustrated with examples from three test workshops.

In the test workshops we conducted only informal debriefs with the participants. The most common feedback is the surprise on how easily the design methods revealed and exposed the underlying conflicts and helped the participants to find ways to mitigate them. Some initial uneasiness with the theatrical games and techniques, especially the constricted dialogue part, was also reported.

There are still many issues and unanswered questions regarding the proposed design methods. Our next step is to apply the design methods to real cases of personified interface design, developing and deploying the interface, and evaluating how effective it is in practice.

While we welcome the explosion of chatbots, mobile assistants, and humanoid robots around us, we are concerned that there is too much to be learned too fast to meet the demand of designing personified interfaces. We hope that some of the ideas in this paper, although still preliminary and untested, can serve as a guide for designers facing the challenge of creating personified interfaces. Our final goal is to make designers and developers able to create interfaces in which users can structure their relationship with personified machines reliably and consistently, recognizing and appreciating their personality, engaging in trustable social behaviors, and co-producing rich, meaningful, and satisfying interactive drama.

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