Planning Small Talk behavior with cultural influences for multiagent systems

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1. Motivation

Human communication depends on several factors such as personality, emotion or personal relationships. Hofstede (2001) refers to this as a mental program, that individualizes every human and affects one's behavior. This so-called "software of the mind" can be categorized into three layers: human nature, culture and personality (see Fig. 1). Since these three levels strongly affect human behavior, we claim that they should also be considered when building believable behavior for virtual agents. So far, enormous efforts have been made in integrating two of the three layers. Through the virtual agents' embodiment, human nature was included in order to simulate believable behavior (verbally and non-verbally). Integrating models of personality was a plausible next step, taking into account that most interactions with virtual agents take place in dyadic conversations and thus a personal layer was considered. However, the third

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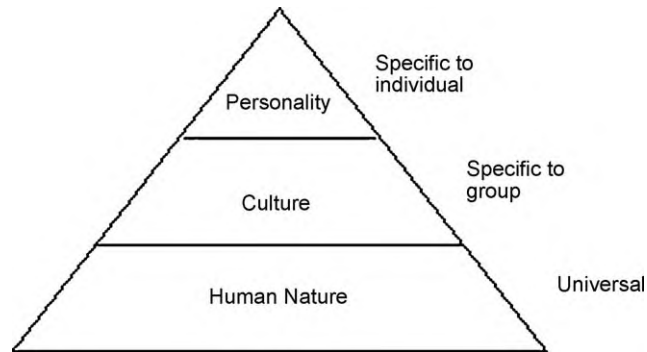
Fig. 1. Hofstede's levels of uniqueness in a human's mental program (Hofstede, 2001).

layer (culture) is rather new in the domain of virtual agents and has come into focus only recently. In the following the three layers will be further explained as well as their correlation with virtual agents.

Human nature represents the universal level in one's mental program and contains *physical* and *basic psychological* functions. Virtual agent systems meet people's *physical* nature in more and more sophisticated ways using natural speech and non-verbal behavior such as gestures or body postures. Basic p sychological functions have been integrated into virtual agent systems as well. The ability to express emotions and act accordingly for example is described in Aylett et al. (2005) and Gratch et al. (2002).

Personality is the level that is specific to the individual and, according to Hofstede (2001), contains a unique set of mental programs that characterizes a person. Enhancing the behavior of virtual humans with a personality component has been a vast research field in recent years. Examples can be found in Rist et al. (2003) and Kang et al. (2008).

Culture is the middle layer of Hofstede's mental program that determines human behavior. In contrast to personality, culture is specific to the group and the environment, which ranges from the domestic circle, the neighborhood or workplace up to the living community of the country an individual lives in. Culture plays a crucial role in the perception and selection of behaviors, mainly without realizing it. Consequently, behavior is sometimes perceived as inappropriate without it being realized that there is a cultural gap causing the problem. Recently the integration of cultural specific behaviors into multiagent systems has gathered momentum (see Aylett et al., 2009; Jan et al., 2007 or Rehm et al., 2008).

Our aim is to generate culture-specific communication for virtual agents. In our work, we focus on the domain of Small Talk as a type of conversation that occurs in every culture. Small Talk is often used to pass time and avoid silence and does sometimes not serve a certain purpose. In addition to that, it can be used to build trust and rapport between communication partners. According to Reeves and Nass (1996) users establish social relations to computer-based systems. Small Talk can be used to influence social relations positively. Bickmore and Cassell (1999), use Small Talk to develop trust and rapport toward a virtual agent. In applications where the development of social relations is intended, Small Talk can be a crucial part of the system's social intelligence. Integrating culture as a social factor in the generation of Small Talk for a computer-based system can enhance the development of social relations.

The contribution of our work is to formalize culture-related differences in Small Talk behavior in a way that allows integration into a program that automatically generates culture-specific dialogs. In our approach, we exemplify culture-related differences in Small Talk for the German and Japanese cultures. Tendencies described in the literature were taken as a basis. As these descriptions are rather broad, we documented the cultural tendencies reported in the literature by analyzing the content of video corpora recording Small Talk in Japan and in Germany. Integrating our expectations into a demonstrator with virtual agents, we showed that human subjects perceive a difference between agent dialogs that are in line with their own cultural background and agent dialogs that are not. We take this as a first piece of evidence that our formalization of culture-related differences in Small Talk behavior can enhance the social behavior of virtual agents. We then implemented a system that automatically generates culture-specific Small Talk for a multiagent system.

This paper is organized as follows: The next section gives an overview of the related work on Small Talk for virtual agents and approaches that enhance their behavior with a cultural component. Then we describe Small Talk and culture as backgrounds from the social sciences. We go on to introduce the basic functions and the structure of Small Talk in Section 3, as well as techniques for categorizing topics that might occur in Small Talk. In Section 4, we define culture

as a concept and describe different models of culture. As a result of reflecting Small Talk and culture as described in the literature, we summarize the tendencies on culture-related differences in Small Talk behavior. To ground these tendencies into empirical data, we describe a corpus study in Section 5 that helps us to characterize our expectations in a more formal way in order to build a computational model. In Section 6, we present a validation study where we evaluated whether subjects perceive a difference between culture-specific dialogs that are in line with observations made for their own cultural background and agent dialogs that are not. Section 7 introduces our system architecture including a hierarchical planner that automatically generates culture-specific Small Talk behavior for a multiagent system. In Section 8, we discuss our results and describe our future work in this research field.

2. Related work

As we stated above, we aim at correlating the two phenomena of Small Talk and culture and integrate them into a multiagent system. The idea of developing virtual agents that have the ability to use Small Talk is not entirely new. For example, Cassell et al. (1999) describe an embodied conversational interface agent (REA) that interacts with a user in the domain of real estate sales. The REA agent is capable of both multimodal input understanding and output generation and supports social as well as task-oriented dialog. In Bickmore and Cassell (1999), an advanced version of the REA agent is described where the social component is enhanced by the agent's capability to engage in Small Talk. Besides accomplishing specific tasks in the real estate domain, the agent uses casual Small Talk to build trust and rapport with the user.

Bickmore (2003) describes an exercise adviser agent that promotes exercise among students in order to evaluate the effectiveness of relational agents in health behavior change. Therefore, the agent needs to be capable of building relationships with people and influencing their exercise behavior. The authors found significantly more laughter in conversations where Small Talk occurred compared to those dialogs where Small Talk was almost absent.

Another purpose of Small Talk in computer-based systems is described by Isbister et al. (2000). A so-called "Helper Agent" virtually joins two users of a chat room in case their conversation stagnates. By introducing typical Small Talk topics the agent can actively help to create interesting and ongoing conversations between human interlocutors. Thereby the agent distinguishes between safe and unsafe topics. The authors state that this division depends on culture. Thus, some topics are safe in one culture and unsafe in another. For their application, however, topics remain limited to those that are either safe or unsafe in all cultures, such as weather and music (safe) or religion and money (unsafe).

Like the ability to engage in Small Talk, the integration of cultural background into the behavior of virtual agents has been focused on recently. Iacobelli and Cassell (2007) present a virtual peer that models ethnicity through culturally authentic verbal and non-verbal behaviors in order to test ethnic identity and engagement. By changing the verbal and non-verbal behaviors and leaving the appearance constant, the authors tested how subjects assess the ethnicity of a virtual character. Their evaluation suggests that the ethnicity of a virtual agent can be estimated by adapting verbal and non-verbal behaviors and that children engage with those virtual peers in promising ways for educational applications.

Huang et al. (2008) present a culture-adaptive virtual tour guide. The authors take a modularized approach using a generic framework to build agents that display appropriate verbal and non-verbal behaviors. However, they do not explicitly model culture or behavioral differences, but integrate random culture-related behavior such as emblematic gestures in the overall process of action selection.

Core et al. (2006) describe a tactical language system where the trainees interact with virtual agents that have a different cultural background than their own. For the training scenario different negotiation styles were implemented: (1) *avoidance*: the negotiator tries to avoid the negotiation which is undesirable in some manner; (2) *integrative*: the negotiation partner tries to find a solution for the given problem that is satisfying for all participants and (3) *distributive*: the conversation partner wants to proof his/her point and "win" the negotiation. Although the authors state that there are culture-rated differences in the usage of these strategies they have not identified culture-specific negotiation styles yet, but acknowledge the importance of such a step.

As we stated above, culture is specific to a group whereas personality is specific to an individual. Several approaches have been integrating personality to the internal model of virtual agents. With a group of virtual agents the phenomenon of culture can be simulated. The CUBE-G project (Rehm et al., 2007) for example, investigates culture-adaptive behavior generation for interactions with embodied conversational agents which can be employed in edutainment applications for increasing cultural awareness and for learning some of the appropriate behavior routines. For the project, three prototypical interaction scenarios have been taken into account: (1) meeting someone for the first-time; (2) negotiation;

(3) conversation with an individual with a high social status. The first scenario covers a first-time meeting, where getting acquainted with each other and thus leading a Small Talk conversation comes into focus. Verbal behavior differences have not been considered, but attributes of non-verbal behavior as well as communication management behavior have been observed.

Another approach in integrating culture-specific behaviors into a multiagent system has been taken by Jan et al. (2007), who present a model for simulating cultural differences. So far, non-verbal behavior clues have been taken into account, such as differences in proxemics and gaze. In their evaluation, the authors show that subjects perceive differences between simulations generated with different parameters and simulations with cultural parameters associated with their own culture.

Aylett et al. (2009) introduce a believable agent-based educational application that was designed to develop inter-cultural empathy in participating users. In the ORIENT application, fantasy characters with their own culture in terms of rituals and symbols were designed. The agent architecture is based on FAtiMA (Dias and Paiva, 2005), where emotions and personality influence the agents' behavior. To simulate different cultures, this architecture was extended to allow cultural adaptation of the agents. However, in their system only the way actions are interpreted depends on culture. Thus, on the one hand, incoming events are perceived in a culture-specific way (which updates the emotional state of an agent) and on the other hand the triggered reaction is performed according to culture. The work described in this paper focuses on the process of action selection depending on culture. Therefore, stereotypical behavior for certain cultures is simulated to help the user to understand these cultural differences.

Integrating culture into the behavior model of virtual agents has come into focus recently. However, most approaches concentrate on non-verbal behaviors. Our work focuses on culture-related differences in verbal behavior. Small Talk is used in virtual agent applications already to establish social relations. Cultural factors are not considered yet. Our contribution is to formalize culture-related differences in Small Talk behavior in order to build a system that automatically generates dialogs that exemplify these findings. In our work, we concentrate on two national cultures and demonstrate concrete differences in their behavior. To that end a video a video corpus was recorded in the two cultures of Germany and Japan.

3. Functionality and structure of Small Talk

In order to formalize Small Talk in a way that allows the generation of different dialogs for different cultural backgrounds, we need to understand and characterize Small Talk first. In this section, we describe Small Talk as it is defined in the social sciences and introduce prototypical sequences and topics for Small Talk conversations.

Small Talk is often thought of as neutral, non-task-oriented conversation about safe topics, where no specific goals need to be achieved. But besides being a simple chat, Small Talk can serve different purposes, such as establishing social relations, getting acquainted with a conversation partner or avoiding undesirable silence. Although the rules of Small Talk seem to be loose, there are certain structures that explain the flow of an average Small Talk conversation. Schneider (1988) describes a sequence that exemplifies the prototypical structure of Small Talk. This sequence of utterances is characterized as follows:

1. Question
2. Answer
3. Reverse Question/understanding/acknowledgment/evaluation
4. Zero or more idle-moves

where step three and four can be performed several times. According to Schneider (1988), this sequence can be used to discuss a topic within a Small Talk conversation. It can then be restarted for every new topic. Of course, this is only one sequence that describes the prototypical flow of discussing a topic and not necessarily every Small Talk conversation has to follow this line. However, it can be used for our purposes in building a computational model of Small Talk for a system using virtual agents. In our work, we use this sequence as a basis to describe the prototypical flow of a Small Talk conversation.

Besides defining a prototypical sequence within a Small Talk conversation, possible topics need to be constrained. Obviously, not every topic is appropriate in an everyday Small Talk conservation. So-called *unsafe topics* such as death, serious illness, religion or sex are avoided. According to Kellermann and Palomares (2004), the choice of topics in

everyday conversation depends on the personal relation between the interlocutors. Consequently, topics that are likely to be discussed in a casual Small Talk situation are predictable.

Schneider (1988) categorizes topics that might occur in Small Talk conversations into three groups, while the choice of topics depends on the social context:

1. The *immediate situation* holds topics that are elements of the so-called *frame* of the situation. In order to explain the idea of a frame, the author of Schneider (1988) uses a Small Talk situation that takes place at a party. Possible topics within a party frame could be the atmosphere, drinks, music, participants or food.
2. The *external situation* (later referred to as social topics) or "supersituation" describes all topics that hold the larger context of the immediate situation. This category is the least limited of the three. Topics within this category could be the latest news, politics, sports, movies or celebrities.
3. For the *communication situation* (later referred to as private topics) interlocutors are seen as a subset of the immediate situation. Thus, topics concentrate on the conversation partners e.g. their hobbies, family or career.

According to Schneider (1988), a typical Small Talk conversation begins with the interlocutors' immediate situation (e.g. the location of the conversation or the weather). Successively, topics can either shift to the external situation (e.g. economy or news) or to the communication situation (e.g. hobbies or career). Whether the conversation addresses social or private topics is dependent on the social surrounding. While shifting to social topics is more common in a social context, such as a party situation, shifting to private topics is typical for a conversation between strangers that want to avoid silence. As a result, topic selection in Small Talk depends on the conversation partners, their personal relation and social context.

4. Defining culture and cultural differences

In the previous section, we discussed the sequence of a prototypical Small Talk conversation as well as an approach that categorizes topics that might occur during Small Talk. So far, the influence of cultural background has not been taken into account. Since the observations described above have been made for Western cultures they do not necessarily hold true for other cultural groups as well. Do topics in Asian Small Talk conversations, for example, shift to the communication situation when silence is tried to be avoided just as described for Western cultures? In addition, the prototypical structure of Small Talk described above does not give any information about the ordering of different topics. Does one topic have to be finished before another one starts? How are topics reintroduced? In this section, we address these questions and summarize tendencies in culture-related differences in Small Talk behavior as described in the literature.

Our objective is to build a multiagent system where the style of casual Small Talk varies with culture. Therefore, we need to define culture and behavioral differences between cultures. Although culture is an abstract concept that describes tendencies of behavior rather than fixed rules, there are approaches that define culture in a dimensional manner or categorize cultural groups and define most likely behaviors for these groups.

Culture can be seen as a concept, where dichotomies are defined and differences in behaviors are explained accordingly. Hall (1966), for example, distinguishes so-called *high-* and *low-contact* cultures, that depict behavioral differences in proxemics and haptics. Following Hall's definition, Ting-Toomey (1999) characterizes the varieties of these cultural groups in more detail. According to her, features of high-contact cultures include direct facing, frequent direct eye contact, close interaction and a rather loud voice, whereas features of low-contact cultures include indirect facing, wider space, little or no touching, indirect glances and a soft or moderate voice.

Another dichotomy analyzed by Ting-Toomey (1999) is the division into *monochronic* and *polychronic* cultures. One behavioral pattern described for monochronic cultures is that members tend to do one thing at a time. Most Western cultures find themselves in the monochronic group. Controversially, most Asian cultures belong to the polychronic group and prototypically tend to do several things at a time. Generalizing these behavioral patterns, Western cultures tend to finish one thing before starting another, while it is more common in Asian cultures to switch back and forth between tasks. Regarding the domain of Small Talk, we derive from the tendencies described above that topics are rather discussed after one another in monochronic cultures and thus in a more sequential manner than in polychronic cultures, where we anticipate switching back and forth between topics as more natural. Concluding this idea, we formulate a first tendency on culture-related difference in Small Talk behavior that distinguishes Asian and Western cultures:

Tendency 1: Topics are more likely to be discussed one after the other (more sequentially) in Western Small Talk conversations than in Asian ones.

Hall (1966) describes another distinction of cultures and divides them into *high-* and *low-context* cultures. Regarding verbal communication, in so-called high-context communication little information is explicitly encoded and the conversation relies mainly on physical context. Besides verbal utterances, meaning is transported through context or non-verbal clues. Thus, interlocutors are expected to "read between the lines" in order to decode the whole meaning of a verbal message. In contrast, low-context communication explicitly encodes information. The speaker is thus expected to construct clear messages that can be understood easily without the need to decode other aspects of communication. Most Western cultures are low-context cultures whereas most Asian cultures are high-context cultures. According to Brett (2000), low-context cultures tend to use many question–answer pairs, whereas high-context cultures develop information from the context. Thus, the structure of Small Talk as described in Section 3 should be more common in Western Small Talk situations than in Asian ones.

As we stated above, the choice of topics occurring in casual Small Talk can be culture-dependent. According to Isbister et al. (2000), the categorization into safe and unsafe topics varies with cultural background. Consequently, a topic (such as talking about family members) can be considered as safe in one culture and as unsafe in another. If the distinction into safe and unsafe topics varies with culture, we expect that the overall choice of topic categories is also dependent on culture. Following Hall's categorization, Ting-Toomey (1999) describes people belonging to high-context cultures as having a lower "public self" than people belonging to low-context cultures. A typical behavioral pattern for members of high-context cultures is not to reveal too much information during a first-time meeting. Bringing together Small Talk as a typical conversation for a first-time meeting and the categorization of topics described in Section 3 (immediate situation, social topics, private topics), we expect private topics to be more common in low-context cultures than in high-context cultures. We therefore formulate the second tendency on culture-related differences in Small Talk behavior for Asian and Western cultures (topic categories are used as defined in Section 3):

Tendency 2: Less private topics occur in Asian Small Talk conversations than in Western ones.

In summary, the choice of topics as well as their sequence within a dialog vary across cultures. In a simulated Small Talk dialog cultural background should be taken into account as well. However, the tendencies described above are rather broad and too abstract for integration into a system that automatically generates culture-specific Small Talk behavior. On the one hand, we need to find empirical evidence that the tendencies described in the literature are valid for concrete human cultures rather than for cultural groups and, on the other hand, concrete data that describe behavioral differences in statistical manners are essential to build a computational model.

5. Empirical corpus study

As we stated above, our aim is to build a multiagent system that generates Small Talk dialogs with culture as a parameter. In Section 4, we introduced tendencies formulating differences in Small Talk behavior between Western and Asian cultures. However, to integrate these ideas into a system, we need more concrete data. In addition, the distinction between Western and Asian cultures is too broad for our purposes. To exemplify culture-specific differences in verbal behavior, we recorded and analyzed a corpus in the two national cultures of Germany and Japan, that was created within the CUBE-G project (Rehm et al., 2007). For the acquisition of this corpus, three prototypical interaction scenarios were videotaped: A first-time meeting, a negotiation and a conversation with a person with a higher social status than one's own.

Since we were interested in Small Talk behavior, we only considered videos for our analysis that took place in the first interaction scenario. For our video corpus, we recorded more than 20 interactions in each culture. Every scenario was recorded with one student interaction partner and one professional actor. Each of the students was told that they would have to solve a task with another student and therefore the two of them had to get acquainted with one another. While having a Small Talk conversation to get to know each other, the video taping had already started. Actors were told to be as passive as possible and to allow the participant to lead the conversation. Only if communication seemed to stagnate, actors should get more active. Participants did not know that they were interacting with actors. In this vein, we were able to ensure high control over the recordings. On the one hand we could assure that participants did not know each other in advance. On the other hand we were able to assure that each Small Talk scenario lasted for around 5 min. To allow all gender combinations, we had to hire four actors for this scenario: one female and one male actor from both participating cultures. It should be noted that dyads were held in each person's mother tongue and thus Japanese subjects interacted with Japanese actors and German subjects with German actors. The same two
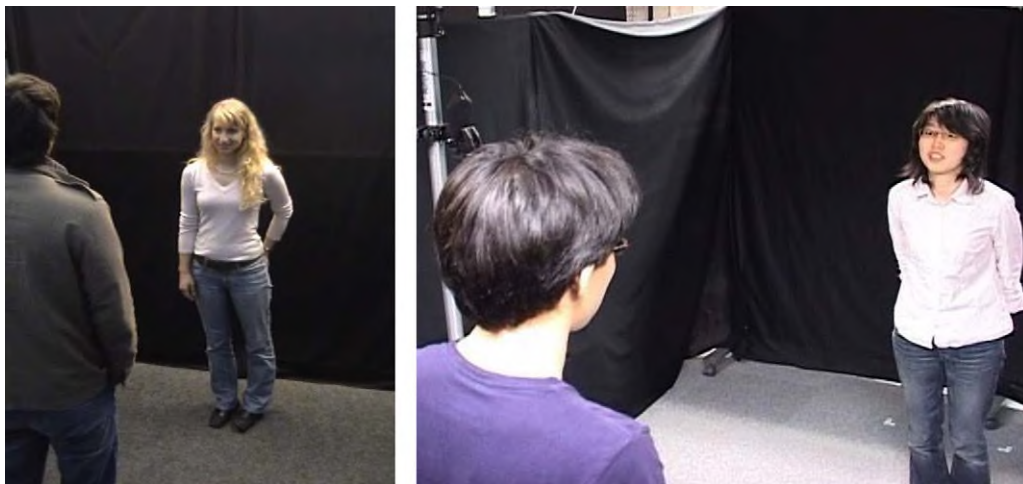
Fig. 2. Female subject interacting with a male actor in the Small Talk scenario of the CUBE-G corpus (left: Germany; right: Japan).

interlocutors participated in the second scenario, a negotiation. For the third scenario, the student subject interacted with another actor who played the role of our business partner who was interested in the results of the recordings. For this role, a female and a male actor were hired in both cultures. In total, around 20 h of video material were collected for more than 40 subjects. Further information on the video recordings can be found in Rehm et al. (2009).

To avoid gender effects, we took into account only videos with mixed gender combinations for our analysis (either subject male and actor female or vice versa). Fig. 2 shows two examples within the Small Talk scenario in the two cultures of Germany and Japan. For our model, eight videos displaying Small Talk dialogs were analyzed, four for each culture. These were the first four videos in mixed gender combination that were translated by our Japanese project partner. In our future work, we aim to translate and transcribe all of the videos for further analysis.

As we stated earlier, we expect topics to be discussed in a more sequential manner in Western Small Talk conversations than in Asian ones (see Tendency 1, Section 4). In our corpus, we therefore assume that topics are reintroduced and discussed several times in Asian conversations, whereas this behavior should not occur as often in Western dialogs. To analyze conversations, we counted the amount of topics that arise in each Small Talk dialog as well as the shifts between topics. If, for example, a pair of communication partners talked about their studies first, then switched to talk about soccer and then talked about a movie they had seen in the cinema, this would mean that they discussed three topics (studies, soccer, movie) and had two topic shifts between them (studies–soccer, soccer–movie). In another conversation, interlocutors might talk about their studies in the beginning as well, then switch to soccer and finally come back to talk about their studies again. For our analysis this would compute to two topics (studies, soccer) and two topic shifts between them (studies–soccer, soccer–studies). In a conversation where studies are discussed and the conversation is concluded with soccer, this would add up to two topics (studies, soccer) and one shift (studies–soccer). Note that the same amount of topics does not necessarily mean the same amount of topic shifts and vice versa. In that manner, we were able to compare conversations in terms of how many topics occurred in a conversation in relation to the sequence of their occurrence or reappearance respectively.

Interestingly, our analysis showed that in both cultures the exact same number of topics was discussed. Thus, in the four German videos we found 26 topics as well as in the four Japanese videos (see Table 1). Regarding shifts between topics, we found 38 topic shifts in German conversations and 46 topic shifts in Japanese conversations (whereas all

Table 1
Comparison of number of topics with topic shifts in German and Japanese Small Talk conversations from our video corpus.

	Germany	Japan
Topics (in all videos)	26	26
Topic shifts (in all videos)	38	46
Topics (average per conversation)	6.5	6.5
Topic shifts (average per conversation)	9.5	11.5

Table 2
Selection of topic categories in German and Japanese Small Talk conversations.

	Germany	Japan
Immediate situation	14%	29%
Social sphere	43%	50%
Private sphere	43%	21%

videos were approximately 5 min long). Although these results are not significant, they are in line with tendencies described in the literature. In addition, these findings give a clearer insight into how many topics and topic shifts we should integrate into our computational model for virtual agents.

Regarding the second tendency (see Tendency 2, Section 4), we expect to observe fewer private topics in Asian Small Talk conversations than in Western ones. Analyzing the same eight videos that were mentioned above, we needed to divide the topics that occurred in the videos into categories. Following Schneider (1988), we distinguish three groups: topics covering the immediate, external and communication situation (see Section 3). Considering the experimental setting at a university with student–subjects, we chose to classify topics as follows:

1. *Immediate situation*: Participants talk about the experimental setting, the task or reasons why they participated.
2. *External situation* (*social sphere*): Subjects talk about studies and university (supersituation for recordings at a university), friends/people they know or public topics such as sports, music or movies.
3. *Communication situation* (*private sphere*): Students talk about topics concerning themselves such as their origins, hobbies, favorite music, going out at night, personal habits or even their health.

Comparing German and Japanese Small Talk conversations, we found out that the Japanese participants discussed significantly more topics referring to the immediate situation than the German subjects (using t-test with $p = 0.03$). In most Japanese conversations, participants discussed the experimental setting while this was not common in German conversations. Furthermore, German subjects talked significantly more about social topics than about topics discussing information about the immediate situation (t-test with $p = 0.03$). This strengthens the impression that talking about the immediate situation, such as the experimental setting is not very common in German Small Talk conversations. Participants preferred talking about social topics such as their studies or friends. We made similar observations for private topics in comparison with the immediate situation. In German conversations, participants talked significantly more about private topics than about the immediate situation (t-test with $p = 0.04$). In that vein, topics such as hobbies or favorite clubs or bars were a lot more common than talking about the setting or task subjects had to solve. In contrast, the Japanese dialogs did not show any significant results comparing the different topic categories. This suggests that all three groups of topics occur similarly and there is no clear tendency toward social or private topics as observed for German conversations.

Table 2 shows the percentaged distribution of the topic categories discussed in our corpus in the two cultures. Again, these findings are in line with tendencies described in the literature. As we stated earlier, we expected to find fewer private topics in Asian Small Talk conversations compared with Western ones. For example, in one German Small Talk conversation, participants talked about their studies, their origins (places of birth) and places they visited during their travels. In comparison, in one of the Japanese dialogs subjects discussed the experimental setting, the task that they had to face later as well as their studies.

We are aware that our empirical study is limited by a very small pool of participants. However, observations made for the two cultures are in line with tendencies described in the literature. We therefore use these preliminary findings to formulate characteristics on culture-specific Small Talk for virtual agents.

6. Validation with virtual agents

Before integrating our findings into a system architecture, we wanted to validate whether the findings in culture-specific behavior also apply to virtual humans. Thus, we decided to investigate in a pilot study whether human subjects perceive a difference between virtual agent dialogs that vary with culture as a parameter.

Fig. 3. Culture-specific agents in the Virtual Beergarden application (left: Germany; right: Japan).

For this validation study, we used the scenario designed for the CUBE-G project (Rehm et al., 2007). In a Virtual Beergarden the agents have the ability to wander around and to communicate with each other. The application was constructed to serve as a training scenario where the user can learn more about culture-specific differences in non-verbal behavior. To that end culture-specific virtual agents were created. Fig. 3 shows two examples from the Virtual Beergarden (left: German agents; right: Japanese agents). The characters' appearance (skin, hair or shape of the face) as well as their non-verbal behavior were adapted to their cultural and ethnic background (Rehm et al., 2008). Differences in non-verbal behavior may manifest themselves in obvious ways, for example in culture-specific gestures (such as a bow for the Japanese greeting) or typical body postures for a given culture (see Fig. 3). To show culture-related differences in non-verbal behavior in a more subtle way, different styles of performing an action were modeled. For instance, the speed, rhythm or spatial extent of a gesture may be varied. For our pilot study, we used the German agents in order to find out if German subjects prefer them performing Small Talk in a German style as derived from the literature review and the corpus analysis.

Our main interest lies in a different topic selection in the two cultures of Germany and Japan. We therefore scripted different Small Talk dialogs for the two cultures that contained different topics depending on the simulated culture. For the pilot study, dialogs were scripted by hand; later scripts will be computer-generated. In total, three conversations were recorded for each culture. Topics within the dialogs were chosen taking into account findings from literature as well as from our corpus study.

As described earlier, Japanese subjects in our empirical study raised significantly more topics covering the immediate situation than the German subjects. Accordingly, the simulated dialogs reflecting typical Japanese Small Talk behavior contained more topics that deal with the immediate situation as well. As an indication of how many topics from each category should be chosen for each dialog, we used the findings from our corpus study summarized in Table 2, Section 5. Thus, we decided to integrate half private and half social topics into the German Small Talk dialogs and one-third private topics, one-third social topics and one-third topics covering the immediate situation into the Japanese Small Talk conversations.

Tables 3 and 4 show two example dialogs from our pilot study. Please note that agent dialogs were held in German for German subjects. Tables 3 and 4 thus show translated dialogs. Before observing the agent videos, subjects were told that the two agents were just introduced to each other by a common friend called Ana in the Virtual Beergarden.

In the German Small Talk dialog, half of the conversation covers social topics and the other half private topics. In that vein, in Table 3 the agents talk about their common friend Ana, the Olympic Games (both social topics) and the studies of the two of them (private topics for both). As mentioned above, in the Japanese Small Talk dialogs every category should be covered by one-third. In Table 4, the agents thus talk about the beer garden location (immediate situation), the weather (social topic), and their hobbies (private topic).

The aim of this pilot was to verify whether subjects perceive a difference between the agent dialogs and if there is a preference for communication styles that are in line with findings made for the subject's cultural background. Our pilot study was held in Germany with German subjects and we thus expect participants to rate the German Small Talk versions as more appropriate. Both Small Talk versions (German and Japanese) were displayed with the Western-style

Table 3
Example for a German Small Talk dialog from our pilot study.

Agent	Utterance	Topic	Category
A	"Have you known Ana for a long time?"	Friends	Social
B	"No. Not too long. I met her last term at university."	Friends	Social
A	"Oh, so you are studying? In which semester are you?"	Studies B	Private
B	"I am in my third year."	Studies B	Private
B	"Are you studying as well?"	Studies A	Private
A	"Yes, I am studying sports."	Studies A	Private
B	"So I guess you watched the beginning of the Olympic Games in Beijing on TV last week?"	Social event	Social
A	"Sure! and Germany has already won a medal."	Social event	Social

characters to assure that subjects did not assume a cultural background different from their own. The agent dialogs were held in German to avoid effects due to the language barrier. In addition, the beergarden setting would not lead to a different cultural assumption, as this is a normal setting for a Small Talk conversation for German subjects.

As we focused on videos from our corpus study where mixed gender combinations were recorded, we decided to show videos with mixed genders in the agent conversations as well. Thus, we were able to avoid interfering effects aroused by different gender combinations.

Apart from the choice of topics, no other aspects of culture-specific Small Talk behavior were taken into account. To avoid user preferences evoked by differences in non-verbal behavior, agents in the Small Talk conversations did not exhibit any gestures or culture-specific postures. Instead they displayed a neutral posture (standing straight with arms hanging down both sides of their body, see Fig. 4). Another analysis of the video corpus revealed that there are culture-related differences in communication management behavior (Endrass et al., 2009). As we wanted to focus on topic selection, the Small Talk dialogs in our study did not use differences in pauses in speech for example, but showed only very brief pauses to simulate breathing between sentences.

Furthermore, in none of the scripted dialogs were topics reintroduced, neither in the German nor in the Japanese version. Topics were rather ordered sequentially, which was assumed to be preferred for subjects with a German background (see Section 4). By simulating only differences in one aspect of communication (topic selection), we avoided interfering effects elicited by other aspects of communication, such as non-verbal behaviors or communication management behaviors. Fig. 4 shows one of the dialog pairs within our pilot study as well as the questions that subjects were asked to estimate.

Subjects watched the three pairs of videos in alternating order and were asked to judge

1. which one is more appropriate,
2. which one is more interesting,
3. which conversation they would prefer to join,
4. which pair of agents gets along with each other better and
5. which topics occurring in the dialogs were more appropriate for the situation.

As we mentioned earlier, we used Western-style characters and invited German subjects. We thus expected participants to perceive the German version as more appropriate and interesting. In addition, we assumed that subjects

Table 4
Example for a Japanese Small Talk dialog from our pilot study.

| Agent	Utterance	Topic	Category
A	"This beergarden is really lovely."	Location	Immediate situation
B	"Yes. And because of the trees there is a nice shade."	Location	Immediate situation
A	"Oh yeah. It is exceptionally hot this summer."	Weather	Social
B	"True, the weather is really good this year. And it has hardly rained at all."	Weather	Social
A	"Like that I can go running quite often."	hobbies	private
B	"Oh, you are running?"	Hobbies	Private
A	"Yes. I run twice a week."	Hobbies	Private
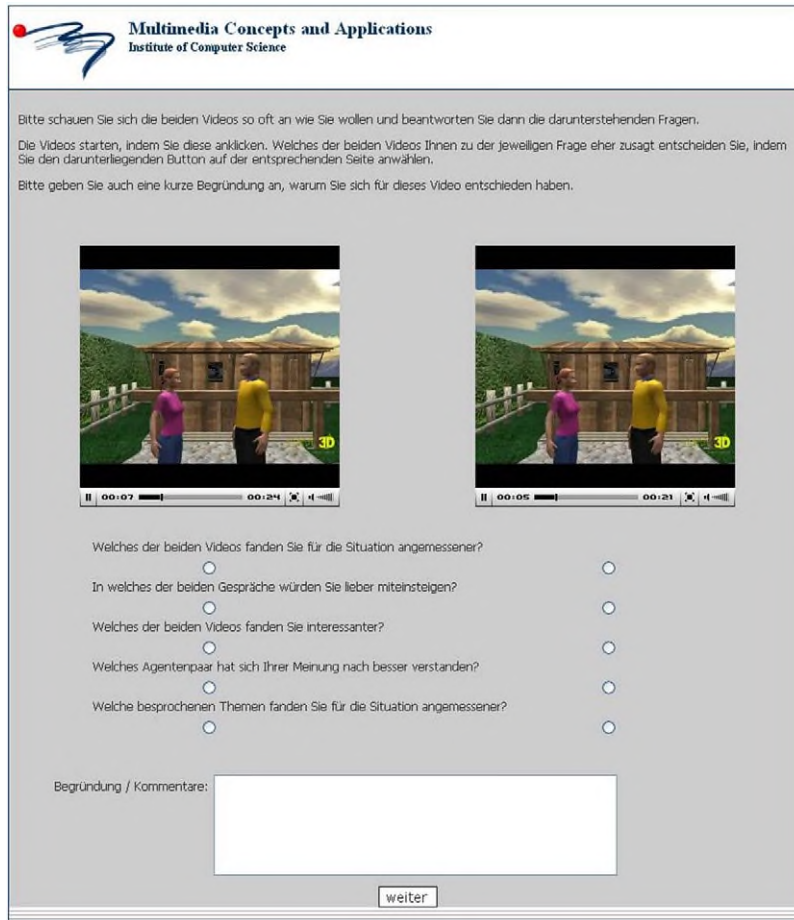
Fig. 4. Screenshot of validation study, showing a pair of videos displayed by Western-style agents.

would rate agents in the German version as getting along with each other better because of the choice of more private topics.

In our pilot study, 11 subjects participated: 5 male and 6 female. All subjects were between 21 and 33 years old. As every subject watched 3 pairs of videos, we obtained a data set containing 33 judgments.

Table 5 shows an overview of the subjects' estimations. Although differences were subtle and participants did not know that the study was about topic selection, the results revealed significant preferences for the German Small Talk versions. Thus, German subjects preferred dialogs where topics were more private and did not refer to the immediate situation. Using the two-sided t-test for statistical analysis, we achieved significance for all five questions with $p < 0.001$.

Interestingly, subjects explained their decisions using expressions such as "constrained", "superficial", "firm" or "distant" for videos displaying the Japanese Small Talk versions, while they commented on videos showing the German versions with expressions such as "more private" or "real interest in the conversation partner".

Table 5
Overview of user ratings in the preliminary evaluation study.

	German version	Japanese version
Video more appropriate	25	8
More interesting	28	5
Rather like to join	26	7
Agents getting along better	26	7
Topics more appropriate	25	8

Although the number of subjects in our pilot study is very small, we have initial evidence that observers perceive a difference between culture-specific dialogs. The results of our validation study show that German subjects preferred dialogs that are in line with observations made for their own cultural background. We thus claim that integrating culture-related differences in Small Talk behavior of virtual agents can enhance the observer's perception of their dialogs. We therefore integrated our findings into a system architecture that automatically generates culture-specific Small Talk behavior for virtual agents. This system architecture is described in the following section.

7. System architecture

Regarding our validation study (see Section 6) we have initial evidence that culture-specific differences in Small Talk behavior performed by virtual agents do have an impact on human users. These effects motivate the integration of different topic selections and sequencing into a system that automatically generates Small Talk for virtual agents with culture as a parameter.

According to Rist et al. (2003), AI-based approaches, and plan-based approaches in particular, are becoming more and more popular to control the behavior of synthetic characters. Using a planner for behavior generation, a complex goal (e.g. getting acquainted with another agent) can be broken down into smaller subgoals and actions (greet the conversation partner, have casual Small Talk). Depending on character-specific attributes (personality, culture) actions could be performed in different ways, or the selection of actions to archive a goal could be varied.

To integrate our findings in culture-related differences in Small Talk into a behavior planning component, a planner needs to satisfy the following demands:

1. Topics for discussion need to be enhanced with an attribute (identifying them as private, social or immediate).
2. Selection of topics according to cultural background of interlocutors.
3. Sequence of discussing a topic can be reordered.

For the realization of our system we use the Simple Hierarchical Ordered Planner (JSHOP2), developed at the University of Maryland.

Fig. 5 presents an overview of our systems architecture. An instance of the planner generates a fixed dialog structure depending on the cultural background of the participating interlocutors. The dialog structure with abstract actions (e.g. question and answer) is passed to the core system, where the language is generated. Concrete actions (verbal and non-verbal) are triggered and sent to the application, which displays the behavior using a graphics engine developed at the University of Augsburg. The systems' components are described in further detail below.
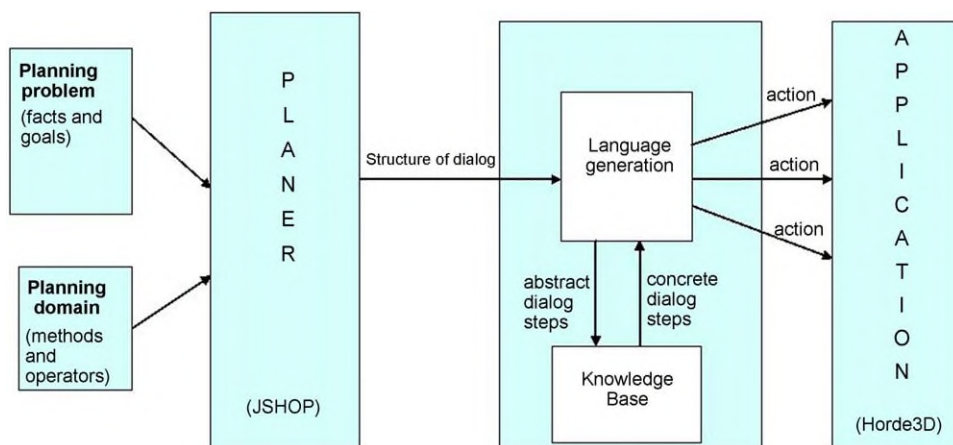

Fig. 5. General system architecture.

```
(defproblem problem SmallTalk
        (agent A) (agent B)
        (personality A introvert) (personality B extrovert)
        (culture A Japan) (culture B Japan)
        (interest A movies)

        (topic Beergarden-location immediate)
        (topic movies social)
        (topic living-situation private)

        ((conversation A B)))
```

Fig. 6. Example definition of agents and topics within the planning problem.

7.1. Behavior planning

As input, the planner expects a *p* lanning problem (state of the world and tasks to solve) and a *planning domain* (rules and actions for planning). Regarding dialog-generation for virtual agents, the planning problem defines the agents with their attributes, topics and an overall goal. An example can be seen in Fig. 6. Two agents (A and B) with their characteristics (such as personality or culture), predefined topics (with categorization as described in Section 3) as well as the overall goal (generating a conversation between A and B) are defined here.

The planning domain contains rules with information about the conversational style, as well as operators that represent the abstract dialog utterances (such as "greeting", "question", "answer"). Within the planning domain, rules were defined that integrate our findings in culture-specific Small Talk. Fig. 7 for example represents a strategy for agents with a Japanese background. The rule applies if the agent is interested in the given topic and it is neither private nor has been brought up by this agent before. As a consequence to that method, the interlocutor performs an answer but does not ask back about the same topic immediately, which would be the strategy for a German agent.

To integrate the first tendency (see Section 4) that was validated for the two cultures of Germany and Japan into a demonstrator, we used the typical Small Talk sequence described in Section 3 as a baseline for each topic. Following that idea, for each predefined topic the four utterances can be performed: (1) question, (2) answer, (3) reverse-question and (4) reverse-answer. As predicted in the literature and confirmed by our corpus analysis, it is more likely that members of Western culture will adhere to that sequence, while for Asian conversations it is more common to switch back and forth between different topics. Hence, in a Japanese conversation a topic might be dropped before the sequence is finished and resumed at a later point in time, while the sequence is strictly followed in a prototypical German dialog. In our system, the rules apply for each agent separately. Consequently, in a conversation with one German and one Japanese agent, the former will follow the prototypical sequence while the latter will give more freedom to the flow of the conversation.

The second tendency described in Section 4 suggests that less private topics occur in Asian Small Talk conversations. This was confirmed by our corpus analysis, which also revealed that there are fewer topics covering the immediate situation in German dialogs than in Japanese ones. To integrate this idea into the behavior planning component, topics were tagged according to the categorization described in Section 3: (1) immediate situation, (2) social sphere and (3) private sphere. Depending on the interlocutor's cultural background the planner will tend to choose social and private topics to be brought up by German agents, while topics covering the immediate situation or the social sphere are the most common ones for Japanese agents. In principal, every topic can be chosen for every agent, as it is possible to talk

```
(:method (SmallTalk ?A ?B)
...
   case_Japan
      ((agent ?A) (agent ?B) (interest ?A ?topic) (culture ?A Japan)
      (not(topic ?topic private)) (not(talkedabout ?topic)))

      ((!ask ?A ?topic) (!answer ?B ?topic) (SmallTalk ?x ?y))
...  )
```

Fig. 7. Example of a dialog rule within the planning domain.

Table 6
Example for a stereotypical German Small Talk dialog.

Agent	Action	Example utterance	Topic	Category
A	Greeting	"Hello!"		
B	Greeting	"Nice to meet you!"		
A	Question	"Do you live in this area?"	Living situation	Private
B	Answer	"Oh yes, I moved here because of my studies."	Living situation	Private
B	Reverse question	"How about you? Do you live nearby too?"	Living situation	Private
A	Answer	"No, I am here to visit my uncle."	Living situation	Private
B	Question	"Have you heard about that new alien movie on cinema?"	Movies	Social
A	Answer	"Yes I heard about it, but haven't seen it yet."	Movies	Social
A	Reverse question	"And you? Have you already seen it?"	Movies	Social
B	Answer	"I saw it yesterday. It was really scary."	Movies	Social

about every topic in each culture. But the threshold for introducing a topic unlikely for one's cultural background is increased and thus hardly ever reached.

As described in this section, the structure of the dialog is generated for the given agents regarding their cultural background. This dialog structure contains a sequence of abstract actions, such as "greeting", "question (topic)" or "answer (topic)". That interaction plan is sent to the behavior generator for further processing.

7.2. Behavior generation

The behavior generator connects the hierarchical planner with the multiagent application. In addition, it contains a knowledge base where verbal utterances for the abstract actions are stored as well as non-verbal behaviors. A core function of this component is to keep track of the dialog and handle the right timing. As we showed in (Endrass et al., 2009), timing is a crucial task in culture-specific communication. The usage of pauses in speech for example differs with cultural background. We showed that users who observe virtual agents showing culture-specific pause behavior perceive differences and judge behavior which is in line with their own cultural background as more appropriate.

7.3. Application

As we stated above, we use the Virtual Beergarden which represents a meeting place where virtual agents interact, to display our findings in culture-related Small Talk behavior (see Section 6). Actions (verbal and non-verbal) that are triggered by the behavior generation component are sent to the application, where they are displayed using body postures, gestures and natural language.

7.4. Example dialogs

In this chapter, we demonstrate two example dialogs that were generated by our system. In the current implementation, 2 topics are provided for each category including sentences that represent the utterances for our prototypical sequence. This amount of topics is sufficient to demonstrate the generation of prototypical culture-related differences in Small Talk. Additional topics can easily be added to create more variation in the dialogs.

In order to exemplify our findings in culture-specific differences in casual Small Talk conversations, we present one German and one Japanese dialog that was generated as described above. Table 6 serves as an example to highlight prototypical German behavior. In the example dialog, two topics are discussed, the living situation of the interlocutors and a movie that is currently showing. This choice of topics is prototypical for a German Small Talk conversation, as a private topic (living situation) and a social topic (movies) occur. In addition, the sequence of the dialog is related to a prototypical German style, as each topic is finished before the next topic is introduced.

In comparison, Table 7 presents a prototypical Japanese Small Talk conversation generated by our system. Just as in the German version, the dialog contains one social topic (a movie currently showing). But instead of raising a private topic, a topic covering the immediate situation is discussed (the beer garden location). The flow of conversation also differs from the German version. In the prototypical Japanese dialog, the first topic is not finished completely by its

Table 7
Example for a stereotypical Japanese Small Talk dialog.

Agent	Action	Example utterance	Topic	Category
A	Greeting	"Hello!"		
B	Greeting	"Nice to meet you!"		
A	Question	"Do you like this Beergarden?"	Beergarden location	Immediate situation
B	Answer	"Oh yes, I think this place is especially nice."	Beergarden location	Immediate situation
A	Question	"Have you heard about that alien movie on at the cinema?"	Movies	Social
B	Answer	"Yes I heard about it, but haven't seen it yet."	Movies	Social
B	Reverse question	"How about you? Do you like this location?"	Beergarden location	Immediate situation
A	Answer	"Oh yes, I come here very often."	Beergarden location	Immediate situation
B	Reverse question	"And that movie? Have you already seen it?"	Movies	Social
A	Answer	"I saw it yesterday. It was really scary."	Movies	Social

first occurrence, but is reintroduced after another topic showed up. In that vein, the beer garden location is discussed in the beginning of the conversation as well as after talking about the movie.

8. Conclusion and future work

Our objective was to build a multiagent system where the style of casual Small Talk is planned according to the cultural background of the interlocutors. Inspired by different definitions of culture and corresponding stereotypical behavior found in the literature, we summarized the following tendencies about culture-specific differences in Small Talk behavior distinguishing Asian and Western cultures:

- *Tendency 1*: Topics are discussed in a more sequential manner in Western Small Talk conversations than in Asian ones.
- *Tendency 2*: Less private topics occur in Asian Small Talk conversations than in Western ones.

Since these tendencies are rather broad and not concrete enough to build a computational model of stereotypical behavior, the CUBE-G video corpus recorded in the two cultures of Germany and Japan was analyzed. Both tendencies were confirmed by the empirical corpus study and a deeper insight into culture-related differences in Small Talk behavior was gained.

In order to verify if these findings are valid for Small Talk dialogs displayed by virtual agents and whether human subjects perceive a difference between the agent conversations, we performed a preliminary validation study. Scripted dialogs exemplifying our findings were rated by German subjects. Although the number of subjects is very limited, the analysis indicates that subjects prefer the choice of topics that is in line with observations made for their own cultural background.

Reflecting on the results from the empirical study (videos with human participants) and the validation study (videos with virtual agents judged by human observers), we built a system that automatically generates Small Talk behavior taking into account the cultural background of the interlocutors. To this end, we used a hierarchical ordered planner to generate a dialog structure and a multiagent application that displays the communication.

The work presented in this article is part of a larger research endeavor that aims at enculturating interactive systems acknowledging the fact that the user's cultural profile provides heuristics of behavior and interpretation that influence the interactions with human and artificial interlocutors. Small Talk as a specific kind of verbal behavior that is relevant for first or casual encounters is thus only one aspect of this endeavor but an important one as the first impression of an agent can determine the user's (un)willingness to continue the interaction. Other aspects include non-verbal behaviors such as gestural expressivity or emotional facial displays, cognitive abilities such as the appraisal of incoming data, or the appearance of the agent in terms of its skin color or dress. Research in this area is in its infancy and one of the current challenges is to determine the importance of the different influencing factors on the user–agent interaction and to integrate relevant factors into a single model.

The challenge arises from the ill-defined nature of the domain which makes it difficult to reliably specify the links between cultural profiles and individual behavior traits. The literature on cultures is often of a very general nature, stating

for example that Southern Europeans use gestures more frequently than Northern Europeans, but lacking information about contexts and situations in which this effect occurs. Thus, much more specific information is necessary to build a reliable model of cultural influence on behavior. In this article, we exemplified how a standardized observational study in specific contexts can shed light on these links and how a 'general' theory of culture like Hall's (1966) can be exploited in order to model the behavioral differences based on this empirical information.

As a next step, we plan to integrate culture-specific semantics of communication management behavior, such as giving feedback or using silence as a means of communication. Additionally, we aim to adapt the conversational style to the cultural background and thus use more question answer pairs in the Western dialogs than in the Asian ones in order to simulate another effect of the classification into low and high context cultures.

Taking into account other concepts of culture, we intend to integrate Hall's (1966) division into high- and low-contact cultures. This dichotomy provides information about the spatial behavior of different cultures. Thus, besides simulating *what* people talk about in Small Talk situations we can also demonstrate *how* they express their culture non-verbally.

So far we have tested the impact of different Small Talk styles on German users in our validation study. After having implemented a system that automatically generates culture-specific Small Talk dialogs, we are planning a larger evaluation study with both German and Japanese subjects.

In the longer term, we are aiming to develop a distributed system that plans Small Talk with culture as a parameter. Thus, agents will be able to react in a culture-specific manner dynamically. In the current version, the system architecture generates a fixed dialog. By distributing this approach, we will be able to integrate the users and allow our agents to react to the user-input in real time.

Acknowledgments

References

Aylett, R., Louchart, S., Dias, J., Paiva, A., Vala, M., 2005. FearNot! – an experiment in emergent narrative. In: Panayiotopoulos, T., et al. (Eds.), Intelligent Virtual Agents. Springer, pp. 305–316.

Aylett, R., Paiva, A., Vannini, N., Enz, S., André, E., Hall, L., 2009. But that was in another country: agents and intercultural empathy. In: Decker, Sichman, Sierra, Castelfranchi (Eds.), Proceedings of AAMAS 2009, Budapest, Hungary.

Bickmore, T., 2003. Relational agents: effecting change through human–computer relationships. PhD Thesis. Media Arts & Sciences, Massachusetts Institute of Technology.

Bickmore, T., Cassell, J., 1999. Small talk and conversational storytelling in embodied conversational interface agents. In: Proceedings of the 1999 AAAI Fall Symposium on Narrative Intelligence, pp. 87–92.

Brett, J.M., 2000. Culture and negotiation. International Journal of Psychology 35 (2), 97–104.

Cassell, J., Bickmore, T., Billinghurst, M., Campbell, L., Chang, K., Vilhjálmsson, H., Yan, H., 1999. Embodiment in conversational interfaces: REA. In: Proceedings of the CHI'99 Conference, Pittsburgh, pp. 520–527.

Core, M., Traum, D., Lane, H.C., Swartout, W., Gratch, J., Lent, M.V., Marsella, S., 2006. Teaching negotiation skills through practice and reflection with virtual humans. Simulation 82 (11), 685–701.

Dias, J., Paiva, A., 2005. Feeling and reasoning: a computational model. In: 12th Portuguese Conference on Artificial Intelligence, EPIA. Springer, pp. 127–140.

Endrass, B., Rehm, M., André, E., 2009. Culture specific communication management for virtual agents. In: Decker, Sichman, Sierra, Castelfranchi (Eds.), Proceedings of AAMAS 2009. Budapest, Hungary.

Gratch, J., Rickel, J., André, E., Badler, N., Cassell, J., Petajan, E., 2002. Creating interactive virtual humans: some assembly required. In: IEEE Intelligent Systems.

Hall, E.T., 1966. The Hidden Dimension. Doubleday.

Hofstede, G., 2001. Culture's Consequences – Comparing Values, Behaviours, Institutions, and Organizations Across Nations. Sage Publications.

Huang, H., Nishida, T., Cerekovic, A., Pandzicand, I.S., Nakano, Y., 2008. Toward a culture adaptive conversational agent with a modularized approach. In: IUI-Workshop on Enculturating Interfaces (ECI).

Iacobelli, F., Cassell, J., 2007. Ethnic identity and engagement in embodied conversational agents. In: Pelachaud, C., Martin, J.-C., André, E., Chollet, G., Karpouzis, K., Pelé, D. (Eds.), Intelligent Virtual Agents. Springer, pp. 57–63.

Isbister, K., Nakanishi, H., Ishida, T., Nass, C., 2000. Helper agent: designing an assistant for human–human interaction in a virtual meeting space. In: Proceeding of CHI'2000, pp. 57–64.

Jan, D., Herrera, D., Martinovski, B., Novick, D., Traum, D., 2007. A Computational Model of culture-specific conversational behavior. In: Pelachaud, C., et al. (Eds.), Intelligent Virtual Agents 2007. Springer, pp. 45–56.

Kang, S., Gratch, J., Wang, N., Watts, J., 2008. Agreeable people like agreeable virtual humans. In: Prendinger, H., Lester, J., Ishizuka, M. (Eds.), Intelligent Virtual Agents 2008. Springer, Tokyo, pp. 253–261.

Kellermann, K., Palomares, N.A., 2004. Topical profiling: emergent, co-occurring, and relationally defining topics in talk. Journal of Language and Social Psychology 23 (3), 308–337.

Reeves, B., Nass, C., 1996. The media equation – how people treat computers. In: Television and New Media Like Real People and Places. Cambridge University Press, Cambridge.

Rehm, M., André, E., Bee, N., Endrass, B., Wissner, M., Nakano, Y., Lipi, A., Nishida, T., Huang, H., 2009. Capturing culture specific behavior – standards for creating multimodal corpora across cultures. In: Kipp, M., Martin, J.C., Paggio, P., Heylen, D. (Eds.), Multimodal Corpora: From Models of Natural Interaction to Systems and Applications. Springer, Tokyo, pp. 138–159.

Rehm, M., André, E., Nakano, Y., Nishida, T., Bee, N., Endrass, B., Huan, H., Wissner, M., Mayer, I., Mastik, H., 2007. The CUBE-G Approach – Coaching Culture-specific Nonverbal Behavior by Virtual Agents. ISAGA.

Rehm, M., Bee, N., Endrass, B., Wissner, M., André, E., 2007. Too close for comfort? Adapting to the user's cultural background. In: 2nd International Workshop on Human-Centered Multimedia.

Rehm, M., Nakano, Y., André, E., Nishida, T., 2008. Culture-specific first meeting encounters between virtual agents. In: Intelligent Virtual Agents 2008.

Rist, T., André, E., Baldes, S., 2003. A flexible platform for building applications with life-like characters. In: Johnson, W.L., André, E., Domingue, J. (Eds.), International Conference on Intelligent User Interfaces. ACM Press, pp. 158–165.

Schneider, K.P., 1988. Small Talk: Analysing Phatic Discourse. Hitzeroth, Marburg.

Ting-Toomey, S., 1999. Communicating across cultures. The Guilford Press, New York.

University of Augsburg. http://mm-werkstatt.informatik.uni-augsburg.de/projects/gameengine/.

University of Maryland. http://www.cs.umd.edu/projects/shop/index.