

# The Need for Culturally Adaptive Agent Behavior

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## Abstract

An important factor which must be considered in designing knowledge strategies or knowledge representation schemes for modeling initiative is that agents are being developed by people whom are part of different cultures whom have different conceptions of approaches to negotiation and what the rules of the game for negotiation are. Specifically, how control or changes in initiative are manifested in the interaction; how taking initiative affects how agents will interpret another agent's actions; and how they choose an appropriate response, are in part, culturally defined. Agent developers ought to equip their agents with subroutines based on cultural models of negotiating behaviors which will provide them with negotiating strategies to draw upon in order to assist them in successfully communicating and collaborating with other agents to achieve desired outcomes.

## Cross Cultural Differences in Negotiating Styles

Cross-cultural differences in communication styles have been explored extensively in the linguistics and cultural anthropology literature at large, and in particular, in the anthropological linguistics and sociolinguistics literature. In addition, there is a mainstream appreciation of the fact that negotiating strategies vary depending on the culture. One only has to look on any bookstore shelf to find handbooks and computer programs on how to get a leg-up when negotiating with people from different cultures, such as Gercik's CD-ROM lessons designed to teach one to effectively negotiate with the Japanese (Gercik 1996).

I would like to illustrate how cross cultural and individual differences come into play in collaborations by way of discussing examples of cultural differences in negotiating strategies based on my own experience negotiating with the Japanese in establishing joint agreements and coordinating with them on projects.

A question which this working group has been tasked with addressing is how a system is to recognize "when to lead or otherwise take control of an interaction and when to

let others take the initiative." In human interactions, generally, when people come together to work on projects, one person makes the first move, thereby imposing his or her particular approach to solving a problem on the interaction. The agent whom is in the response mode, therefore, has essentially two ways of responding to the agent's first move: 1) s/he can either respond in the manner that the lead agent expects him/her to or 2) change the framework of the interaction.

Let me illustrate this with an example. In all the instances that I, an American, have worked with the Japanese, when my Japanese counterpart makes the first move in an interaction, I at times, respond in the way that s/he intends me to or at other times, make the move to change the nature of the interaction. My response will vary, depending upon which best suits my needs at a particular time. For instance, I was working on a joint project organizing a conference with my Japanese counterpart and another American party. My Japanese counterpart began by sending me emails of whole lists of questions, some of which I thought were only appropriate to act upon once the Memorandum of Understanding (MOU) had been put in place between us. I responded by answering some of her questions and told her that since we were still working on the MOU, we needed to get that done first before we proceeded onto addressing her other concerns.

This type of response is perfectly acceptable when working with the Japanese. Japanese workers are given lists of tasks by their superiors and they do not expect that they will all get done. Indeed, in this particular interaction, I could have gotten away with only answering the questions that I felt should be answered before the signing of the MOU without acknowledging her other questions and mentioning that I would attend to them later. If I had simply done that, then I would have been responding in the manner that my counterpart expected me to. It would have been typical of a Japanese response to things: just answer some of the things and disregard the things you cannot/do not want to respond to. However, in the interest of time and efficiency, I felt that I had to steer the interaction in such a way so as to focus us both in on setting priorities for when tasks would be done.

While such work is limited to studies of specific individuals interacting in specific situational contexts, and the statements about male and female communication styles are generalized, the generalizations deserve to be examined further. In other words, though it is not true that all American females and males fit the Tannen model, sufficient enough generalizations about what characterizes American male and female speech behaviors in specific situational contexts may be drawn which would be useful to capture in the design of a default mechanism in a sub module for recognizing and responding to gender differences in communication styles.

## Culturally Adaptive Agents

The differences in approaches to the design of frameworks for interaction and negotiation may well be reflective of individual differences, and less to cultural and gender differences. Kuniyoshi's approach to agent behavior modeling in cooperative tasks could be more a matter of his own approach to cooperative behaviors than it is a reflection of his "Japaneseness." Nevertheless, no matter what these differences may be attributed to, it must be recognized that there are differences. It is necessary for an agent which will be interacting with other agents in heterogeneous environments to be attentive to cultural, gender, and individual differences, since a knowledge of such differences can provide insight into understanding how to respond to cooperative behaviors and requests for cooperative behaviors by other agents. Such knowledge holds predictive power.

Frost has developed two Java agents which work cooperatively to process a message (Frost 1996). The series of steps taken by the agents to accomplish the task reveals a particular mode of interaction which the agents follow. The steps are as follows:

1. First, when Agent 1 attempts to send the first message, it will realize that it does not have the address for Agent 2 so it will block the message transmission and send a message to the ANS asking for the address of Agent 2.
2. The ANS will get the ask-resource message from Agent 1 and will send back the address of Agent 2.
3. After getting the address for Agent 2, Agent 1 will go ahead and send the test message to Agent 2.
4. Agent 2 will receive the test message and realize that it does not have the test interpreter and is therefore unable to interpret the message. Agent 2 will therefore block interpretation of the message and attempt to send a message to Agent 1 requesting the location of the TestInterpreter code. However, Agent 2 does not have the address for Agent 1 so it will have to block the message to Agent 1 and first send a message to the ANS requesting Agent 1's address.

5. The ANS will receive Agent 2's request and will respond with the address for Agent 1.

6. Agent 2 will receive Agent 1's address and will proceed to send a message to Agent 1 requesting the location of the TestInterpreter.

7. Agent 1 will get the ask-resource message from Agent 2 and will reply with the location for the TestInterpreter (both url and absolute class name).

8. Agent 2, after getting the location of the TestInterpreter, will load the code, create a new instance of the TestInterpreter class and finally interpret the first message it received from Agent 1 (the KQMLmessage object will be passed as an argument to the interpretMessage() method of the TestInterpreter object).

9. The TestInterpreter will identify the language for the content field as KQML and will thus parse the content field according to the KQML syntax (KQML message within a KQML message).

10. Because the performative of the content is "test2" the test2Action() method will be called. This method checks to see if the current agent has a GUI and, if it does, passes an subclass of Panel up to the GUI. This is the panel which gets displayed.

Characteristic of this mode of interaction is that the agents ask each other for information and the other responds. This is like the mode of interaction I described in my example of working with my Japanese counterpart. My colleague had set the terms of negotiation by asking me a series of questions and expecting me to respond. This is fine if the two parties agree on this mode of interchange at the outset, and in the case of agents, it is fine if they are programmed to respond in this manner. Frost's agents are designed to cooperate in this way. However, agents developed by different people meeting to cooperate together, will be approaching the game of negotiation and interaction differently. Some agents will not be programmed to merely respond to any request that is given, for instance.

Optimal coordinated behavior among agents will occur if all agents are equipped with an ability to reason about their problem-solving plans, the status of their beliefs and a knowledge of the implications of their actions on other agents' beliefs (Lesser 1990). A dimension of an agent's problem-solving capability ought to be an ability to detect differences in the coordinating behaviors of agents and be able to respond to them appropriately and make modifications to their own behaviors if necessary. Another method of resolving this issue is by having agents, when they come together, decide on what form the interaction should take.

Otherwise, it was a waste of her time to think of things for me to do way in advance of when they should be done and worry about it, as well as a waste of my time to have to read messages about these things, even if I chose to ignore those items which were not priority items. I did not want to set the agenda and invite speakers (something that she wanted us to do) before we had an agreement in place. In this case, I chose to take the initiative in order to reset the framework for task accomplishment. I find that I have to do this very often in my work with the Japanese. Of course, when I attempt to reset the framework of interaction, I have to steer the interaction politely, so as to not be offensive. It is necessary to say things in Japanese to accomplish what you want without being direct. Examples are, "I think that we should do X" instead of " We will do X"; and "Don't you think it would be better to do Y?" as opposed to "We will not do X, we will do Y." These are ways of saying things that I use when I communicate with the Japanese, either in Japanese or in English, which have met with much success, especially in negotiating the language of agreements. To reset the framework, I have to employ culturally adaptive behaviors.

### Cultural Influences in the Design of Agents

Developers are finding it difficult to resist designing agents that mirror their own ideas about the nature of negotiation and negotiating techniques. Evidence of this is already being witnessed in the research and development directions being taken by the Japanese. In a benchmarking study on human-computer interaction technologies in Japan, the study team reports:

The fundamental idea behind the work we observed is to make computers behave as humans would, obeying social rules and communicating with emotional feedback (Holdridge 45:1996).

The panel cites the research being carried out at Sony Computer Science Laboratory, Inc., which is focused on how facial expressions, voice tones and gestures communicate human feelings to illustrate efforts towards the goal of introducing emotion into human-computer interactions. In the area of agent-human communications, we can already see how such research is being leveraged. A team at the Image and Media Laboratories at Sharp Corporation studied Japanese subjects engaged in conversation in order to characterize nodding behaviors and gaze direction (Sakamoto 1997). These characteristics were translated into the design of an agent which gauges the nodding and gazing behaviors of the human it is interacting with and responds appropriately with its own nodding and gazing. In an experiment, an agent was built for the purposes of helping the user select a television station; this type of interaction can be considered a form of negotiation. Subjects used the system with the response model turned on and turned off. A survey taken to assess

user preferences revealed that they preferred the response feature.

Note that the agent's nods and gazes were built to be reflective of Japanese communication styles. The set of nods and gazes use in an agent designed to be used with people from other cultures might vary in terms of the amount, duration, and timing of these behaviors. An interesting example of how body language is interpreted by different cultures is the labeling of facial expressions in a slices of video footage being catalogued by Japan's ATR Human Information Processing Research Laboratories. Figure 1 shows clips of two women; one labeled as "gentle" and the other as "fierce" by the Japanese research team (Holdridge 1996).



Fig. 1. "Gentle" and "Fierce" (ATR).

In an informal survey I conducted in which I asked individuals (four American and one Canadian), what kind of feeling they got from these photos, not one of my informants characterized either of these women's expressions as "gentle" or "fierce." Two men commented that they thought that the woman on the right was the more attractive of the two.

Japanese cultural influences also seem to be at play in Kuniyoshi's work in modeling multi-agent cooperative behaviors (Kuniyoshi 1996). Kuniyoshi's agents look out for each other in cooperating to achieve a goal. Agents check to make sure that nothing is blocking the others' paths, and if something is, one of the other agents will remove whatever is blocking the path. This cooperative model is reflective of Japanese culture, in which making sure that members of one's group are taken care of is a strong cultural imperative.

Compounding the issue of cultural differences in communication styles is the fact that there also exists gender differences in communication styles. This is another area that should be explored and explicated in order to develop subroutines similar to the ones which account for cultural behaviors. Remember that our agent designers are male and female. Gender differences in communication styles are being explored by sociolinguists. Tannen's studies of differences in male-female communication styles, particularly those that are exhibited in the workplace, are useful to examine (Tannen 1994). Others have built upon Tannen's work and explored gender differences in communication styles across cultures.

One of my agents meeting Kuniyoshi's agents may not like it if Kuniyoshi's agent will automatically remove things that are blocking its path. The reason for this would be that my agent may believe that such behavior will not serve in the long-run to help them achieve their goal. When I work cooperatively with the Japanese, I take control of an interaction and try to change its shape and direction when I see that the way that someone else is controlling the interaction will not lead us to our mutually agreed upon goal. Likewise, I let others take the initiative when I feel that what they are doing will lead us to that goal. The principle, therefore, to derive from this is that in the modeling of agent behavior, the agent must always keep in mind what the goal is. Therefore, the agents could pre-empt the possibility of one agent setting the framework of the interaction by deciding mutually when they first come together, what the individual tasks ought to be which comprise the overall task as well as the order that they will be worked upon. This is the position advocated by Decker, whom is developing agents that achieve a consensus on shared goals (Decker 1994).

In addition, flexibility should be built into the system for dynamic resetting of the framework of the interaction and the individual tasks comprising the overall job. As agents are engaged in the process of work, one may learn of a better way to meet the goal. Also, there will still be some agents sometime that will not do what they are supposed to be doing; therefore, each agent should always have in mind what the goal is; monitor other agents' behavior and determine whether the others are working towards that goal. In the instances in which the agent thinks that one or more of the others is doing things that will not help the team achieve desired outcomes, or present its ideas about a new idea for task accomplishment, the agent must be able to take the initiative. In the case of a "rogue agent," the system must allow other agents to ascertain whether, indeed, a particular agent is not working towards the goal, and if so, the group must be able to steer it away from those kinds of activities towards those that will be beneficial in helping to achieve the goal. When any agent tries to take the initiative, it must do so in a way that takes into account the cultural background of the other agents.

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