Building a New Internet Chat System for Sharing Timing Information

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Abstract

Chat system has gained popularity as a tool for real-time conversation. However, standard chat systems have problems due to lack of timing information. To tackle this problem, we have built a system which has the following functions: 1) function of making typing state visible; 2) floor holding function at the start of typing. The evaluation results show that the sys-tem with each new function significantly increases the number of turns, which indicates the effectiveness of the new functions for smooth communication. The survey results showed that the system with the function of making typing state visible significantly different from that without them concerning 1) easiness of adjusting the timing of utterances and smoothness of conversations, and 2) easiness of using the system.

1 Introduction

Use of computer communication tools is now indispensable to our everyday life because of the proliferation of computer network. These communication tools include E-mail, BBS (Bulletin Board System) and chat systems. Among all, chat system users have been increasing dramatically for its real time nature. Despite of its popularity, standard chat systems do not allow users to share timing information, which is thought to be necessary for smooth communication. This often makes chat conversations confusing such as ones with a lot of repetitions and corrections.

To tackle the problem of lack of timing information, we have implemented a system which has the following functions: 1) function of making typing state visible; 2) floor holding function at the start of typing.

To evaluate the effectiveness of the system, the length of utterance and the number of utterances are used as quantitative index for smooth communication. We also conducted questionnaire surveys of users' evaluation of the system from effective-ness of the new functions to easiness of using the system.

The rest of the paper is organized as follows. Section two explains the problems of standard chat systems and related studies to tackle them. Section three describes our implemented new system with explanatory examples. Section four shows the effectiveness of our new system by quantitative evaluation results. Section five concludes with some final remarks and our further attempt to improve the system.

2 Previous Work

2.1 Problems of standard chat systems

In chat conversations, even if no message appears on the screen, this does not mean other users are typing a message. Other users might be reading or waiting for the others' message or be leaving the computer. This is due to the mechanism of standard chat systems. In standard chat systems, a user sends a message by pressing the return key. This means that what users know is only complete utterances, without the information on how the utterances are made: In face-to-face conversation, the participants sometimes signal the difficulty of making utterances by inserting fillers and pauses, but in chat conversation, the participants cannot send such kind of information. The lack of this process information has been known to cause phenomena similar to overlap in face-to-face conversation and interruption [1,2]. Figure 1 shows an example of this overlap-like phenomenon.

1:A>I'm going to visit a company tomorrow.
2:B>You are going to Osaka, aren't you?
3:A>So, how is the Job interview of T Company going?
4:A>Yes, I'm going to Osaka.
5:B>I have to submit data. So …

Figure 1: Example of overlap-like phenomena

In Figure 1, Speaker A talked about the visit to some company (utterance 1) and speaker B checked where A would go in response to utterance 1. At almost the same time of B's response, A sent his message about the job interview (utterance 3), which made adjacent turns semantically irrelevant. This overlap-like phenomenon can be escaped if at least A knows B is typing a response to A.

2.2 Communicating the information on how the utterances are made

MSN messenger [3] shows whether the participants are typing at the bottom of the system window. Tangible Chat [5] communicates the state of the other user's typing using vibration of the cushions. When a user starts to type, the other user's chair cushion vibrates, which enables users to share typing information without distracting their attention to the messages. In UNIX talk program (a little old chat system), users can send a message character by character, which allows them to know what the others are doing.

Alternative Interfaces for Chat realized two proto-type systems; Status Client for sharing status information; Flow Client for sharing time sequence information [4]. Status client implemented the following functions for sharing user's status information.

- When a user presses a key, his or her name in the participants list is highlighted.
- A user's last utterance appears next to his or her name in the participants list.
- When a user starts to write a message, it appears in gray color next to his or her name in the participants list.

Flow Client improved the following floor holding function so that slow typists can easily join conversation.

- A user has own track on screen
- Visualization of participants' character and timing information
- Auto scrolling of the message history

2.3 The design concept of our new system

- *User interface*

Many people have already used the current chat systems and got accustomed to the interface of the current system. This observation was confirmed in the evaluation of Status Clients and Flow clients [4]. Thus, we decided to make the interface of our new system similar to that of the current system.

- *The information the proposed system communicates*

Our preliminary experiments confirmed that the information about whether the other participants are writing does not improve easiness of using the system. Based on this result, we decided to examine two approaches: one is to increase the information to be communicated. That is, as in the UNIX talk program, the system communicates what the participants write in real time; The other is to focus on the floor holding function. In face-to-face conversation, the information on how the utterances are made is used for taking or holding the floor. Thus if the chat system users can take or hold the floor easily, this might contribute to improving easiness of using the system.

With respect to the function of the floor holding, the former function might subsume the latter. However, this does not mean both functions are the same. Some users do not want to show the process of utterance making and even think it distracts their attention. If this is true, and the system can support the floor holding function effectively, then system does not have to communicate what the participants writes character by character, which will be examined in Section four.

3 The Implemented New Chat System

We implemented a new system in which users can share the process information. An example of the system display is shown in Figure 2 and 3. A user sends messages and read conversation history in the main window (Figure 2), and recognizes the typing state of other users in the sub window (Figure 3).

3.1 Function of making the typing state visible

The new system can show the typing state of other users for all the time. When a user connects to the system, his or her nicknames appear in the sub window. Figure 3 shows the display where 'miho' and 'yo' connected to the system and 'miho' sent a message "石川 (Ishikawa)". Each time a user starts to write a message, a new text appears next to his or her name in the sub window.

3.2 Floor holding function at the start of typing

In face-to-face conversation, people monitor each other's behavior, which helps them take turns smoothly. But in the standard chat systems, a user cannot know each other's states, since s/he see only complete utterances without the information on how the utterances are made. A user sometimes misses his or her turn because of this. The first user is writing a message in response to the second's, while the second user sends another message which is accepted by the system before the first user's response. To deal with this problem, the new system implemented a floor holding function at the start of writing a message.
When a user starts to write a message, the system holds the place or turn in advance for the user, displaying [--- start to write a message ---] in the main window. Thus, utterances are displayed in the order of the time when a user starts to type. Users can send their messages without considering their typing speed.

The system also allows users to stop sending a message in the middle. In this case, the system holds a line with the message [stop writing a message without sending] in gray color in the main window. This function is for showing the status or the activity of a user even when s/he does not send a message.

Figure2: Main window of the system

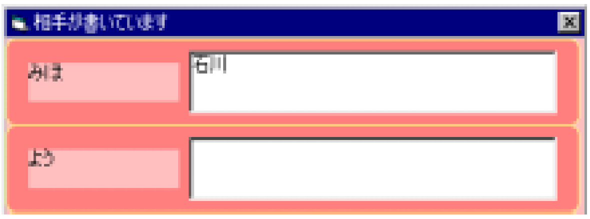

Figure3: Sub window of the system

1:たけ＞こんにちは
take *hello*

2:みほ＞こんにちは
miho *hello*

3:よう＞こんにちは＞ALL
yo *hello* *ALL*

4:たけ＞今日は寒いですねー
take *it is cold today, isn't it?*

5:みほ＞□□□途中で止めました□□□
miho *[stop writing a message]*

6:ようそうですねー
yo Yeah

7:みほ＞みなさん出身はどこですか？
miho Where are you all come from ?

8:たけ＞･･･書き始めました･･･
take [--- start writing a message ---]

9:よう＞石川です
yo I'm from Ishikawa

10: みほ＞･･･書き始めました･･･
miho [--- start writing a message ---]

11: よう＞･･･書き始めました･･･
yo [--- start writing a message ---]

Figure 4: English translation of the chat dialogue in the main window (Figure 2)

4 Evaluation of the System

4.1 Experimental Design

Four experimental systems were built to evaluate the effectiveness of the system (Table 1)

System	Function	
	Typing state	Floor holding
system1	invisible	at the end of typing
system2	visible	at the end of typing
system3	invisible	at the start of typing
system4	visible	at the start of typing

Table1: Experimental systems

In the experiments, eight groups, each of which consists of three subjects, engage in chat conversation. All subjects are computer users at the inter-mediate level or higher: they have experiences of using chat systems and no problems of typing. The task of the experiments is just to chat with each other about any topics for twenty minutes.

4.2 Chat logs

The average and the standard deviation of the number and the length of turns are shown in Table 3 and 4, respectively.

Ave.(SD)	B1	B2
A1	16.83 (6.32)	25.33 (10.01)
A2	24.42 (10.4)	22.00 (8.61)

Table 2: Average number of the turns and its SD

Ave. (SD)	B1	B2
A1	17.82 (5.97)	16.48 (4.71)
A2	17.70 (6.04)	17.98 (4.09)

Table 3: Average length of the turns and its SD

We examined the effects of the functions by applying two-way ANOVA to the number and the length of turns. Factors and levels are summarized in Table 4.

	Level 1	Level 2
Factor A：(typing state)	visible (A1)	invisible (A2)
Factor B：(floor holding)	at the end of typing (B1)	at the start of typing (B2)

Table 4: Factor and Level for ANOVA

Table 5 and 6 shows that main effects concerning both the number and the length of turns are not significant. But interaction effects concerning the number of turns are significant. The detailed analysis of the interaction effects showed that the system with each new function significantly increases the number of turns.

The previous work suggested two hypotheses about the number and the length of turns [4][5].

(1) If users share the process information, this will prompt smoothness of communication which results in the increase of the number of turns.

(2) If users use the function of floor holding at the start of writing a message, they will be able to write what they really want without considering time pressure. This makes the length of turns longer than that without using the function.

Adopting these assumptions, the results here might indicate the effectiveness of the new functions for smooth communication. The number of turns didn't increase when participants used the system with both functions. These functions are displayed on different windows and might distract user's attention.

However, these assumptions can be said to be rather naïve, since the number and the length of turns can be affected by many other factors like the familiarity between the participants and kinds of topics the participants happen to choose. Still we do not have good evaluation criteria for the functions of chat systems in general and thus the interpretation of our data against these assumptions should be used as corroboration to show the effectiveness of our system, but apparently not enough to prove it. Therefore, we conducted questionnaire survey to examine the usability of the system.

	SS	d.f.	MS	F
Factor A	54.19	1	54.19	0.62
Level B1	345.04	1	345.04.	3.92*
Level B2	66.67	1	66.67	0.76
Factor B	111.02	1	111.02	1.26
Level A1	433.05	1	433.05	4.93**
Level A2	35.04	1	35.04	0.40
Interaction	357.52	1	357.52	4.07**
Error	87.95	44	1.99	
Total		47		

(*: level of significance 10% **: 5%)

Table 5: ANOVA for the number of turns

	SS	d.f.	MS	F
Factor A	5.70	1	5.70	0.19
Factor B	3.38	1	3.38	0.11
Interaction	7.48	1	7.84	0.26
Error	1332.47	44	30.28	1.00
Total		47		

Table 6: ANOVA for the length of turns

4.3 Questionnaire survey

	Item 1	Item 2	Item 3
System 1	2.58	2.67	3.50
System 2	1.92	3.67	3.75
System 3	2.17	3.00	3.00
System 4	1.58	3.92	4.00

Item 1: smoothness of conversation
Item 2: Easiness of adjusting the timing of making utterances
Item 3: Easiness of using the system

Table 7: Evaluation results of questionnaire survey

Experimental subjects were asked to answer the questions such as effectiveness of the new functions and the easiness of using the system on five-point scale. Table 7 shows the part of the results.

The results showed that the system with the function of making typing state visible (factor A) gains significantly higher score than that without them concerning the smoothness of conversations, the easiness of adjusting the timing of utterances and the easiness of using the system (Table 8,9 and 10). This suggests that the function of making typing state visible is effective in chat systems.

	SS	d.f.	MS	F
Factor A	4.69	1	4.69	3.90*
Factor B	1.69	1	1.69	1.41
Interaction	0.02	1	0.02	0.02
Error	1.20	44	0.03	
Total		47		

(*: level of significance 10%)

Table 8: " The smoothness of conversations”

	SS	d.f.	MS	F
Factor A	11.02	1	11.02	8.38**
Factor B	1.02	1	1.02	0.78
Interaction	0.02	1	0.02	0.02
Error	1.32	44	0.03	
Total		47		

(**: level of significance 5%)

Table 9: " Easiness of adjusting the timing of utterances "

	SS	d.f.	MS	F
Factor A	4.69	1	4.69	5.83**
Factor B	0.19	1	0.19	0.23
Interaction	1.69	1	1.69	2.09
Error	0.81	44	0.02	
Total		47		

(**:level of significance 5%)

Table 10: " The easiness of using the system "

4.4 The number of overlap-like phenomena

The new system enables users to share the process information. Theoretically this should decrease overlap-like phenomena observed in conversations using the standard chat systems.

Figure 5 shows the ratio of the overlap-like phenomena. It is difficult to find overlap-like phenomena from chat logs. Here we counted the number of the places which satisfies the following conditions: one is that the interval of utterances should be short (three seconds here); The other is that the topic threads should be parallel. We used an algorithm proposed in [6] to extract topic threads.

There are no great differences for all the systems and the ratio of system 4 is the lowest. The combination of functions might raise awareness for others' behavior, but the combination effects should be examined more thoroughly as future work

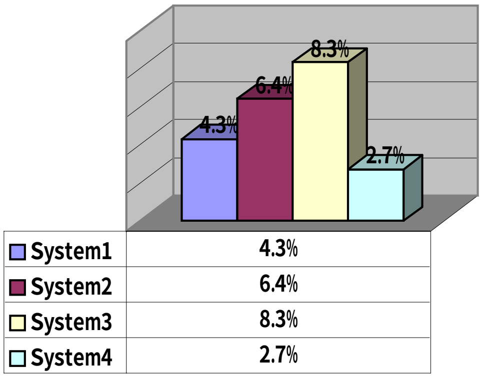

Figure5: The ratio of overlap-like phenomena

4.5 Semantically irrelevant turns in adjacent positions

Table 11 shows examples of sequence change of turns. In the normal sequence of turns example, speaker A was able to respond to speaker B’s utterance 40, while in the sequence change of the turns example, speaker B’s utterance 42 wrongly preceded A’s response 41 to B’s utterance 40, which makes adjacent utterances 40 and 41 disrupted.

[Sequence change of turns]

Uttr.No.		
40	B	Smother the sliced meat and the flour separately
41	B	So it's difficult to cook it by myself
42	A	Ah I'm getting hungry somehow

[Normal sequence of turns]

Uttr.No.		
40	B	Smother the sliced meat and the flour separately
42	A	Ah I'm getting hungry somehow
41	B	So it's difficult to cook it by myself

Table 11: Examples of sequence change of turns

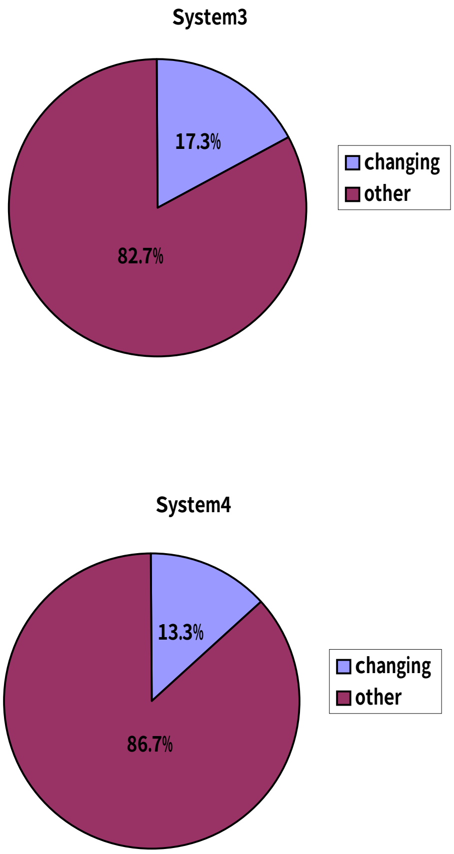

Figure 7: The ratio of changing sequence of turns for system 3 and 4

The number of sequence change of turns is expected to decrease when the system has the floor holding function. Based on the method proposed in [6], these turns were examined and their ratio was calculated shown in Figure 7. The results indicated that there are no great differences for both systems (changing sequence of turns existed at least 10% in both systems). The ratio of system 4 is a little lower than that of system 3. This might be able to be interpreted that visibility of typing information can be one of the factors to decrease sequence of change of turns, but this need s to be examined in future work.

5 Conclusion and Further Study

We built a new system for sharing the process information. The system has the following functions: 1) function of making typing state visible; 2) floor holding function at the start of typing. The evaluation results showed that the system with each function significantly increases the number of turns, which might indicate the effectiveness of the new functions for smooth communication. The survey results showed that the system with the function of making typing state visible gained significantly higher score than the system without it concerning easiness of adjusting the timing of making utterances, smoothness of conversations, and easiness of using the system.

This system was confirmed to be effective to the problems caused by the lack of time information, but did not solve it completely. We tried another approach to solve one of the problems, semantically irrelevant turns in adjacent position. We implemented a function by which users explicitly specify a semantically relevant turn with its number and those relevant turns are displayed in the same color (Figure 8). We conducted questionnaire survey to verify the effectiveness of this function, but the results confirmed the usefulness of this function, but also the need for the improvement of the interface design.

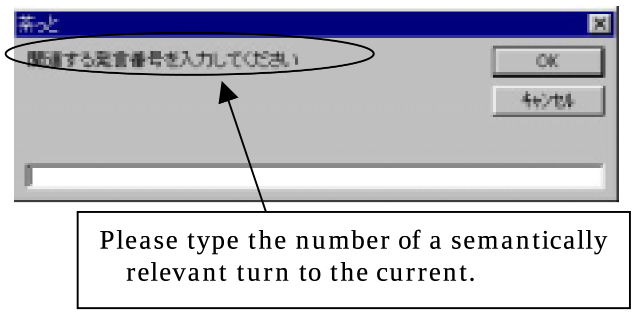

Figure 8: Example of the Dialog Box for a new function

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