

Toward Multimodal Cue Suited to Personal Situation in Live Sphere

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The purpose of this research discusses how I have a user notice the information which exists in ubiquitous space. Therefore, in this paper, it was made to notice, the requirements for a way were arranged, and how to make it noticing using multimodal of media, such as a loudspeaker and a robot, was considered from the experiment in the space imitating a house and a store to information. This paper reports the fruits of work.

Keyword interaction task multimodal cue

1. Introduction

In recent years, diffusion of internet was overflowed information. It is difficult for a consumer to choice the information that I want and various problems happen. For example, in shopping, we lose a purchasing opportunity without noticing the existence of a suitable article though there is the article which is suitable for oneself in the shop because there is much information such as an article or the poster. In addition, as a result of cannot choose what kind of topic I should talk about between families because the people bathe in information of enormous quantity, it is it in lack of communication.

Therefore this study unveils we solved such a problem, and anyone enjoyed shopping comfortably and one consumer was alone and tried construction of the ubiquitous space that showed suitable information for the purpose of it being possible for natural communication. Therefore I suggest most suitable multimodal who can put it to remind the information presentation in the various situation of it in this study in ubiquitous environment I use the information presentation that is multimodal stimulating sight and the hearing of the person, and to notice it.

2. A matter with cue

2.1 Considered the situation in how to cue

It is necessary to consider the situation in how to cue. Because the reason is because it is thought that how to cue changes "what" you reminded me of "how" "when" "where".

This study unveils, in consideration of the following situation, in the ubiquitous space suggest multimodal to be able to employ

to cue it.

- What do you remind me of?
- Where do you remind me of it?
- How do you remind me of it?

2.2 What do you remind me of

Say in this study unveils, "cue" it thinks about three ways of the following.

- (1) I remind a user of it for a change of the media such as article displays
- (2) A user notices it for the intention that the information adducer side showed in information contents. (I understand)
- (3) I remind the value of contents to show information of it

(1)It is to cue a change in the media to "appear what it is" in the contents such as displays showing a certain information in ubiquitous environment.(2) I show that a user understands intention of the adducer side "whom the information of trendy clothes of this year appears".(3) "Preference of these clothes me", contents are to remind value to be useful of it. I think about (1) and how to cue about the (2) in this study unveils.

2.3 Where do you remind me of it

In this study unveils I pay attention to house space and the store space and think about how to cue how a multimodal on the ubiquitous space is dull. The reason is because it thought that it can apply the reason that paid attention to these two space in most space of the everyday life by studying this how to notice in these two space. Because it was thought that there was difference in the store space between private space, the public space and this house space each, I gathered it up on the following lists about the difference.

Item	House (private space)	Store (public space)
Privacy	It is necessary to take into consideration.	You have to protect.
Is the purpose in the place?	There is nothing.	It is (shopping).
Number	One person	From several persons to a large number
Does lighting have restriction?	There is almost nothing.	It is.
Are there any restrictions to sound?	There is nothing.	It is.
Does use of contents have restriction?	There is nothing.	There is restriction.

Table 1 A difference of house space and the store space

When I consider an item of table 1 at the point of view of how to cue, You must take how to cue in consideration of there being limitation in the store space. On the other hand, it is thought that it is possible for how to cue that was correct in freedom and taste with a personal individual because there is not limitation in the house space. It is thought that it is necessary to take how to cue by different methods from the above in house space and the store space.

2.4 How do you remind me of it?

This study unveils, As Media of how to notice, I experimented on how to cue by multimodal in a trial, house space and store space with a display, a projector, a speaker, the media of the communication robot. I show that I remind a user of it for a change in the media with how to cue to say here. In addition, in consideration of consideration of table 1, I change multimodal in house space and store space and test it, I suggest most suitable multimodal whom there was in each space from an experiment result.

3. A method with the cue in the public space

3.1 A multimodal experiment in the store space

A purpose of the experiments in this chapter is to examine if I use which media so that the (1) that I spoke with 2.2 in shop space can remind you of it whether you are most suitable. In addition, I assume clothes shop as a concrete example of the shop space in this study and test it. The consumer touches it with an article (clothes) in the clothes shop, and, for a hand, there is the case that I confirm whether I use the mirror nearby and become me, and is blocked both hands. Therefore the thing which I could remind information of in the state that the both hands of the user were full thought that it might be necessary and used a display, a speaker, a communication robot (PaPeRo) as the media to be able to remind you of in the shop space. If there is even space to be able to put it, the display can show the various information such as the fashion of this year or the marketable goods of the shop. However, there is a thing overlooking it without noticing information in the (shopping) during the task. Therefore I thought that I might remind information of it in this study by putting a speaker, a communication robot together to a display each. If the speaker stimulates the hearing of the user, and stimulation reaches the edge of the user of a task, it is thought that I can notice it. In addition, I thought that there might be an effect in even the thing which stimulated hearing than the speaker without the presence because substance / presence used the communication robot which there was like a person and used it for an experiment. I show a multimodal experiment method / result in the shop space as follows.

3.2 The method of the multimodal experiment in the store space

I have a subject do shopping in imitation store space. The shopping is on the way, and, on a monitor according to a thing of a shelf put clothes, the image (figure 2) of different clothes is displayed in total three times each. It is 30 seconds till it is displayed next after it was displayed in three seconds in indication time.

Fig. 1 Experiment scenery

Fig. 2 Displayed picture



Since dress was influenced of taste, in this experiment, it divided into two states in the case of dress needed and the dress which he does not want, and experimented by dividing into the dress of a shelf, and a total of four displayed states of two states of a picture further.

- ① The state that the clothes which a subject wants are put on the shelf, and the image of clothes wanting is displayed by a display
- ② The state that the clothes which a subject does not want are put on the shelf, and the image of the clothes which I do not want is displayed by a display
- ③ The state that the clothes which a subject does not want are put on the shelf, and the image of clothes wanting is displayed by a display
- ④ The state that the clothes which a subject wants are put on the shelf, and the image of the clothes which I do not want is displayed by a display

The judgment of the (I do not want it) that the subject wanted showed the image of all the clothes to use for a subject by an experiment before an experiment and carried out a questionnaire whether or not I wanted it. In addition, I used 3 of the following as Media to remind of that the image of clothes was displayed by a subject doing shopping.

- i : Only the image of clothes is displayed with a monitor by a display. (The sound does not sound on this occasion)
- ii : It is with the sound effects of the speaker and displays it.
- III : It is with the utterance (the voice that recorded the voice of the announcer beforehand) of the communication robot and displays it.

It was the same shelf, but the placement of each media arranged the media at the position that was in the field of vision of the subject in another step (the upper section) like (figure 1). In addition, I supposed that I memorized the shown information when a subject noticed shown information from interface by the experiment of this chapter and asked it a questionnaire after the experiment end. In addition, the (a correct answer rate is high) that I memorized to say here shows what a subject noticed for the intention that the information adducer side showed in information contents.

3.3 hypotheses

It is thought that there is an effect in getting together with the mind of the sight that utterance, how to cue about the hearing stimulation by the speaker sound effects robots display in the state that a subject performs a task (shopping). In addition, about the hearing stimulation put it to cue it, and it is thought that the utterance of the robot is effective than the speaker sound effects.

3.4 experimental results

It experimented to three students in his twenties.

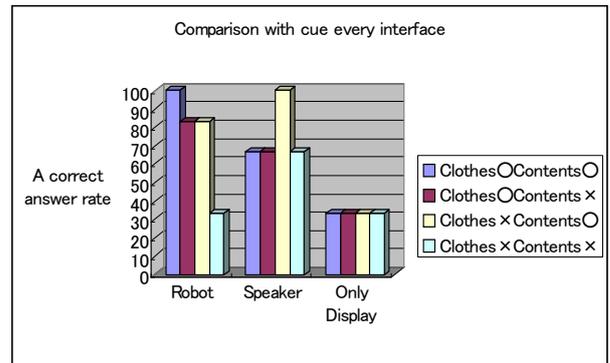


Fig. 3 Comparison which he notices for every interface

Table2 The most suitable media in each state to be common to the subject group

	Contents O	Contents X
The clothes of the shelf O	Robot	It is a robot a little
The clothes of the shelf X	speaker > Robot	There is no pertinence

From figure 3, How to cue with the display understands that it is bad in comparison with the utterance of the robot, the sound effects of the speaker. From table 2, in addition, it is thought whether how to cue by the utterance robots is slightly effective by how to cue by the difference of the taste subjects.

3.5 consideration

From figure 3, It followed that how to notice only in a display was bad. As for the cause, it is thought that I may not have cue a display when a subject stoops down with clothes of the bottom of the shelf because the information of clothes was shown. In

addition, from figure 3, when the image of the clothes which the clothes which were put on the shelf when I compared speaker sound effects with the utterance of the robot wanted and the clothes which were put on the shelf when the image of the clothes which I did not want was displayed did not want and the clothes which I wanted was displayed, how to cue speaker sound effects was higher than the robot. It is thought that this cause is because I was affected by a displayed image (contents). How to cue by the utterance of the robot leads the result that there was an effect in than how to cue by the PC sound effects when Nakamura [2] put it in the case of the utterance of the robot, PC sound effects, a display during the task of 100 trout calculations and examine it whether they are different in how to cue. The contents that most suitable multimodal in store air space cue it on the basis of this, and Media shows information are in condition to be it in a field of vision, and it is thought that what I can remind you of with speaker and multimodal by hearing stimulation of degree to hear by a voice of a robot than sight is most suitable.

4. A method with the cue in the private space

4.1 A multimodal experiment in the house space

Because I am different from the store space, and there is not limitation, it is thought that how to cue that is multimodal whom I changed brightness of the illumination into is possible in the house space. I used a projector as how to cue Media In addition, I changed the size of an image displayed by a projector, a background and contrast with a displayed image, the color of the image. I show a multimodal experiment in the house space, an experiment result as follows.

4.2 A multimodal experiment method in the house space

A purpose of this experiment is to examine an image as the topic and music, information how it is a thing of the that the people react to them if they offer it (I cue it). Therefore, I hypothesized that the subject noticed shown information if I showed a topic within the field of vision of the subject without being concerned with the presence of the action (I drink tea as soon as I play a game) in the space of the subject by this experiment and tested it.

In this study unveils the state of the subject

- When I work alone
- When I carry out a joint activity with two people

I distributed it and tested it. In addition, I defined the state that a subject acted as the state that operated and had you carry out an as follows activity.

- Work at the age of one : It is Othello game on a computer
- Work at the age of 2 : It is a soccer game on a board

While I carry out each activity, as for the topic information, the projector is set to enter the field of vision of the subject by all means. By this experiment, I prepared for the image which seemed to be figure 4 that an arrow was written as various colors by size, contrast backed by white as topic information. I call topic information to use by this experiment afterward an arrow image.



Figure 4 : An example of the topic information

And I examined whether there was connection if the background of this image and a difference of the contrast in the arrow and the size of the arrow, the difference of the color were with the mind of the subject.

4.3 An evaluation method

This experiment catches a plain background in each work that I showed in (4.2) every 30 seconds, and an arrow shows a described image and evaluates whether a subject cues it. The needs assessment of the experiment result went in the following procedures.

1. I showed all patterns arrow image (figure 5) which I showed by an experiment to examine whether a subject noticed the arrow image of what kind of color and did whether there was the arrow of which color with a finger.
2. I had how you changed again reply it whether "brightness" (darkness) and "the size" of the arrow image which I showed to a subject changed several

pieces during an experiment to examine whether a subject noticed an arrow image with how much brightness (darkness).

3. I analyzed the timing of the reporting that could use information to examine a timing to show the arrow image which was most suitable for a user without they performed the questionnaire of the following items, and stopping the conversation of people and when people were necessary for each subject.
 - When it thought that an arrow image is unpleasant, what kind of time is it?
 - When it could think that an arrow image might be offered, what kind of time was it?
 - Which arrow image was suitable for current environment?

In addition, I analyzed it after I photographed the behavior of a subject testing it on a video, and an image shown later changed whether a subject woke up an action (for example, I put up a face) to "watch" the description.

4.4 experimental results

4.4.1 When it Works by One Person

I show an experiment result in table 3, 4, 5, 6.

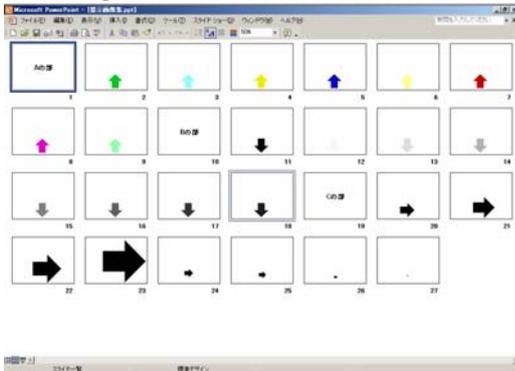


Fig. 5 All patterns of the shown subject information

Table 3 showed a color and relations with the mind of the subject. I was able to get a result that I distributed it, and there was individual difference in one of the mind to the change of the outside world from table 3. In addition, I understood what this "purple" that a background and the most-colored difference were big in three colors was easy to notice when I conducted an investigation into easiness of with the mind by the difference of the color of the arrow image orally. Table 4 showed a difference of the brightness (darkness) of the arrow image and the number of times with the cue of the subject. Brightness 150,128,95,28

used (it is light so that a value is big) for the arrow image which they used this time. Because all the members reacted to the arrow image of lower than brightness 95 that a background and contrast grow big by the experiment, it is thought that there is a boundary line in this neighborhood. I showed size (magnification) and relations with the mind of the subject from table 5. It may be said that magnification does not tend to notice the extremely low arrow image from this table 5. The subject that a correct answer rate was not filled with this experiment in half with a subject of 100% than table 6 was, and a difference was watched conspicuously. From this, it is necessary I stand on it, and it increases the number of the samples a little more that there is individual difference, and to test it.



Figure 6 experiment scenery (work at the time of one person)

In addition, when a change occurred in the presentation contents by the video analysis, the subject gave a face, and it was rare that I did the behavior to cue. The subject notices that this is based on a result of table 6 from table 3 and thinks for the change of the presentation image, but it is thought that I felt it only by the movement of eyes.

Table 3 Relation which difference in color and subject notice

	1	2	3	4
Yellow	○	×	○	×
Purple	○	△	○	×
Blue	○	×	△	×

Notes: Although △ has noticed change of presentation, it shows not having remembered the color clearly.

Table 4 Difference in brightness (darkness) of arrow picture
The number of times which a subject notices

	1	2	3	4
150	×	×	○	×
128	×	×	○	×
95	○	○	○	○
28	○	○	○	○

The relation which table 5 size (magnification) and a subject notice

	1	2	3	4
100%	○	○	○	○
300%	○	○	○	○
50%	○	○	○	○
25%	×	×	○	×

Table 6 Percentage of correct answers of each element and subject

	1	2	3	4
Color	100%	33%	100%	0%
Contrast	50%	50%	100%	50%
Size	75%	75%	100%	75%

4.4.2 When I worked with plural people

I show an experiment result to table 7, eight or nine, 10 when I worked with plural people. Table 7 showed a color and relations with the mind of the subject. A tendency to notice clear colors such as blue or red was seen in appearing like a result of table 1 as a result of table 7. By the experiment of plural people, I used 140,120,100,51,0 arrow images with brightness. When brightness 100 used the above-mentioned image than table 4 and table 9, it may be said that there is a possibility that it was not got how to notice subjects.



Fig. 7 Experiment scenery (work at the time of two persons)

All elements understand that a correct answer rate is less than half when they average it by the work in plural people from table 10. In addition, I understand that a correct answer rate is considerably bad when I compare it at the age of one of table 6.

Table 7 Relation which color and subject notice

	1	2	3	4
Red		×		×
Blue		○		×
Green		×		×
Purple	×		○	
Blue	○		×	
Yellow	×		×	

Table 8 The number of times which magnification and subject notice

	1	2	3	4
25%	×	×	×	×
50%	×	×	×	○
100%	○	○	○	○
300%	○	×	○	○

Table 9 Difference in brightness (darkness) of arrow picture The number of times which a subject notices

	1	2	3	4
140	×	×	×	×
120	×	×	×	×
100	×	×	×	×
51	○	×	○	×
0	○	○	○	×

Table 10 Percentage of correct answers of each two or more man-hours element and subject

	1	2	3	4
Color	33%	33%	33%	0%
Size	50%	25%	50%	75%
Contrast	40%	20%	40%	0%

4.5 Consideration

In an individual and the plural people remind me of it, and show one in table 11. I suggest multimodal so that it is thought that there is individual difference about the color by can put the results of an individual and the plural number person together

about a color and brightness.

Table 11 The multimodal to be able to put to notice it of an individual and the plural number is dull

It is made to notice how.	Individual	Two or more persons
Color	Purple	Blue
Brightness	95 or less	50 or less
Size	It OKs 50% or more.	It OKs 100% or more.

Information contents, the media (a projector) with the mind were in a certain state in a field of vision, and most suitable multimodal in the house space was equal to or less than it with brightness 50 from the above-mentioned result, and did the size of the image to 100%; it is thought that can suggest multimodal who can put it is in a state, and to notice it by changing an image in the projector.

5. View of Conclusion and Future

I suggested most suitable multimodal who could put it to remind the information presentation in the ubiquitous environment of it in this study I used multimodal who stimulated sight and the hearing of the person, and to notice it. I am in condition to have the contents that Media to remind of it shows information in a field of vision, and it is thought that what I can remind you of with speaker and multimodal by the hearing stimulation of the degree to hear by the voice of the robot than the sight is most suitable. In addition, as for most suitable multimodal in the house space, it is thought that I can suggest multimodal who can put it so that I remind me of it, and I am in a certain state, and I am in condition following, to have made the size of the image 100%, and Media (a projector) can remind you of brightness 50 in a field of vision by changing an image in the projector information contents. I think that I remind the value of contents I am smaller and analyze this experiment for the future prospects, and to show information of it and study.

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"compound sensitivity in the true space and modeling of Robo Thich of the variety of the situation understanding and assistance such as the the application" (19-23 Heisei year) and carried it out. I thank NEC / the robot research institutes who have offers such as the robot machinery on pushing forward this study.

Bibliography

- [1] Akira Ogino University, Ryotaro, the deer and others
"A trial of decision making / the communication support in modest ubiquitous interface"
06 summer sensitivity engineering convention
- [2] Masaya Nakamura, Kenichi Ogawa, Toshikazu Kato
"robot participates; remind me of it, and is examined the model collaboration support"
06 summer sensitivity engineering convention
- [3] NEC robot Development Center ↓ ↓
<http://www.incx.nec.co.jp/robot/robotcenter.html>
- [4] Ryotaro between the deer, Akira Ogino University other "
Trial manufacture "of the communication support function of the topic suggestion type
06 image information media study group
- [5] Masaya Nakamura Kenichi Ogawa
"a communication robot remind me of it trial of the model information presentation that I used"
07 image information media study group