Influences of Telops on Television Audiences' Interpretation

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Abstract. The influence of text information, known as "telops," on the viewers of television programs is discussed. In recent television programs, textual information, i.e., captions and subtitles, is abundant. Production of a television program is facilitated by using telops, and therefore, the main reason for using this information is the producers' convenience. However, the effect on audiences cannot be disregarded when thinking about the influence of media on humans' lives. In this paper, channel theory and situation theory are introduced, and channel theory is expanded in order to represent the mental states and attitudes of an audience. Furthermore, the influence of telops is considered by using a scene of a quiz show as an example. Some assumptions are proposed based on the considerations, and experiments are carried out in order to verify the assumptions.

1 Introduction

A lot of textual information, e.g., telops and subtitles, is used in television programs in Japan. In many cases, these messages request laughter and emphasize the features of the cast. Therefore, it can be said that this information is used for the convenience of program producers. However, when considering the strong impact of mass media on society, the side effects of using textual information for audiences cannot be ignored.

The authors have investigated the influence of telops on focusing points and memory of a television audience by carrying out experiments [1, 2]. However, these studies did not include the influence on the audience's interpretations. In this paper, the influence of textual information on the mental states of an audience is discussed with channel theory [3], which is a mathematical framework used for modeling information flows.

Kawakami et al. have expanded channel theory in order to represent a diverse interpretation [4]. In this paper, the expanded theory is used to describe an interpretation of an television program audience. Some scenes of a quiz show are represented by mathematical models using the theory, and the effects of telops are investigated.

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2 Channel Theory and Situation Theory

2.1 Intra-classification

A classification: $A =< tok(A),\ typ(A),\ models_A >$ consists of a set $tok(A)$ of objects to be classified, called "tokens of A," a set $typ(A)$ of objects used to classify the tokens, called "types of A," and a binary relation $models_A$ between $tok(A)$ and $typ(A)$ indicating the types into which tokens are classified.

Given a classification A, a pair $<\Gamma,\ \Delta>$ of subsets of $typ(A)$ is called a "sequent of A." A token $a \in tok(A)$ **satisfies** $<\Gamma,\ \Delta>$ if a is of type α for $\forall\alpha \in \Gamma$; then a is of type β for $\exists\beta \in \Delta$. If every token $a \in A$ satisfies $<\Gamma,\ \Delta>$; then $<\Gamma,\ \Delta>$ is called a "constraint" supported by A, and denoted as $\Gamma\ vdash_A\ \Delta$.

A **local logic:** $L= A,\ vdash_L,\ N_L$ consists of a classification A, a set $vdash_L$ of sequents of A called the constraints of L, and a set $N_L \subseteq tok(A)$ of tokens called the **normal tokens** of L, which satisfy all the constraints of L.

L is **sound** if $N_L = tok(A)$, and L is **complete** if $vdash_L$ includes all the constraints supported by A. Given a classification A, a sound and complete local logic, called $Log(A)$, is generated from A.

2.2 Inter-classification

An **infomorphism:<f, g>** is a pair of functions. Given two classifications A and B, an infomorphism from A to B written as $A \rightarrow B$ satisfies

$$g(b)\ models_A\ \alpha\ \ iff\ \ b\ models_B\ f(\alpha)$$

for $\forall\alpha \in typ(A), \forall b \in tok(B)$, where f and g are whole-part relationships.

An **information channel:** **C**= $f_i : A_i \rightarrow C$, where $i \in I$, is an index family of infomorphisms with a common codomain C called the "core of the channel." I is an index set.

2.3 Situation Semantics

Situation semantics [5] is one of the frameworks that explain what intentions are included in our utterance. In situation semantics, a speaker's mental states are classified into some cognition states, e.g., see, know, believe, and assert.

Furthermore, utterances made with "see" ("see reports") are classified into a *primary* see report and *secondary* see report. The primary see report reports a direct acquisition of knowledge via perception, and the secondary report reports an acquisition of knowledge based on perception which is supplemented with what should be known based on what one sees. For instance, thinking about the following conversation;

A: "Is Mr. C still in the room?"
B: "The room was empty."

In this case, the content of the primary see report by B is the fact that the room is empty. On the contrary, the content of the secondary see report is the belief by B that C has already gone home.

When thinking about a situation in which an audience is watching a weather forecast on television, his/her content of the primary see report is "it may rain tomorrow," and his/her content of the secondary see report is "I should take an umbrella tomorrow."

3 An Extension of Channel Theory

This section gives specific interpretations to the terms used in channel theory for modeling diverse interpretation, and then extends the theory.

3.1 Specific Interpretation of Classification and Soundness

Assuming communication among humans, we interpret a classification *A* as a representation of the cognitive system of a person A. Each element of *tok(A)* represents an instance that is perceived by A, and that of *typ(A)* represents a cognition of A.

The next assumption is that each cognitive system *A* always tries to maintain the soundness of "generated local logic *Log(A)*." Each $models_A$ shows a cognitive rule of A, and each abnormal token indicates a matter that cannot be understood by A in the light of $models_A$. The existence of abnormal tokens cause unsoundness of *Log(A)*, which can be interpreted as a confused state of A.

3.2 Indetermination of $models_A$

Originally, $models_A$ was defined as a binary relation. This paper extends the definition and allows an indeterminate state. This extension enables the following discussions.

Primary See Reports and Secondary See Reports. In the case where a classification *A* represents a cognitive system, the state, where $t_1\ models_A\ \tau_1$ ($t_1 \in tok(A)$, and $\tau_1 \in typ(A)$), corresponds to a primary see report of situation semantics. Basically, a subject believes $t_1\ models_A\ \tau_1$ from direct information. However, the subject is also influenced by secondary see reports, i.e., facts that should be known based on direct information with primary see reports. This fact implies that *A* has to have a state where $t_1\ models_A\ \tau_1$ is not determined, and it is inferred by $t_1\ models_A\ \omega_n$ ($\omega_n \in typ(A)$) and $\omega_n\ vdash\ \tau_1$. This extension enables the modeling transition of a subject's mental states caused by secondary see reports.

Supplementing New Type and Token. Acquiring a new concept and encountering an unknown matter correspond to supplementing a new type and a token, respectively. Generally, humans do not recall all details, but only the relevant concepts and/or previous events when they acquire new concepts and/or experiences. This fact can be implemented by indetermination of $models_A$.

3.3 Relative Relation among Tokens

Establishment of each constraint ($\in vdash_A$) of a classification *A* varies depending on each token ($\in tok(A)$). In other words, constraints cannot represent the relative relationship among multiple tokens. It is as if the number of universal variables involved in *wff* of the predicate logic is restricted to one. For example, the constraint equivalent to the following *wff* cannot be represented by a constraint:

$$(\forall x, \forall y)\{clemency(x) \wedge aggressive(y) \rightarrow fast(x,y)\} \tag{1}$$

Given this fact, this paper defines an "accompanying classification $R = < tok(R),\ typ(R),\ vdash_R >$" for a normal classification $A = < tok(A),\ typ(A),\ models_A >$ as follows:

$$tok(R) = tok(A) \times tok(A)$$
$$typ(R) \supseteq \{l,r\} \times typ(A)$$
$$a_i\ models_A\ \alpha_j \rightarrow \{(a_i,*)\ models_R\ (l,\alpha_j)\} \wedge \{(*,a_i)\ models_R\ (r,\alpha_j)\}$$

where $\forall a_i \in tok(A),\ \forall a_j \in typ(A)$.

If *tok(A)* = {*gentoo, rockhopper*} and *typ(A)* = {*clemency, aggressive*} then
tok(R) = {(*rockhopper, rockhopper*), (*rockhopper, gentoo*), (*gentoo, rockhopper*), (*gentoo, gentoo*) },
typ(R) ={(*l, clemency*), (*l, aggressive*),(*r, clemency*), (*r, aggressive*), …}

Supplementing a relative relation *fast* to *typ(R)*, classifications *A* and *R* are represented by Chu maps [6] as follows:

A	clemency	aggressive
rockhopper	0	1
gentoo	1	0

R	(l,clemency)	(l,aggressive)	(r,clemency)	(r,aggressive)	fast
(rockhopper,rockhopper)	0	1	0	1	0
(rockhopper,gentoo)	0	1	1	0	0
(gentoo,rockhopper)	1	0	0	1	1
(gentoo,gentoo)	1	0	1	0	0

here 1 denotes the establishment of "*models*". In this case, the constraint equivalent to the above mentioned *wff* is written as;

$$\{(\mathrm{l, clemency}), (\mathrm{r, aggressive})\}\ models_R \{\mathrm{fast}\},$$

but we cannot expect natural infomorphism between *A* and *R* [4].

4 Influence of Telops on Audiences' Mental State

In this section, the influence of telops in a television program on audiences' mental states is discussed by using the extended channel theory.

4.1 Mental States of an Observer

Assuming a situation where answerer 1 (P_1) has given a wrong answer, and answerer 2 (P_2) has given the correct answer in a quiz show, an audience sees (primary SEE) facts indicating that

- P_1 has made a mistake,
- P_2 has succeeded

and believes those facts. Here, the mental states of the observer are represented with classification R shown as follows: $tok(R) = \{ P_1, P_2 \}$, $typ(R) = \{correct, error\}$, P_1 $models_R$ $error$, P_2 $models_R$ $correct$.

In this case, if the observer feels "I can answer the question," a token *self* is added that represents him/herself and is classified as "*self models correct*." The feeling of "can answer" depends on a *feeling of knowing* [8], but has not actually been verified in tests. Accordingly, it is a state in which the observer believes "I can answer." In this case, the accompanying classification R_r for R is represented by a Chu map as follow:

R_r	(l,correct)	(l,error)	(r,correct)	(r,error)	foolish
(P_1,P_1)	0	1	0	1	0
(P_1,P_2)	0	1	1	0	1
(P_2,P_1)	1	0	0	1	0
(P_2,P_2)	1	0	1	0	0
$(P_1,self)$	0	1	1	0	1

Generally, media have an *agenda-setting function* [9] which defines "what a problem is in this situation". In consequence of situations where more that one person tries to answer questions, a type "foolish," which indicates a relative evaluation between answerers, is added. In this case, an observer believes two facts: that P_1 is more foolish than P_2; and P_1 is more foolish than her/himself.

On the other hand, when an observer does not have a *feeling of knowing*, R_r is represented by a Chu map as follows:

R_r	(l,correct)	(l,error)	(r,correct)	(r,error)	foolish
(P_1,P_1)	0	1	0	1	0
(P_1,P_2)	0	1	1	0	1
(P_2,P_1)	1	0	0	1	0
(P_2,P_2)	1	0	1	0	0
$(P_1,self)$	0	1	-	-	-

In this case, the audience does not understand or does not think that they can answer the question.

4.2 Influence of Telops on Observers

A background in which emphatic telops display wrong answers is a producer's interpretation that "average people do not give such answers." If classification S represents a producer's interpretation and S_r represents the accompanying classification of S, then the following constraints in S_r are translated to R_r viewing the telop.

$$\{(r, average)\}\ models_{S_r} (r, correct) \tag{2}$$

$$\{(l, average)\}\ models_{S_r}(l, correct) \tag{3}$$

As a result, the type "average" is added to R_r.

We have a tendency to understand society via several media, and to sympathize with the majority opinion and suppress our own assertions in order to avoid isolation [9]. In this case, *self models average* holds because of the consideration "I am average." As a result, R_r transitions as follows:

R_r	(l,correct)	(l,error)	(r,correct)	(r,error)	foolish	(r,average)
(P_1,P_1)	0	1	0	1	0	0
(P_1,P_2)	0	1	1	0	1	1
(P_2,P_1)	1	0	0	1	0	0
(P_2,P_2)	1	0	1	0	0	1
(P_1,self)	0	1	-	-	-	1

Here, the audiences' mental states obey the constraints of

$$\{(l, error), (r, correct), (r, average)\}\ models_R(l, isFoolish) \tag{4}$$

which means "the person who makes a mistake with a typical question is foolish." The type "isFoolish" indicates absolute relationships between tokens. Accordingly, R_r transitions as follows:

R_r	(l,correct)	(l,error)	(r,correct)	(r,error)	foolish	(r,average)	(l, isFoolish)
(P_1,P_1)	0	1	0	1	0	0	0
(P_1,P_2)	0	1	1	0	1	1	1
(P_2,P_1)	1	0	0	1	0	0	0
(P_2,P_2)	1	0	1	0	0	1	0
(P_1,self)	0	1	-	-	-	1	1

When the concept of "average" is introduced by producers, audiences begin to think about the absolute relationships.

Furthermore, "*self models correct*" and "$(P_1, self)$ *models foolish*" are derived from constraint (4). These classifications mean "I must answer the question, and answerer 1 is more foolish than me." Hence, even for audiences who did not have a *feeling of knowing* for the problem until the telop was displayed, the possibility arises that they will think, "I should have been able to answer that correctly."

4.3 Experiments

Simple experiments were carried out to investigate the discussion in the previous section. The movies A and A' were used in the experiments: Both movies included the same parts of a quiz show program, and some telops were appended to A'.

The subjects were 14 physically and mentally healthy university students. The experimental procedure was as follows.

1. The subjects were divided into two groups, G1 and G2.
2. The subjects were led into the room one by one.
3. A was presented to the member of G1, and A' was presented to the member of G2.
4. The subjects answered the questionnaire shown in Fig. 1.

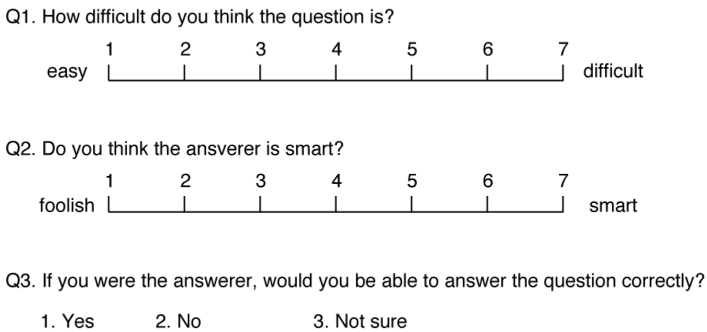

Fig. 1. Part of the questionnaire sheet

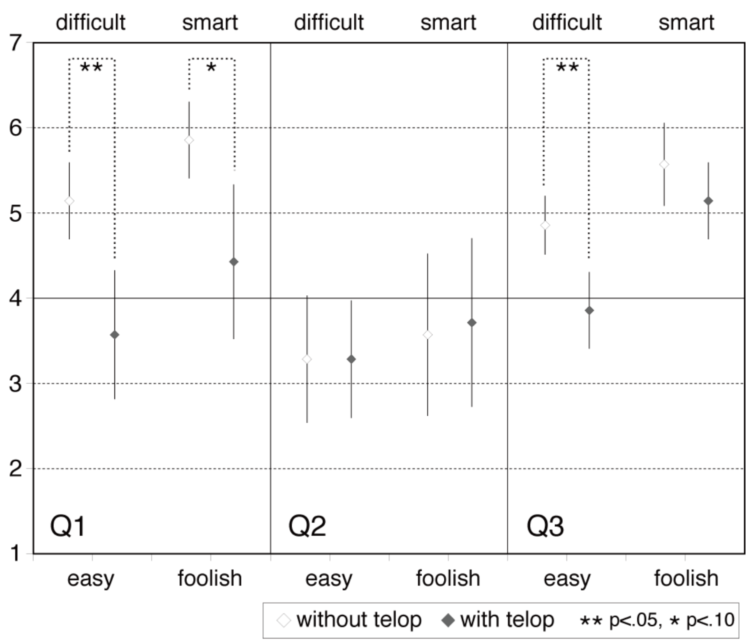

Fig. 2. Results of experiments

The results of the experiments are shown in Fig. 2. As a result of the t-test, it is clear that there is a significant difference between the “difficult vs. easy” data of A and A' in the case of Q1 and Q2 ($p<.05$). Slight differences are also seen in “smart vs. foolish” in the case of Q1 ($p<.10$). These results agree with our assumptions that if a telop is displayed when an answerer makes a mistake,

- audiences feel that the question is easier than in the case when a telop is not displayed.
- audiences recognize that the answerer is inferior to themselves.

In the case of Q2, no differences are seen in both “difficult vs. easy” and “smart vs. foolish.” The reason for this is thought to be that question Q2 might be too difficult for the subjects.

5 Conclusion

In this paper, audiences' mental states of a quiz show were discussed in the context of extended channel theory. We proposed an assumption that if a telop was displayed when an answerer made a mistake, audiences would recognize that the answerer was inferior to the average person. We also proposed an assumption that telops affect the audiences' *feeling of knowing* for a question. Experiments were carried out in order to verify these assumptions, and the results largely agree with our assumptions. The authors plan to conduct more experiments with easier questions in the future.

Because an observer's recognition is classified as “I must solve the question,” his/her recognition of the difficulty of a question may also change. That is to say, the assumptions “The question might be very difficult” and “P_2 might be excellent” are denied, and audiences may fall into a uniform interpretation that “P_1 made a mistake even though the question was easy.” The authors expect that this situation can be explained by adding a “problem” into *tok(R)*.

Using telops is an easy solution for program providers. It is also easy for audiences because they can understand the producers' intentions without having to think deeply. However, using telops reduces the diversity of interpretation, and audiences may lapse into having a uniform interpretation. To address this problem, it is expected that an analysis from the aspect of the *Benefit of Inconvenience* [10] will be effective. According to the *Benefit of Inconvenience*, conserving labor will not necessarily lead to the best design solution. We plan to analyze the relationship between using telops and the *Benefit of Inconvenience* in our future work.

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