Communication Pattern analysis between MCR operators that use Extended Speech Act Coding Scheme in emergency circumstance of Nuclear Power Plant

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1. Introduction

Emergency operation circumstance of nuclear power plant asks operators fast action as is different from normal operation, abnormal operation and the result is much seriouser. Therefore, correct communication of operators action is required more much. So, is trying much lest human mistake at this emergency circumstance should happen at nuclear power plant. Nuclear power plant operators must take a course of normal operation, abnormal operation, emergency operation practice training and lecture room education in simulator by periodic (minimum 2/year). There have been a lot of researches about communication of nuclear power plant operator so far and these researches gave a lot of helps in operator training and power plant operation. In this study, observed emergency operation simulator practice about ISLOCA (Interfacing System LOCA) of operators of Yonggwang NPP 1. Analyzed communication patterns comparison with communication[Ref . 1] in previous abnormality circumstance analyzing communication patterns of operator in this scenario circumstance.

2. Methods and Results

Need various communication for comprehension of phenomenon, 'Shared mental model' indeed being circumstance of operators in nuclear power plant emergency circumstance. Speech Act Coding Scheme can sort contents of conversation by type as speech behavior type classification system that embody to take spare this, and is applied in various field. There was proposal of Speech Acting Code for many-sided Communication analysis meantime and classification and researches have achieved in reply. Recently, there is 'Extended Speech Act Coding Scheme' during published research paper. [Ref . #1] this research analyzed using 'Extended Speech Act Coding Scheme'.

2.1 Extended Speech Act Coding Scheme

The speech act coding scheme suggested in this research is composed of 7 main categories, i.e., 'CALL', 'INQUIRY', 'COMMAND', 'OBSERVATION', 'JUDGMENT', 'ANNOUNCEMENT', 'ACKNOWLE-DGEMENT' with 18 sub-categories, all of which are arranged in Table 1. They are subdivided to overcome the restriction of 11 categories used in the previous research and added as detailed items to enhance the confirmation of message delivery in each stage of main categories

Tab. 1 : A modified speech act coding scheme used in this study

CATEGORY		DEFINITION
CALL	Call	A call for a specific person for communication.
	Response	A response for the Call.
	Call-Identification *	A Caller's self-identification to target person
	Call-Id-Ack *	A Receiver's Response for caller's self-identification
INQUIRY	Inquiry	A statement for asking.
	Reply	An answer for the question.
	Reply-Ack *	A statement representing a reply was received
COMMAND	Command	A specific order of responsibility by one to another to manipulate an object.
	Command-Ack	A statement representing a command was received
	Command-Confirm *	A Confirm message that command was sent successfully to receiver
	Suggestion	A statement of recommendation for specific action or an introduction of an idea for consideration
OBSERVATION	Observation	A statement that describes status of the plant or equipment
	Observation-Ack *	A statement representing an observation was received
JUEGMENT	Judgment	An expression that judge the situation
	Judgment-Ack *	A statement representing a Judgment was received
ANNOUNCE-MENT	Announcement	A statement to the public which gives information about something that happened or that will happen. Announcement.
	Announcement-Ack *	A statement representing an Announcement was received
ACKNOWLEDGE-MENT	Acknowledgement	A statement representing a message was received

2.2 Data Collection and Analysis

Emergency scenario that is used in practice is ISLOCA (Interfacing System LOCA) that is one of design standard accident of Weseuting house cooperation designed nuclear power plant. This event is low relative incidence and it is scenario pressed very to operators because symptoms appear over system more than two. In order to gather verbal protocol data, a full scope simulator installed in the training center of the reference NPPs was used. The full scope simulator used in this research is a conventional 1,000MWe pressurized water reactor (PWR), in which traditional alarm tiles, indicators, trend recorders or control devices have been installed. Since audio-visual recording equipment has been installed in this simulator, all kinds of communications among human operators can be recorded on a videotape. Accordingly, using this audio-visual recording equipment, we were able to collect re-training records that contain each and every communication verbalized by human operators who are working in the MCR.

2.3 Results of Communication patterns

If depend to Main category analysis Fig.1., trouble-shooting process in emergency operation circumstance appeared in form that is some different from Yonggwang NPP 2 relationships abnormality practice circumstance. Dominate whole 73.6% by 18.5% because main communication pattern comes 57.1% by 'INQUIRY/reply' and 'COMMAND'.
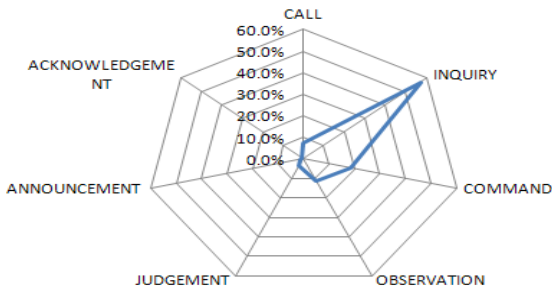

Fig. 1. The result of communication pattern analysis classified by main categories

Fig. 2. describes the result of communication pattern analysis classified by detailed sub categories. Be different from The figure of detailed sub categories increasing Yonggwang NPP2 relationship 'Flying-bird' form 'INQUIRY/reply' dominates large majority of communication pattern by 53.4%.
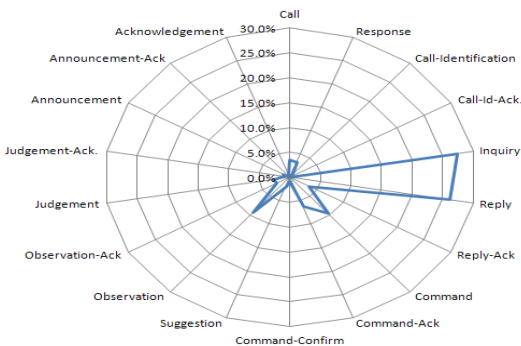

Fig. 2. The result of communication pattern analysis classified by sub-categories
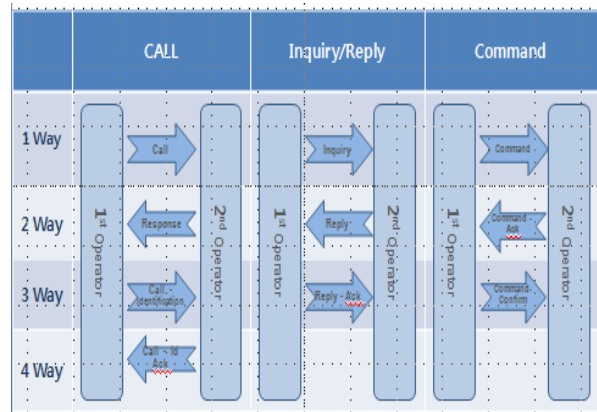
2.4 Results of Multi-Way Communication Analysis

table. 2
The results of Multi-Way communication analysis

Call	Inquiry/reply	Command
2-Way (95.8%)	2-Way (86%)	2-Way (87%)
4-Way (4.2%)	3-Way (14%)	3-Way (13%)

Fig. 3
The Multi-Way communication stage used in this study

3. Conclusion

The result of main category analysis was shown pattern such as 'Arrowhead' that 'INQUIRY/reply' dominates more than 60%. For correct circumstance realization that this is emergency circumstance perhaps, part that 'INQUIRY/reply' occupies looked big. Observed that is doing Multi-Way communication that is less farther than analysis wave of Multi-Way communication and occasion of abnormality. Could know that need to apply to other emergency circumstance scenario back to certify observation of this research.

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