A Pattern Mining Method for Interpretation of Interaction

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Introduction

Interaction Corpus
video/audio data & indices
interactions between humans and objects

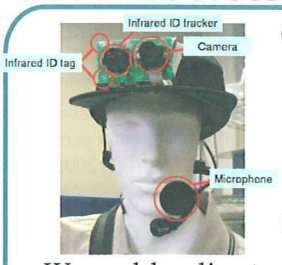
Lower-level indices
"look at," "speak," etc.

Higher-level indices
"group-discussion," "joint-attention"

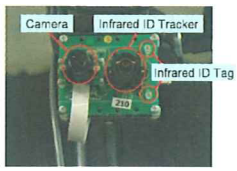
How can interaction indices be designed?
By intuitive sense of corpus architects?
→may overlook important interactions

➡ Pattern mining method

Interaction Capturing System

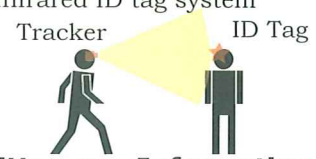


Wearable client

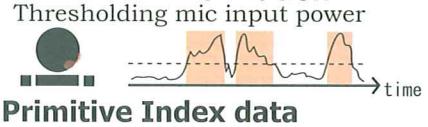


Ubiquitous client

Gazing Information
Infrared ID tag system



Utterance Information
Thresholding mic input power



Primitive Index data

Pattern Mining Method

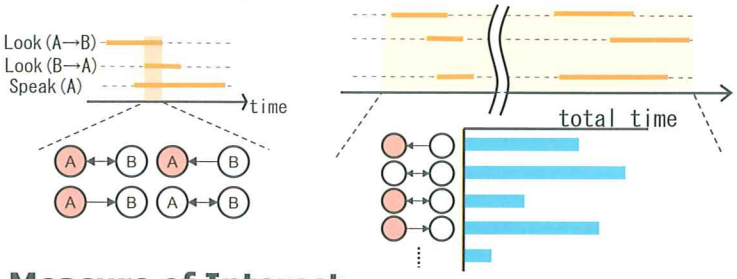
A Model for Interaction Pattern

"person A looks at person B, and speaks"

Connected and directed graph model
Object ⇒ Node
Interaction ⇒ Directed edge
Look ⇒ An edge from subject to object
Speak ⇒ A self-loop on the subject
(depicted by colored node)

Simultaneously occurring pattern
Represents state of interactions
ex. "Person A talks to person B" = "Person A looks at person B" & "Person A speaks"

Pattern difinition & Occurrence time

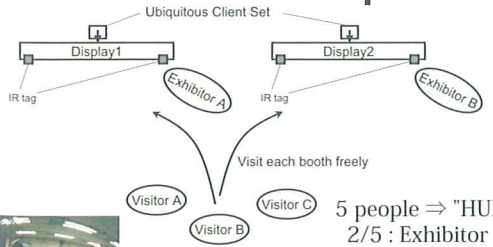


Measure of Interest

$$I_{pattern} = \frac{Actual\ total\ occurrence\ time}{Expected\ total\ occurrence\ time}$$

Experiment

Poster exhibition setup

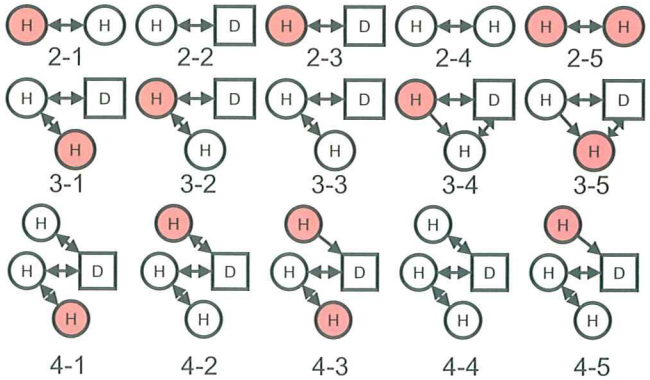


5 people ⇒ "HUMAN"
2/5 : Exhibitor
3/5 : Visitor
2 displays ⇒ "DISPLAY"

The interaction for the total duration of about 87 minutes is recorded.

Our proposed method is applied to the data.

Results



Top five patterns for each node number.
"H" indicates "HUMAN" and "D" indicates "DISPLAY"

Conclusion and Future Work

- A novel mining method for interaction pattern is proposed.
  This method extracts important patterns with a novel measure of interest.
- A mining method for sequential pattern should be invented.

※This research is a collaborative research with ART Media Information Science Laboratories.