#### GAZE MATCHING OF REFERRING EXPRESSIONS IN COLLABORATIVE PROBLEM SOLVING

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# INTRODUCTION

- Efficiency in Collaborative tasks highly depends on 'Identifying Objects in a Conversation'
  - **Referring Expressions**: Linguistic expression to denote an intended object
  - **Referent**: Object that a referring expression denotes
- Construction of a 'Common Ground' is crucial for identifying referring expressions
- Richardson and Dale (2005) studied the relation b/w a speaker's and a listener's eye gaze and listener's comprehension

### RICHARDSON AND DALE (2005)

- Experiment: Recorded speakers talking about TV shows, then played back their speech to listeners
- Eye movement coupling observed between each speaker listener pair
- **Recurrence**, i.e. overlap, between the speaker and listener's gaze peaked at a lag of 2 seconds



• Causal link between eye movements and language comprehension

#### THIS PAPER STUDIES THE RELATION BETWEEN EYE GAZE MATCHING OF CONVERSING PARTICIPANTS AND SUCCESS OF COLLABORATIVE PROBLEM SOLVING.

THEY HAVE MAINLY FOCUSED ON EYE GAZE MATCHING INITIATED BY REFERRING EXPRESSIONS

### EXPERIMENT

- 5 pairs, each has to solve the Tangram puzzle 'collaboratively'
- Each pair is split into a solver and an operator
- Solver thinks of arrangement of the pieces, gives instructions to Operator who manipulates the pieces with the mouse according to the instructions



- Each pair is assigned 4 exercises: (1), (4) symmetric and (2), (3) asymmetric
- A trial ends when the goal shape is complete or time is up (15 min)
- Utterances by participants are recorded in synchronization with position of the pieces, mouse operations and eye gaze of both participants.

## **RESULTS AND DISCUSSION**

- Eye gaze of a pair is considered "matching" when gaze of both stayed within range of 100 pixels for more than 0.1s
- Gaze matching rate equals the ratio of sum of gaze matching periods in a trial to the total time of the trial

Pair	Goal shape	Success	Task comp. time [sec]	Gaze matching rate			
				total	early phase	middle phase	late phase
A	1	yes	886	0.19	0.11	0.26	0.21
A	3	yes	841	0.39	0.23	0.43	0.52
A	4	yes	697	0.40	0.37	0.42	0.42
В	4	yes	427	0.30	0.17	0.34	0.40
Average			713	0.32	0.22	0.36	0.39
A	2	no		0.20	0.18	0.24	0.18
B	1	no	—	0.31	0.28	0.30	0.35
В	2	no	:. <del></del>	0.30	0.33	0.26	0.30
В	3	no	_	0.32	0.20	0.19	0.38
Average			3 <u>—</u> 1	0.28	0.25	0.25	0.30

Table I. The eye gaze matching rate.

#### **RESULTS AND DISCUSSION**



# CONCLUSION

- Eye gaze of both participants was recorded in synchronization with speech in a collaborative problem solving setting
- The results showed:
  - Eye gaze matching rate was higher in pairs who successfully completed the task than the unsuccessful ones
  - Peak of matching rate comes at a different position from the onset of referring expressions depending on the surface form of the expressions, i.e. pronouns and other noun phrases.

#### REFERENCES

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