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Symbol Grounding from Natural Conversation for Human-Robot Communication

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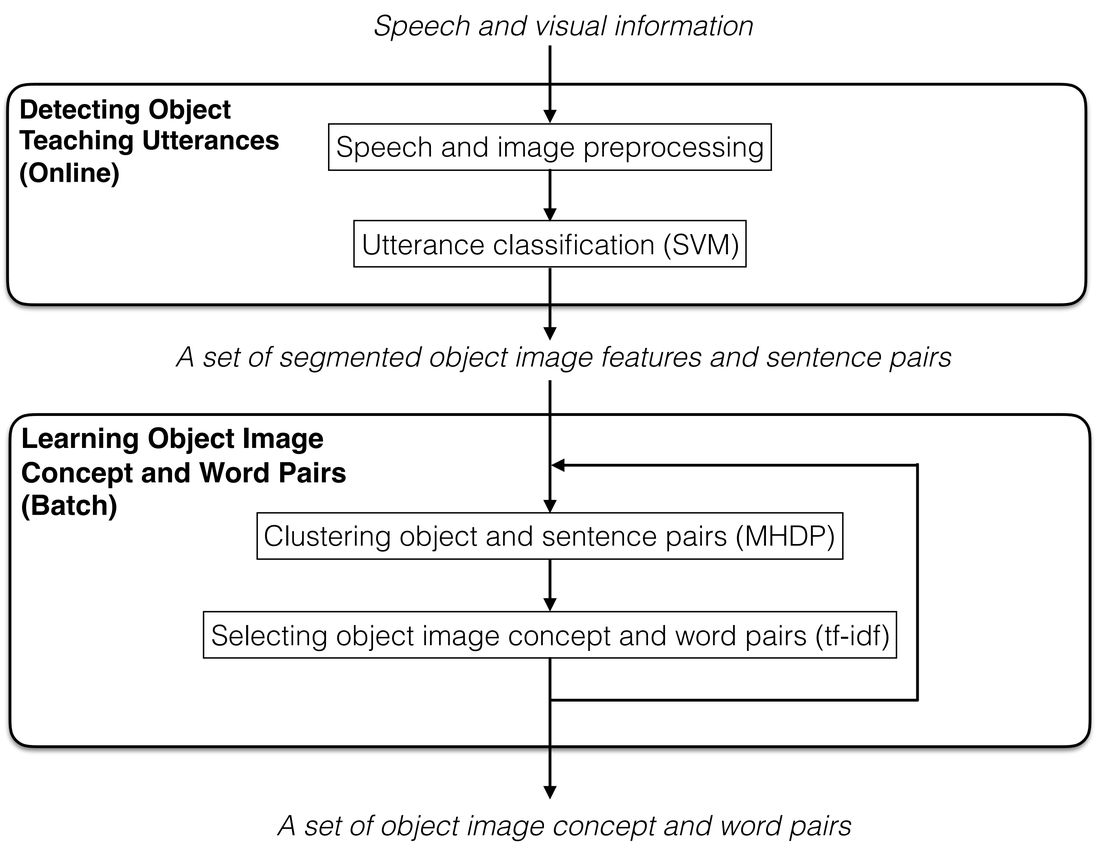
1. Introduction

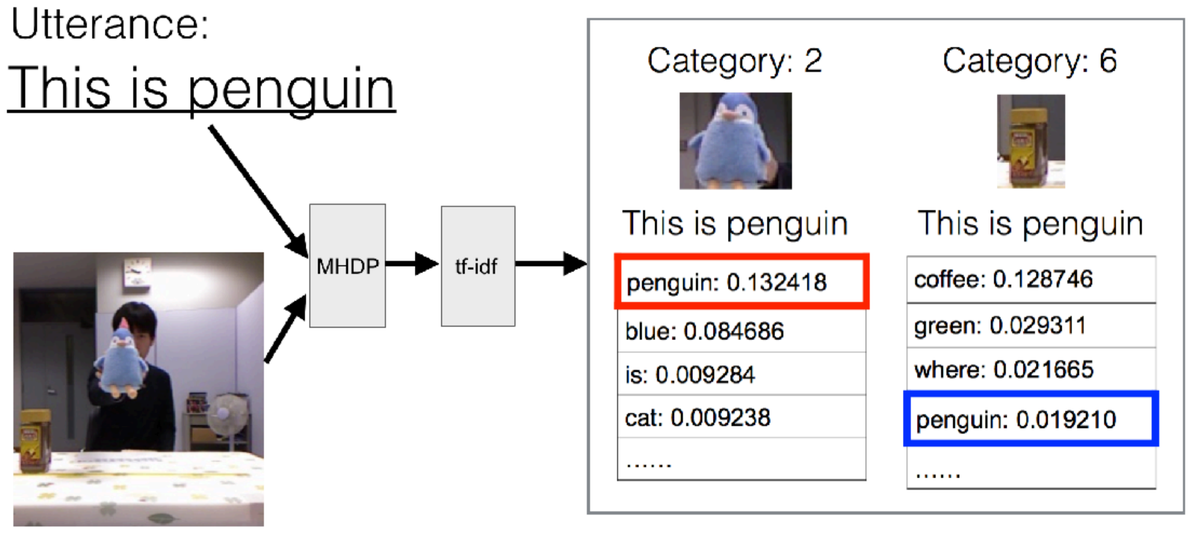
- **Symbol Grounding × Chatting**
- Research on language acquisition and symbol grounding (focus on the acquisition of physically grounded knowledge through utterances that express physical things, such as objects and motions)
- Most of the previous studies have focused on learning without any prior symbolic knowledge
- The problem of how to acquire physically grounded knowledge based on grounded utterances through natural interaction has yet to be explored
- We focus on object-teaching utterances as grounded utterances

2. Experimental Environment

3. Propose Method



4. Learning Method (MHDP+tf-idf)



5. Experimental Setup

- some examples of dialogue conducted in the experiment are as follows:

Human	Robot
Do you know any toys?	I am not familiar with toy.
Here is the stuffed toy.	Oh, I see.
Do you like animals?	I like dogs.
I like this penguin.	I got it.

- The ten objects used in the experiment are as follows:

Here, two black stuffed toy cats (small & big), two stuffed toy fishes (red & yellow), and two cups (red & yellow)

6. Results

Table. Results of learning accuracy of object and words (%)

Method	P_w	P_c	P_{wc}
w/o loop	31% (61/196)	30% (59/196)	10% (19/196)
w/ loop	35% (69/196)	57% (112/196)	28% (54/196)

Here,

- P_w: probability of selecting correct word in each sentence
- P_c : probability of selecting object image concept for each sentence
- P_{wc} : probability of selecting both correct word and object image concept for each sentence
- Result: without loop < with loop

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