TidyBot: Personalized Robot Assistance with Large Language Models

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tidybot.cs.princeton.edu

Introduction

How can household robots learn your preferences from just a few examples?

Key insight: Summarization with LLMs can be an effective way to achieve generalization in robotics

Method

Example preferences —LLM→ Generalized rules

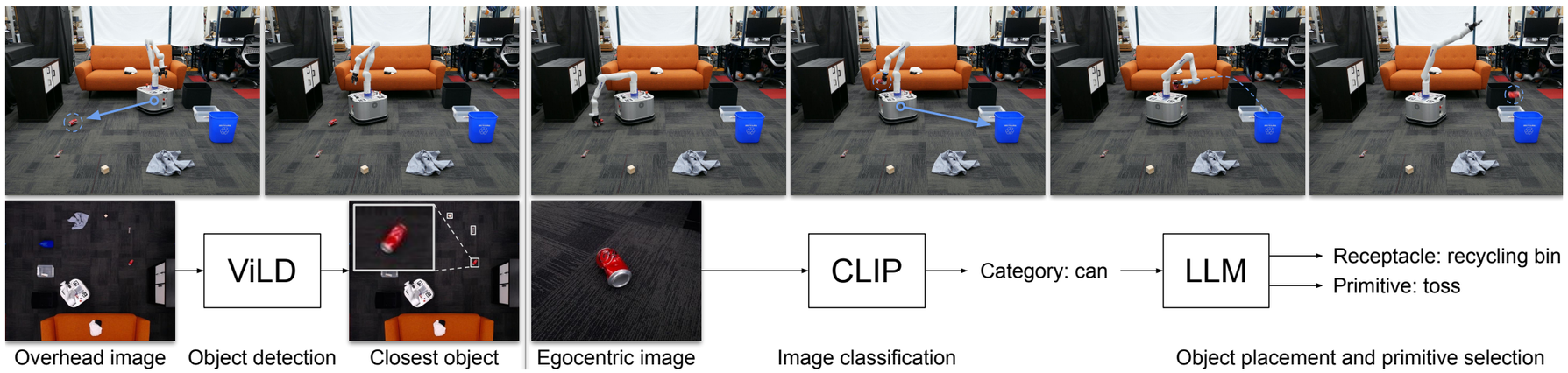
```
objects = ["yellow shirt", "dark purple shirt",
"white socks", "black shirt"]
receptacles = ["drawer", "closet"]
pick_and_place("yellow shirt", "drawer")
pick_and_place("dark purple shirt", "closet")
pick_and_place("white socks", "drawer")
pick_and_place("black shirt", "closet")
# Summary: Put light-colored clothes in the
drawer and dark-colored clothes in the closet.
```

Summarizing preferences

```
# Summary: Put light-colored clothes in the
drawer and dark-colored clothes in the closet.
objects = ["black socks", "white shirt", "navy
socks", "beige shirt"]
receptacles = ["drawer", "closet"]
pick_and_place("black socks", "closet")
pick_and_place("white shirt", "drawer")
pick_and_place("navy socks", "closet")
pick_and_place("beige shirt", "drawer")
```

Placing unseen objects

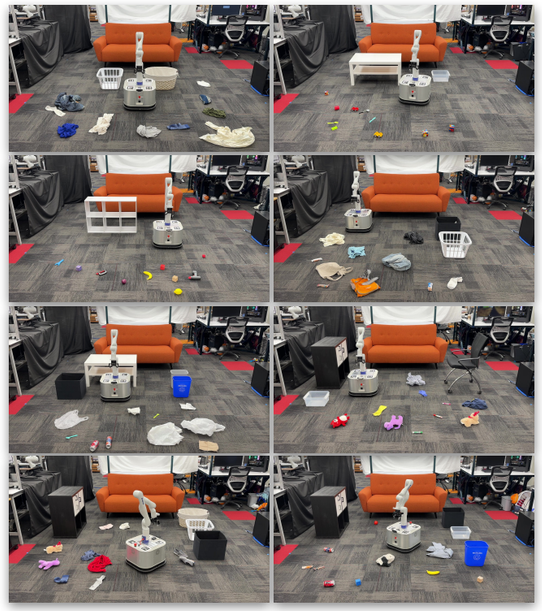
System Overview



Benchmark Results

Method	Accuracy
Commonsense	45.6%
Examples only	78.5%
WordNet taxonomy	67.5%
RoBERTa embeddings	77.8%
CLIP embeddings	83.7%
Summarization (ours)	**91.2%**

Real-World Results



8 diverse test scenarios

70 unique objects, 11 unique receptacles

TidyBot can put away **85%** of objects