

# Shopper: taking advantage of structural stability\*

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Consider the task of finding an arbitrary item X in a grocery store. The task is impossibly hard without knowing something about the object. Information about the item is relevant only if it somehow helps in the locating process. In the SHOPPER project, we are attempting to build an agent which locates items satisfying desired goals while operating with incomplete knowledge of the domain, and with imperfect sensing capabilities. The agent is, however, endowed with knowledge about the organization of domains, plus informative elements placed in the domain to facilitate activity. The particular domain we use is GROCERYWORLD, a simulated grocery store.

Suppose we have the goal of looking for Cheerios cereal in a supermarket. In order to locate this cereal, we need to assume some things about the cereal, and the store. An obvious fact about Cheerios is that it's a cereal. An important assumption about the store is that items are often grouped according to type, e.g., there is a cereal section in supermarkets. So if we spot one cereal, it makes sense that other cereals are present nearby. There might also be a sign in front of an aisle with the word cereal written. This sign is also an indicator of where the Cheerios may be. These types of information and assumptions make clear some of the assumptions and cues we rely on in order to facilitate their shopping goals.

In the SHOPPER project, we are building a classification of structural assumptions and information resources present in domains such as grocery stores, libraries, office buildings – almost anything for public use. Assumptions based on structured domains can serve as cues, or *appropriateness conditions* (Converse and Hammond 1992) for execution of plans. For example, knowing that signs in an aisle indicate the type of objects there, we can *suspend* a goal (Hammond *et al.* 1990) of obtaining chicken soup by indexing according to type “soup”. When a sign saying “soup” or another soup is seen, the opportunity is recognized to achieve the goal of obtaining the particular soup desired.

Thematic relations in terms of items commonly used together can also serve as cues: Suppose I'm looking for pancake mix and maple syrup. I find the desired pancake mix near the cake mixes. A few feet away I see maple syrup. I grab the syrup. There are two assumptions here: the pancake mix is the same “type” as the cake mixes, and the maple syrup shares a thematic relation to pancakes because they're often used in the same pancake recipe.

So far, we have identified two types of structural features: **Information resources** - signs in front of aisles, employees, maps, recipes on items; and **Resource organization** - types (e.g., cereal section) and thematic (e.g., fabric softener placed near laundry detergent). There is also an assumption made on the stability of the domain: item location stability. We assume that items won't be moved often; i.e., the fruit section won't get moved across the store every other day. We don't assume, however, that items such as grapes will always be in the same spot.

Exactly how all these types of assumptions will be combined is the subject of future work. Currently, SHOPPER is able to locate certain sections in two aisles by assuming type organization. After recognizing a section, the plan for looking for a particular item (e.g., Cheerios) can be constrained to the locations near the section (e.g, cereal section). If the item can't be found, the agent may conclude that the cereal does not exist in the store.

## References

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- Hammond, K., Converse, T., & Martin, C. 1990. Integrating planning and acting in a case-based framework. In *The Proceedings of the 1990 National Conference of Artificial Intelligence*.

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