

Ontology Guided Dynamic Preference Elicitation of Conditional Preferences

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Background Information

In the ever-expanding search to bring consumers what they want in a more efficient way, the field of preference elicitation is evolving, reaching out into different fields such as the semantic web where a computer can be taught the similarities of objects in an ontological database or taxonomy. With the merging of ideas from different fields, the goal is to more accurately and swiftly obtain consumers' complex desires.

Problem Definition

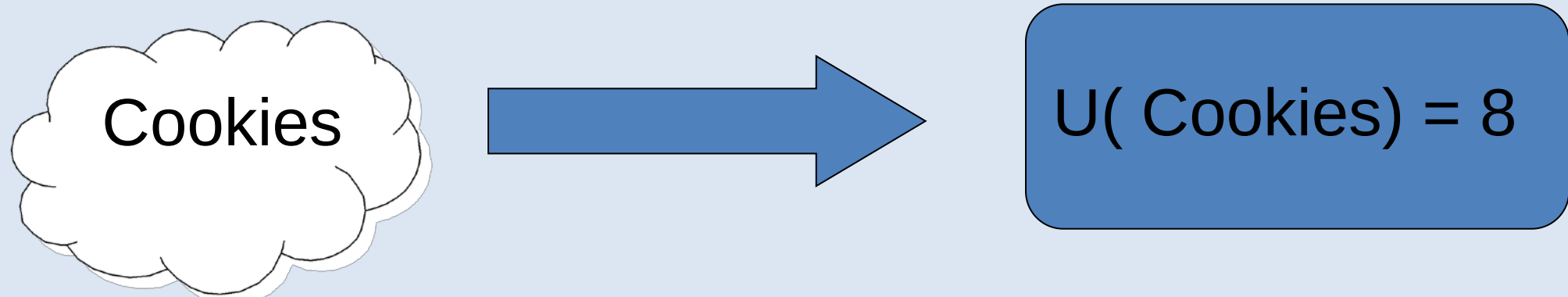
The standard problem for preference elicitation is the attempt to accurately model a user's preferences with as little hassle to the user as possible. Specifically the sub-problem is to efficiently find preference dependencies or conditional preferences using semantic techniques. Conditional preferences occur when a user's preference for an object changes based on a condition.

Proposed Solution

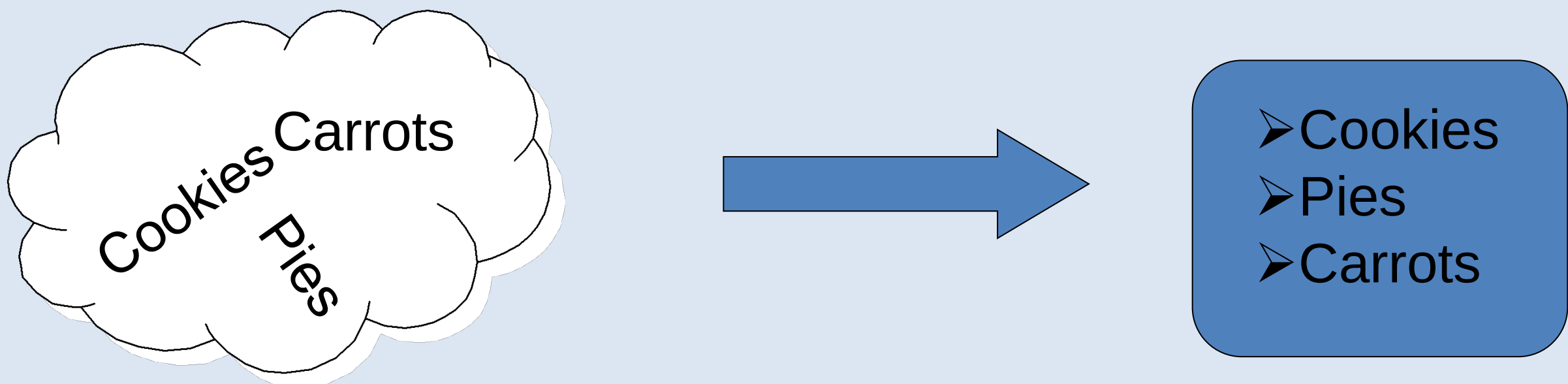
After a basic inquiry into some of the user's preferences, the assumption of people having similar preferences for similar objects is invoked to fill in the remaining preferences. Then, through a heuristic method, good potential candidate items are selected. Once these are selected the user is questioned about possible conditional preferences pertaining to these candidate items. If a conditional preference is found then it serves as a good starting point to attempt to find conditional preferences in items similar to the candidate that spawned the original conditional preference.

Basic Inquiries into Preferences

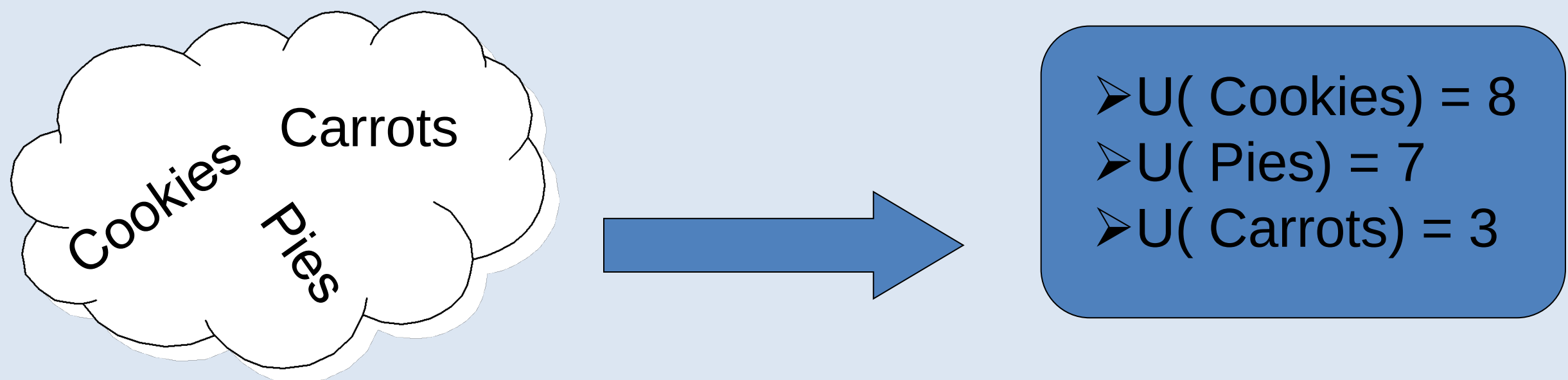
Scoring: A scoring style question simply asks the user what they think of an item on a scale. An example would be: what do you think of cookies, on a scale from 0 to 10, with 0 being that you can't stand them and 10 being that they are your favourite food. This style of question is quick and very easy to convert into a normalized utility. Utility functions $U()$ map the desirability of an object or outcome to a number. However, it normally only gives you information on one object.



Ordering: An ordering style question asks the user to list a group of items in ascending or descending order, based on what they think of them. This style of question gives more information than the scoring style question. However, it is more complex to gain normalized utilities because only relative utilities are obtained from this style of question.



Combination: A combination of scoring and ordering questions gives the most flexibility and it is much easier to find more accurate normalized utilities.



Conditional Preferences or Milk and Cookies

Some basic utilities:

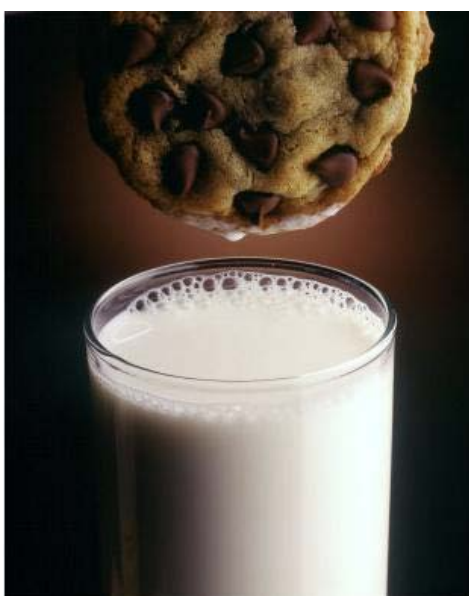
$U(\text{Crunchy Cookies}) = 7.5$

$U(\text{Soft Cookies}) = 8.5$

Assume now that the user is drinking milk.

Given(Milk), $U(\text{Crunchy Cookies}) = 9.5$

Given(Milk), $U(\text{Soft Cookies}) = 9$



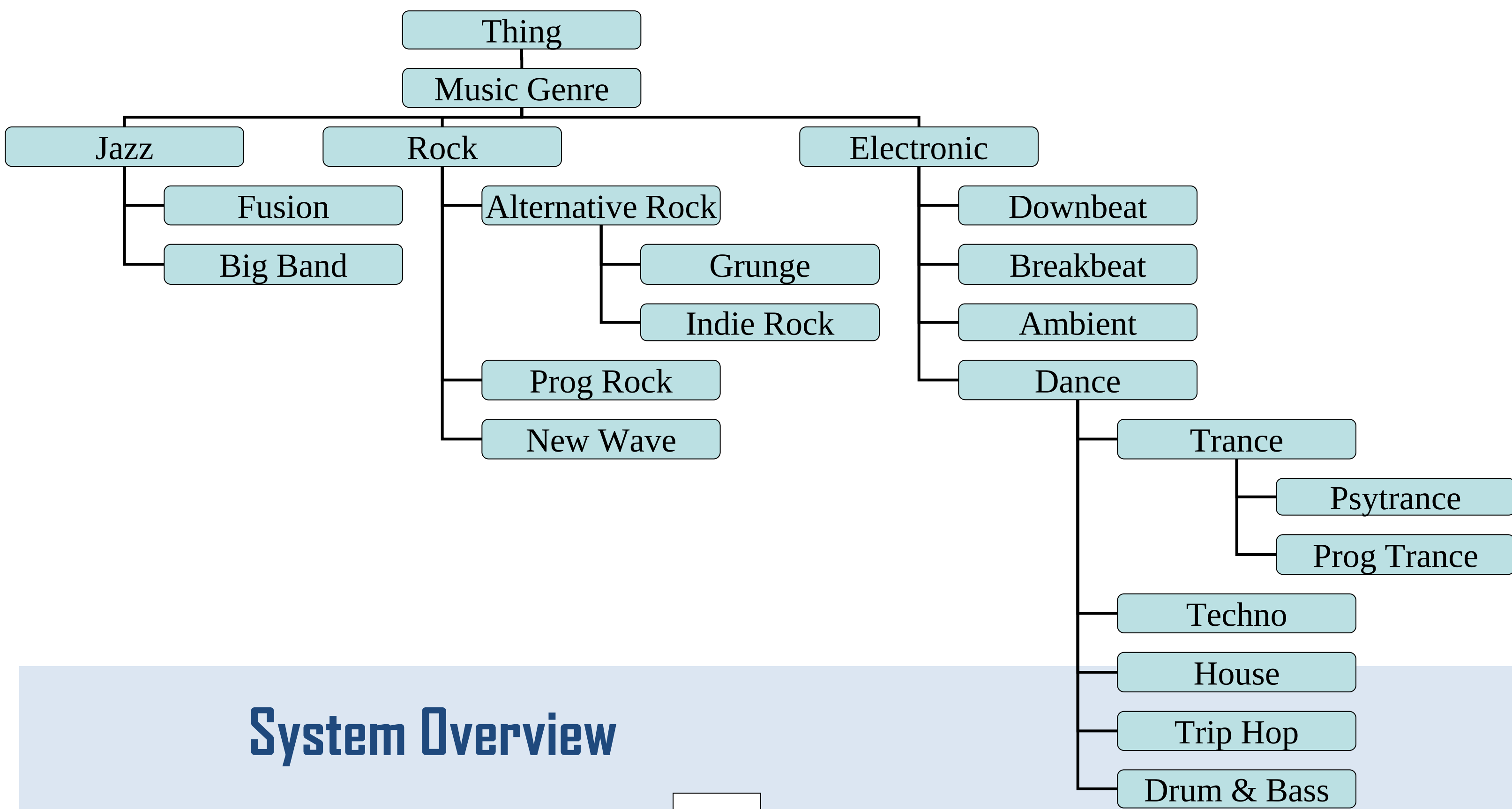
Similarity

A taxonomy is a classification of something arranged in a hierarchical structure.

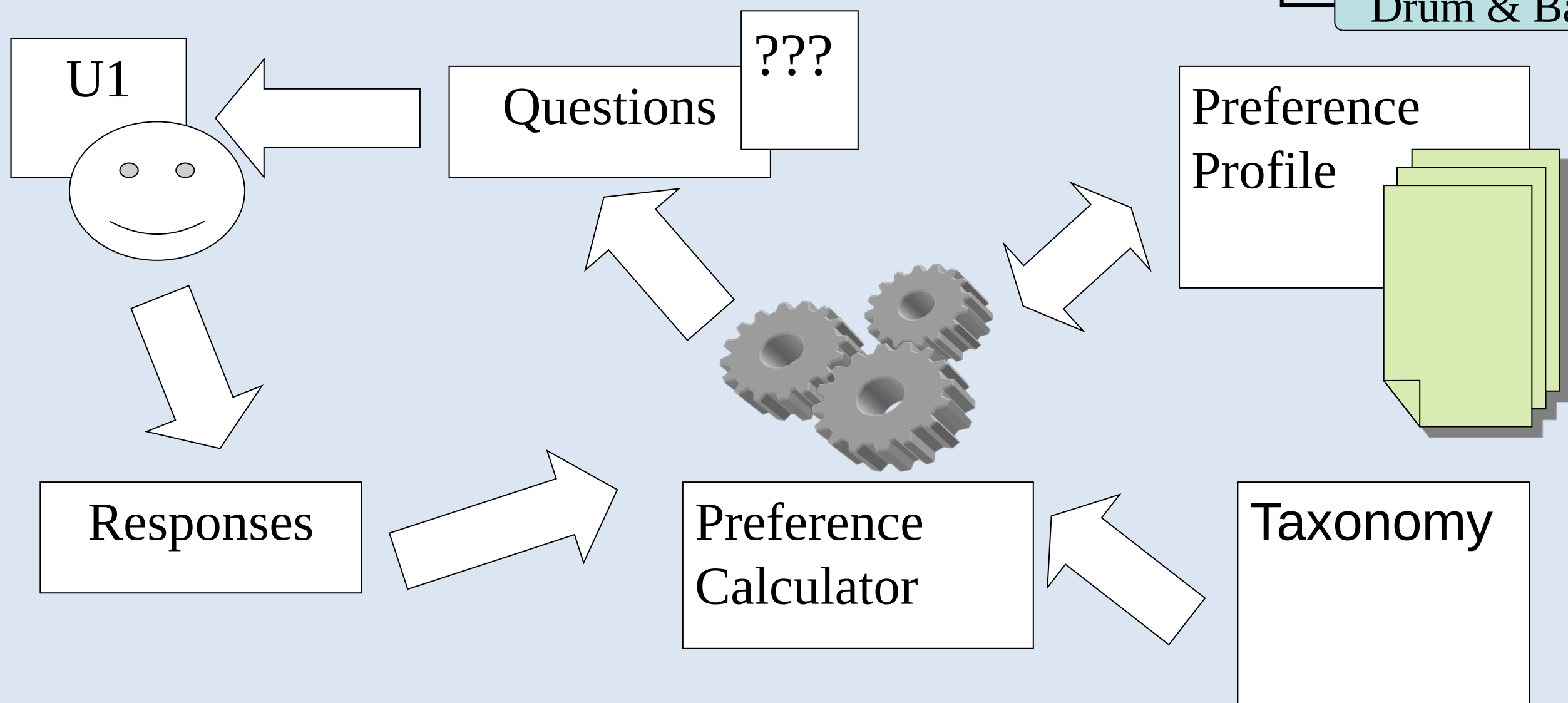
Similarity Via Distance: The most basic form of finding similarity in a taxonomy is to assume that the closer in the graph items are, the more similar they are. There are significantly more complex versions that take into account the hierarchy of the taxonomy and the depth at which items are.

Similarity Via Shared Attributes: Another way to measure similarities based on semantics is to compare the number of equivalent attributes items have. An example would be that a red bike is more similar to a red car than a black bike is, but a black bike would be more similar to a red bike than a red car is.

Example of a Taxonomy



System Overview



Handling Conditional Preferences Using Semantics

The preference profile of each user is a RDF (Resource Definition Framework) tree that has an object for each item in the taxonomy. Each object can have a utility through a hasA relation; this also allows us to define conditional utilities and grant them to objects via hasA relations as well.

Commercial Uses

Online shopping and personalized web user interfaces are the way of the future in industry. Being able to effectively obtain and model users' complex preferences will aid in better advertising, better search results, and less annoyed consumers.