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Project Description
"E-Tourism Recommendation system"
Deadline: 27/3/2020

Project Description

Many systems nowadays incorporate a recommendation system to personalise the experience of their users, such as music playing apps and online shopping platforms. One industrial sector that could benefit from such technological advancement is the tourism industry, where travellers have different personal requests that they wish be satisfied when travelling. Therefore, you will be implementing an E-Tourism Recommendation system.

Travel agencies have a knowledge base of the available offers they could recommend to customers. For each of those offers, the accommodation and means of transportation is specified. Moreover, they all also have knowledge about a customer's preferred accommodation, transportation and the type of activities he/she would like to perform. As a result, the system should be provided with this data to be able to recommend to the customer an offer accordingly.

For the system to recommend an offer to the customer, he/she should provide a list of their preferences indicating, for instance the activities he/she would like to perform, the type of accommodation he/she would like to stay in, etc. The system tries then to satisfy as much of those preferences as much as possible and recommend an offer accordingly.

The system could also recommend an offer to a group of people, as each offer could be scheduled to a maximum of `N` guests. Each customer will provide his list of preferences and the system will try to choose a set of preferences that is satisfied by an offer. It will then pick maximum `N` customers who will be most satisfied by the offer(based on the data present in the knowledge base).

Facts

You will be provided by some facts that you can use for testing your implementation but we recommend that you add your own so that you can make sure that your implementation is sound and doesn't miss any detail.

offerMean/2

The fact `offerMean(O,M)` succeeds when the offer `O` has means of transportation `M`. The offer is a structure of the for:
`offer(destination, activities, cost, validFrom, validTo, period, duration, noOfGuests)`, where:

- `destination` specifies the destination of travel e.g. dahab
- `activities` is a list of the activities that could be performed in the specified destination, e.g. [diving, snorkelling]

- `cost` is the total cost of the offer
- `validFrom` specifies that the offer is valid starting from this date, where it's of the form yyyy-mm-dd
- `validTo` specifies that the offer is valid till this date and it's of the form yyyy-mm-dd
- `period` specifies the period the customer could be travelling during
- `duration` is the number of days the customer will be travelling during the period specified in the offer
- `noOfGuests` is the maximum number of people who could be scheduled to this offer

offerAccommodation/2

The fact `offerAccommodation(O,A)` succeeds when the offer `O` has accommodation `A`, where the offer `O` is having the same structure specified above. Note that all the offers specified in `offerMean/2` should be specified in `offerAccommodation/2`

customerPreferredMean/3

The fact `customerPreferredMean(C,M,R)` succeeds when the customer `C` prefers transportation mean `M` with relevance rating `R` that has a value between `0` and `100`. Note that facts for this predicate should be defined for all transportation means for all customers, where customers are defined by the below structure: `customer(firstName, lastName, birthDate, status, noOfChildren, job)`, where

- `firstName` specifies the customer's first name
- `lastName` specifies the customer's last name
- `birthDate` is the customer's birth date in the format yyyy-mm-dd
- `status` specifies the marital status of the customer, e.g. `married`, `single`, etc.
- `noOfChildren` is the number of children the customer has, `0` otherwise
- `job` is the customer's current occupation

For instance, if in the knowledge base the only offered means will be `bus` and `plane`, then each customer will have to rate travelling with both means, e.g.

```
customerPreferredMean(customer(ahmed, aly, 1993-01-30, single, 0, student), bus, 30).
customerPreferredMean(customer(ahmed, aly, 1993-01-30, single, 0, student), plane, 90).
customerPreferredMean(customer(mohamed, elkasad, 1999-01-30, single, 0, student), bus, 90).
customerPreferredMean(customer(mohamed, elkasad, 1999-01-30, single, 0, student), plane, 20).
```

customerPreferredAccommodation/3

`customerPreferredAccommodation(C,A,R)` succeeds when the customer `C` prefers accommodation`A` with relevance rating `R`. It follows the same idea as `customerPreferredMean/3`.

customerPreferredActivity/3

`customerPreferredActivity(C,A,R)` succeeds when the customer `C` prefers activity `A` with relevance rating `R`. It follows the same idea as `customerPreferredMean/3`.

Predicates to be added

You are going to implement this system purely through Prolog, you can add as many predicates as you need to make sure the following predicates work correctly. This means that you are **not allowed to use any clpfd libaries**. Your solution must utilise both techniques, unification and generate-and-test. You **should implement all of the following predicates.**

possibleSubset/2

The predicate possibleSubset(L,R) succeeds when R is one of the permutations of every subset of L.

choosePreferences/2

To be able to recommend an offer that satisfies as many of the customer's preferences as possible, the predicate `choosePreferences(Prefs, ChosenPreferences)` chooses a set of preferences from the customer's input preference list `Prefs`. In the preference list, the customer could state the destination he/she would like to travel to, the activities he/she would like to perform, etc. Below you could find the different structures that could be used to specify the customer's preferences.

- `dest(X)` specifies the target destination the customer would like to travel to
- `budget(B)` specifies the budget the customer would like to pay for the recommended offer
- `means(M)` used to specify the means of transportation the customer would prefer to travel by
- `accommodation(A)` used to specify the type of accommodation the customer would like to stay at
- `activity(A)` specifies the activities the customer would like to perform on his/her trip, where `A` is a list of the activities
- `period(yyyy-mm-dd, yyyy-mm-dd)` is the period the customer would like to travel during

Example of a customer's preference list would be as follows:

```
[dest(dahab), period(2020-04-01, 2020-06-15), means(bus), accommodation(hotel), activity([diving,
snorkelling, sightSeeing]), budget(5000)]
```

preferenceSatisfaction/4

The predicate `preferenceSatisfaction(Offer, Customer, ChosenPrefs, S)` calculates `S` which states how much the customer is satisfied by the offer `O`, based on the knowledge present in the knowledge base and the preferences chosen to be satisfied.

overlapPeriod/2

The predicate `overlapPeriod(P1,P2)` checks if the two periods `P1` and `P2` are overlapping.

getOffer/2

The predicate `getOffer(ChosenPrefs,Offer)` gets an offer `Offer` to match the list of preferences `ChosenPrefs`. Note that if one of the preferences provided in the `ChosenPrefs` list is the `period` structure, it is enough that there is an overlap between the offer's period and the customer's target period

recommendOfferForCustomer/3

The predicate `recommendOfferForCustomer(Prefs, ChosenPrefs, O)` chooses from the list `Prefs` a subset `ChosenPrefs` that could be satisfied by the offer `O`.

recommendOffer/4

The predicate `recommendOffer(Customers, PreferenceList, Offer, CustomersChosen)` takes as input a list of customers `Customers` along with their preferences `PreferenceList` (a list of lists, where the ith preference list belongs to the ith customer) and recommends an offer `O`. Since each offer is only applicable to a maximum of `N` guests, we choose from the given list of customers maximum `N` guests who will be satisfied the most by the recommended offer given their provided preferences.