CrowdPlanr: Planning Made Easy with Crowd

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Goal
Crowd-sourcing can be used effectively to solve problems that are difficult for computers.

CrowdPlanr uses the power of the crowd to solve a problem of planning a sequence of actions, when the goal is hard to formalize.

Model presentation
We assume that we have a set of possible items $S$. All possible sequences of items from $S$ are presented as a tree (order is important!).

Q: "Given history $x, y, z$, what should I do next?"

Ask N users

Two counters for each edge:
- $d(u)$ — display counter
- $c(u)$ — choice counter

Score can be calculated for every path $p = (u_1, u_2, ..., u_n)$

$$\text{score}(p) = \prod_{i=2}^{n} \frac{c(u_i)}{d(u_{i-1})}$$

We shall return a path with a highest score

An example of a problem
Prepare a schedule for a vacation trip

Input:
Dates, budget, location, interests

Desired output:
A detailed schedule of what to do and when on your vacation

Goal:
Enjoy your vacation the most!

Example input:
I am in Brisbane for an ICDE'13 conference. In my spare time I would like to explore the city. What should I do?

Possible output:
City Hall → Treasury Building → Customs House → City Botanic Gardens → Brisbane Arcade → South Bank Parklands → Wheel of Brisbane → Streets Beach

Algorithm
- For every path calculate a potential min and max scores
- Continue asking questions until the top-1 path is known for sure (it’s potential minimum score will be higher than all other potential maximum scores)
- Allow an error of up to $\epsilon$ in the score
- Ask the next question on:
  - A path with the highest potential maximum score (a highest node of this path)

Benefits
- $\epsilon$-optimal algorithm (in instance optimality sense)
- Every deterministic algorithm is at most $\frac{1}{\epsilon}$-optimal

Challenges
- The tree of all the plans is exponential in the length of a plan
- Most of the plans are irrelevant (will have very low score)
- Asking questions is expensive (in time and possibly money)

Experimental Results
Questions asked on every level  #Questions function of tree depth