Resource-bounded Crowd-sourcing of Commonsense Knowledge

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The Framework

m users

Ask commonsense question:
Dog is a ____?

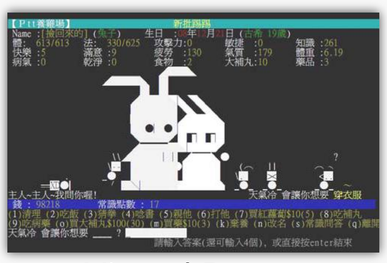
Answer question:
Dog is an animal.
Dog is a creature.

Resource bound: Answer Θ questions within time T

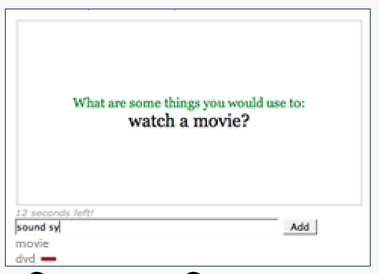
Website/games for crowd-sourcing

Open Mind Common Sense

Verbosity

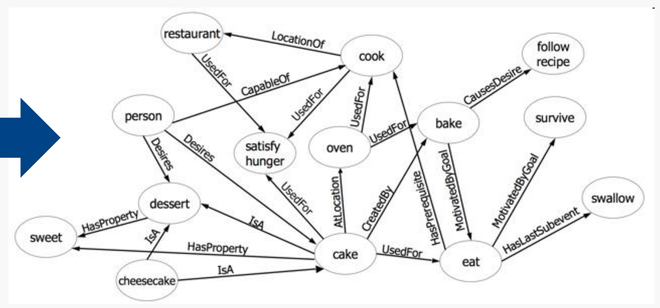


Virtual Pets



Common Consensus

Commonsense Knowledge Base (KB)

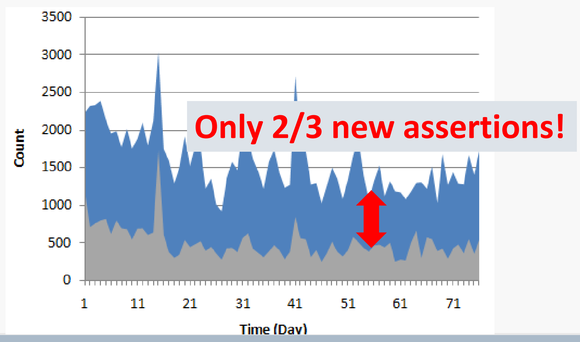


ConceptNet

The Problem

- Unguided collection suffers from high redundancy, e.g. Virtual Pets
- How do we crowd-source commonsense knowledge effectively within the **resource bound**, i.e. users answer limited questions within a time T?

Overlapped data in Virtual Pets



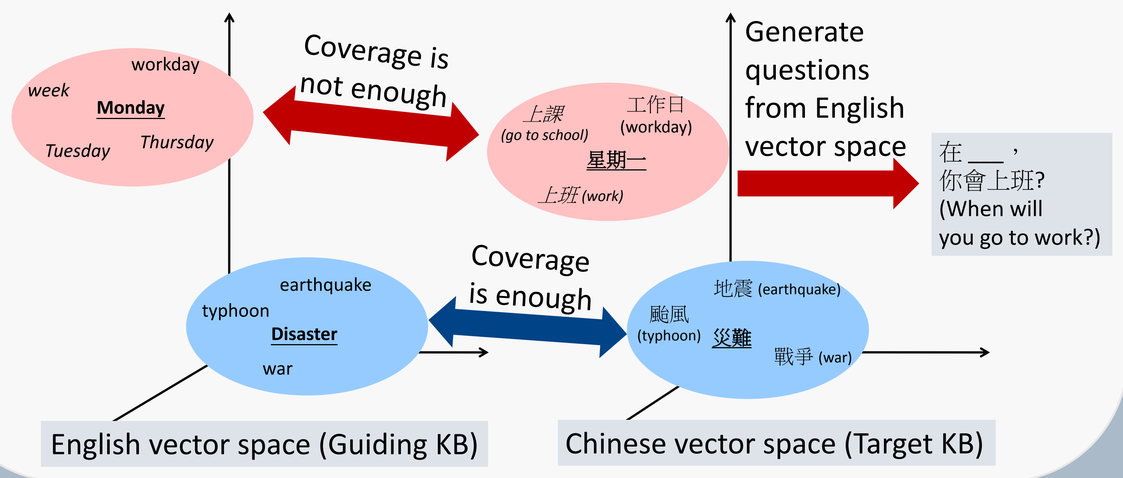
KB Approximation

Main Idea:

- We should identify the most productive questions for acquiring answers
- A **guiding KB** helps us identify the questions by estimating the answers of a question and their inference results before asking users

Algorithm:

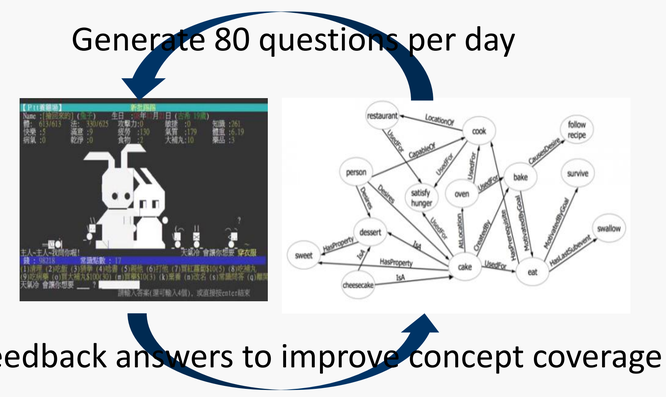
1. Represent every concept in a KB as a feature vector in vector space. For example, “dog” is a concept and “is an animal” is its feature.
2. For every mapped concept in the two KB, find their similar concepts.
3. If the overlap of the similar concepts in guiding KB and target KB is low, transfer features in guiding KB to create questions for crowd-sourcing.



Experimental Result

Setup:

- Enhance Chinese ConceptNet by generating questions from English ConceptNet
- 173.8 questions are answered in Virtual Pets per day
- Perform the collection process for six weeks



Results:

- Quality of generated question

	By our algorithm	By players
# of questions	480	4,329
# of bad questions	28	264
% of good questions	94.17%	93.90%

- Precision of collected answers
  85.37% (about 80% for Virtual Pets without guide)
- Improvement of concept coverage

	week 0	week 5	week 6	week 7	week 8
$\lvert c^- \rvert$	8,630	5,783	5,495	5,450	5,435
Δ	–	33.51%	36.33%	36.85%	37.02%

*$\lvert c^- \rvert$: # of concept whose coverage score < 0.5