

Teaching new skill to a human: My design is for tutoring system that can prepare a student for Graduate Record Examination (GRE). We'll use Common sense reasoning, Understanding, Classification and Scripts concepts here. I'm simplifying the use case to only the verbal reasoning part of the GRE exam. My tutor agent has a dialog manager to coordinate conversation and a curriculum script. It's build as a generic tutoring system that can be customized for teaching different subjects. There is a corpus with different material related to the course and a standard set of questions with answers. This information is loaded for teaching different subjects which would take order of tens of hours or a couple of days for the whole data to be updated for teaching specific subject. Let's get into our use case to prepare a student for GRE verbal reasoning part.

Most important part of verbal reasoning tests is to have a good collection of words, synonyms, antonyms and their usages. On top of that is to solve different models of questions like picking right set of two words out of six options in the sentence blanks. We'll use frames to represent the vocabulary which act as flash cards that can be presented to student as part of conversation whenever needed.

#### Vocabulary frames

Word

Name: abstruse

Meaning: difficult to understand

Synonyms: obscure

Antonyms: obvious

Word

Name: obscure

Meaning: difficult to understand

Synonyms: abstruse

Antonyms: obvious

Word

Name: obvious

Meaning: clear

Synonyms:

Antonyms: abstruse, obscure

Tutor has curriculum scripts to teach different models of questions on different days. A typical dialog would start with introduction and topic under discussion for the day. Tutor throws a challenge from a certain model of questions. Say, the question asks to fill sentence blanks with two words meaning the same from six options. Student picks the options he feels right or ask for more information like the flash cards of words given in options. Tutor can give clues like showing the pairs of words meaning the same out of six options that makes student's job easy to pick the right pair that fits in sentence. A sample dialog between tutor and student can be as follows:

Tutor: Hey, how are you doing today?

Student: I'm good. What's our topic under discussion today?

Tutor: Ah, like your curiosity. Let's get into the business. Are you familiar with a question model that asks you to fill in sentence blanks?

Student: Yes, I guess so. Does it ask to fill two blanks in a sentence that makes it meaningful?

Tutor: Nice to see you have some knowledge about different question models. But, we'll talk about the model you mentioned next Thursday. Today, it's about filling a single blank with two words that mean the same out of six options. Sounds interesting?

Student: Wow, I'm excited. That'll help me also learn a lot of unknown vocabulary by end of the class.

Tutor: Yes, apparently you're learning six words that are given as options per question. I'll make sure you get around the synonyms, antonyms and usages of all the options of questions before we fill in the blank

Student: Great. So, where is my first question? :)

Tutor: Okay, here you go.

Tentative, fearful even, John's first forays into theatrical arts were hardly \_\_\_\_\_

Options: 1. Unheralded 2. Auspicious 3. Commendable 4. Unpropitious 5.

Satisfactory 6. Favorable

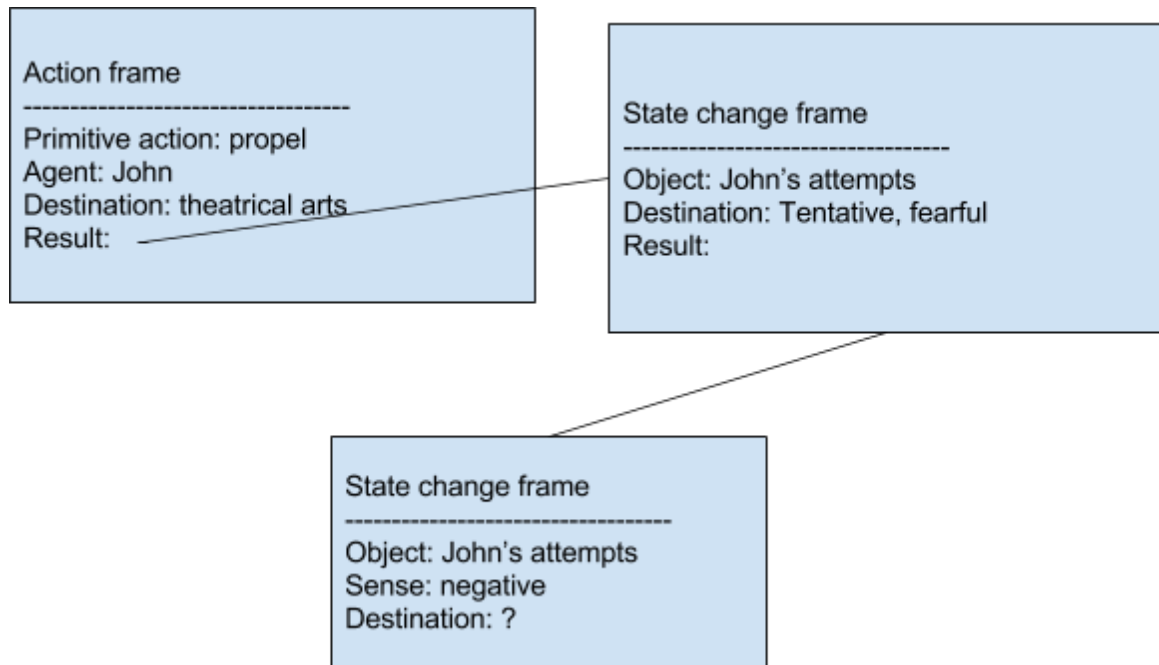
Student: Okay, help me understand the question first. What does forays mean?

Tutor: Forays has different meaning as noun and verb.

.....  
.....  
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The sentence under discussion from above dialog is "Tentative, fearful even, John's first forays into theatrical arts were hardly \_\_\_\_\_". can be represented on tutor side using Common sense reasoning and Understanding concepts.

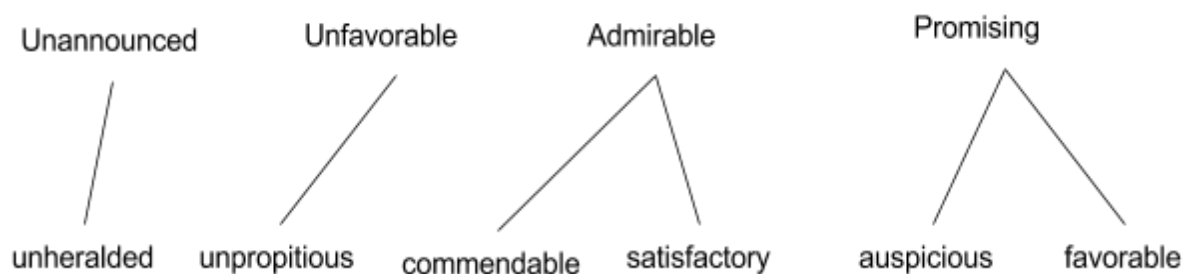
Common sense reasoning can be applied to imply the action in sentence to match with some primitive action. Here, forays can be matched up with the primitive action "propel". The action frames for given question can be represented as follows:



Destination in last state change frame takes the opposite in meaning for the words listing in options since there is the word 'hardly' before the blank in sentence. This is captured by common sense reasoning using the attribute 'Sense' that says the opposite of the word fits in the sentence blank. From the sample sentence, options 6. favorable and 2. auspicious are the right pair of words meaning the same that make the sentence complete. The word 'hardly' makes it mean unfavorable and hence, John's forays into theatrical arts are unfavorable.

The AI agent uses classification to classify these options under different meanings to separate synonym pairs from options. For the sample sentence, classification is as follows happened bottom-up:

Classification: John's forays, state change destination



The whole tutoring mechanism happens through curriculum scripts. AI agent takes help of these scripts to teach different models of questions on different days. A sample curriculum script looks as follows:

Script: Curriculum  
Track: GRE verbal reasoning  
Props: Monitor, Mouse, Web, Table, Pen, Paper, Book  
Roles: Student, Tutor  
Entry: Tutor has subject knowledge; Student is curious to learn  
Result: Tutor enhances teaching ability; Student learns new things  
Scenes: Introduction, Throwing challenge questions, answering known questions, answering unknown questions, etc.

Scene Pick Question:

Action frame		Action frame		Action frame
Prim: expel		Prim: see		Prim: expel
Agent: tutor	—	Agent: student	—	Agent: tutor
Source: corpus		Object: question		Object: 6 options
Object: question				

Likewise, different scenes can be represented. Even the above scene can be broken into many sub-scenes like moving the mouse, student asking for options, etc. different parts of a dialog.

Conclusion: I've a strong feeling that a very successful AI agent can be implemented to prepare students for competitive exams like GRE, GMAT etc. Students have a hard time preparing themselves aggregating resources. They also have a hard time sitting in class either offline or online in particular time schedules. It's also very less lively with a recorded lecture. AI bot can make this very interesting and I'm looking forward for Professor's feedback to actually implement this as a working bot in future.