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Project 1 Reflection
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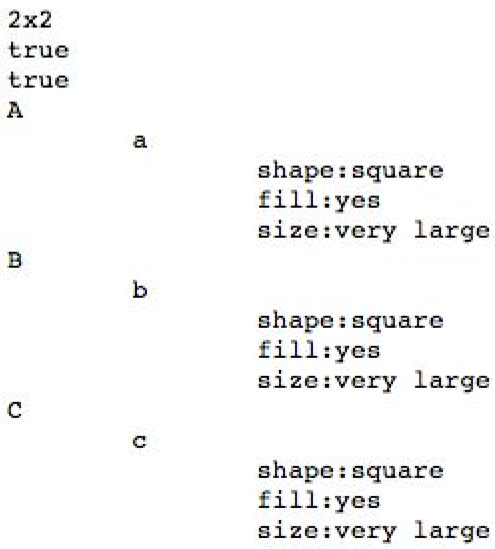
What is your agent's reasoning approach - visual or verbal? Does your agent need to convert between one or the other?

When designing this project I had both approaches in mind, however I have decided to process the text verbally instead of visually. This approach allowed me to create transformation dictionaries for specific differences and similarities between objects. Such verbal approach has its benefits by making it easier to view the semantic network that you are building. However, while I feel that this approach solves all of the given set B problems, I feel that this method could benefit from the use of a hybrid system. The hybrid system would allow visual processing to retain more detail for which would help to score the possible solution immensely.



```
2x2
true
true
A
        a
                shape:square
                fill:yes
                size:very large
B
        b
                shape:square
                fill:yes
                size:very large
C
        c
                shape:square
                fill:yes
                size:very large
```

How does your agent represent/store the images efficiently? What is your agent’s overall problem-solving process?

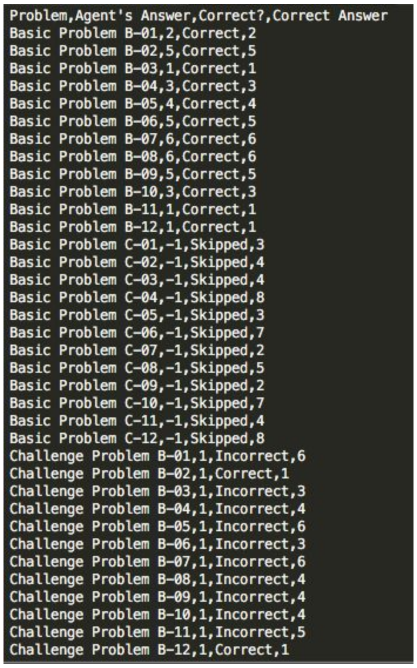
The overall problem-solving process includes both semantic networks and generate and test. Semantic networks allow the object representations to be compared to each other. Once the representations are discovered, the agent loops through each possible solution (1-6). For each possible solution, the semantic network represents the comparison from C to D, where D is within the range (1-6). In order to find a solution, the agent takes the transformation relationships from A to B and C to D. Each attribute has a weight attached within the semantic network to allow for a more precise solution. The answer is finally chosen based on the highest similarity score from C to D (1-6). The images are stored by looping through all of the objects and adding them to a dictionary. Along with the objects, I had created a transformation dictionary to hold all of the transformations as well. Once these were set up, I figured out the comparison of shapes and attributes across figures A, B and C. I believed that having dictionaries to hold and store image properties was the best way to go.

Provide an overview of the design of your agent

As described above, the overview starts with the basics of semantic networks. The agent reads in each objects attribute within each figure and compares them to each other. The comparisons are then recorded and used to find the closest similarity between C and D (1-6). The main classes provided within this project are Agent.py, SemanticNetwork.py and Weights.py. The agents similarities dictionary is built by getting the comparisons between A to B and A to C then goes through each possible solution 1-6. Once the similarity dictionary is completed, the agent can return the figure with the highest similarity score. The design of the agent came was build off of a one problem at a time approach while looking at the harder solutions to see if the agent would be able to solve those as well. By being able to take one problem at a time, the semantic network was able to grow bigger by making more distinct comparisons horizontally and vertically.

What mistakes does your agent makes? Could these mistakes be resolved within your agent's current approach, or are they fundamental problems with the way your agent approaches these problems?

The agent within my project makes a mistakes by generating a random tie breaker which proceeds to answer any non handled problem with special attributes by selecting a random answer for it. The result of this is simply all of the challenge problems answering differently upon each run since they were not handled. These problems can be resolved with the current approach by simply making the network smarter and score attributes differently however I would like to use a more hybrid approach when trying to solve the more challenging problems. When using a hybrid approach scores can be more distinctive and even be gauged by using an x and y location plane. The semantic network would be more fine tuned for solving much more difficult problems.



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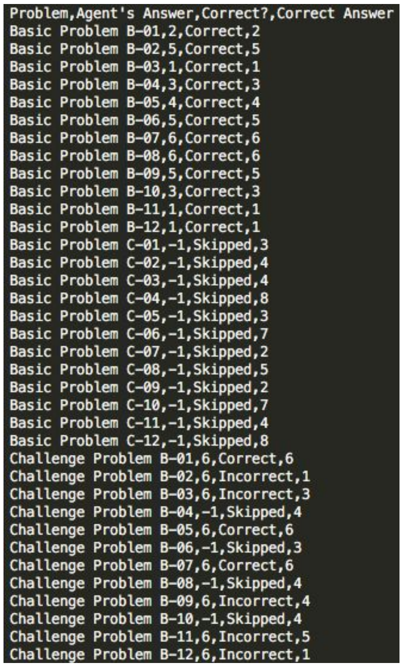
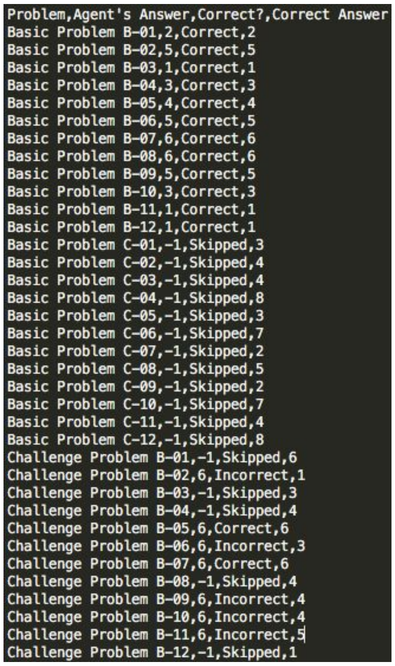
Problem,Agent's Answer,Correct?,Correct Answer
Basic Problem B-01,2,Correct,2
Basic Problem B-02,5,Correct,5
Basic Problem B-03,1,Correct,1
Basic Problem B-04,3,Correct,3
Basic Problem B-05,4,Correct,4
Basic Problem B-06,5,Correct,5
Basic Problem B-07,6,Correct,6
Basic Problem B-08,6,Correct,6
Basic Problem B-09,5,Correct,5
Basic Problem B-10,3,Correct,3
Basic Problem B-11,1,Correct,1
Basic Problem B-12,1,Correct,1
Basic Problem C-01,-1,Skipped,3
Basic Problem C-02,-1,Skipped,4
Basic Problem C-03,-1,Skipped,4
Basic Problem C-04,-1,Skipped,8
Basic Problem C-05,-1,Skipped,3
Basic Problem C-06,-1,Skipped,7
Basic Problem C-07,-1,Skipped,2
Basic Problem C-08,-1,Skipped,5
Basic Problem C-09,-1,Skipped,2
Basic Problem C-10,-1,Skipped,7
Basic Problem C-11,-1,Skipped,4
Basic Problem C-12,-1,Skipped,8
Challenge Problem B-01,1,Incorrect,6
Challenge Problem B-02,1,Correct,1
Challenge Problem B-03,1,Incorrect,3
Challenge Problem B-04,1,Incorrect,4
Challenge Problem B-05,1,Incorrect,6
Challenge Problem B-06,1,Incorrect,3
Challenge Problem B-07,1,Incorrect,6
Challenge Problem B-08,1,Incorrect,4
Challenge Problem B-09,1,Incorrect,4
Challenge Problem B-10,1,Incorrect,4
Challenge Problem B-11,1,Incorrect,5
Challenge Problem B-12,1,Correct,1
```

Run 1



```
Problem,Agent's Answer,Correct?,Correct Answer
Basic Problem B-01,2,Correct,2
Basic Problem B-02,5,Correct,5
Basic Problem B-03,1,Correct,1
Basic Problem B-04,3,Correct,3
Basic Problem B-05,4,Correct,4
Basic Problem B-06,5,Correct,5
Basic Problem B-07,6,Correct,6
Basic Problem B-08,6,Correct,6
Basic Problem B-09,5,Correct,5
Basic Problem B-10,3,Correct,3
Basic Problem B-11,1,Correct,1
Basic Problem B-12,1,Correct,1
Basic Problem C-01,-1,Skipped,3
Basic Problem C-02,-1,Skipped,4
Basic Problem C-03,-1,Skipped,4
Basic Problem C-04,-1,Skipped,8
Basic Problem C-05,-1,Skipped,3
Basic Problem C-06,-1,Skipped,7
Basic Problem C-07,-1,Skipped,2
Basic Problem C-08,-1,Skipped,5
Basic Problem C-09,-1,Skipped,2
Basic Problem C-10,-1,Skipped,7
Basic Problem C-11,-1,Skipped,4
Basic Problem C-12,-1,Skipped,8
Challenge Problem B-01,6,Correct,6
Challenge Problem B-02,6,Incorrect,1
Challenge Problem B-03,6,Incorrect,3
Challenge Problem B-04,-1,Skipped,4
Challenge Problem B-05,6,Correct,6
Challenge Problem B-06,-1,Skipped,3
Challenge Problem B-07,6,Correct,6
Challenge Problem B-08,-1,Skipped,4
Challenge Problem B-09,6,Incorrect,4
Challenge Problem B-10,-1,Skipped,4
Challenge Problem B-11,6,Incorrect,5
Challenge Problem B-12,6,Incorrect,1
```

Run 2



```
Problem,Agent's Answer,Correct?,Correct Answer
Basic Problem B-01,2,Correct,2
Basic Problem B-02,5,Correct,5
Basic Problem B-03,1,Correct,1
Basic Problem B-04,3,Correct,3
Basic Problem B-05,4,Correct,4
Basic Problem B-06,5,Correct,5
Basic Problem B-07,6,Correct,6
Basic Problem B-08,6,Correct,6
Basic Problem B-09,5,Correct,5
Basic Problem B-10,3,Correct,3
Basic Problem B-11,1,Correct,1
Basic Problem B-12,1,Correct,1
Basic Problem C-01,-1,Skipped,3
Basic Problem C-02,-1,Skipped,4
Basic Problem C-03,-1,Skipped,4
Basic Problem C-04,-1,Skipped,8
Basic Problem C-05,-1,Skipped,3
Basic Problem C-06,-1,Skipped,7
Basic Problem C-07,-1,Skipped,2
Basic Problem C-08,-1,Skipped,5
Basic Problem C-09,-1,Skipped,2
Basic Problem C-10,-1,Skipped,7
Basic Problem C-11,-1,Skipped,4
Basic Problem C-12,-1,Skipped,8
Challenge Problem B-01,-1,Skipped,6
Challenge Problem B-02,6,Incorrect,1
Challenge Problem B-03,-1,Skipped,3
Challenge Problem B-04,-1,Skipped,4
Challenge Problem B-05,6,Correct,6
Challenge Problem B-06,6,Incorrect,3
Challenge Problem B-07,6,Correct,6
Challenge Problem B-08,-1,Skipped,4
Challenge Problem B-09,6,Incorrect,4
Challenge Problem B-10,6,Incorrect,4
Challenge Problem B-11,6,Incorrect,5
Challenge Problem B-12,-1,Skipped,1
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Run 3

Please detail on your evaluation/performance criterias and your agent's results. Think about accuracy, efficiency and generality. Are there other metrics or scenarios under which you think your agent's performance would improve or suffer?

The agents results for this first project were positive. The agent handles all of the given B problems and solves them by measuring the different transformations along with with their scores to find the appropriate answer. I started to build the system by taking a one problem at a time approach while keeping the end goal (solving harder problems) in mind. The way that the agent current evaluates the transformations by applying specific weights are efficient enough to handle the first set of problems, however as the problems get more challenging so does the scoring system. For the second project, handling the 3x3 matrices is really going to put the current system to the test. Improvisation will have to be implied to handle the extra set of matrices, along with more comparisons and transformations as things become more complex.

Please provide an explanation of how your methods/components/ideas in your agent's design are/might be similar to (or can be related) to specific KBAI methods discussed in class

The methods that were used to get a working solution of this project came 100% from lectures. From building a semantic network to generate and test, these methods allowed me to build a system smart enough to handle basic problems. When first designing the system, I tried to mimic the semantic network horizontal and vertical transformations that were seen in class for Figure A to Figure B and then repeated it for every possible answer. I had then created a class called Weights.py to handle the weights of similarity for each transformation. This allowed to build a solution that would possible fit the problem. As project complexity increases the semantic network will have to become much stronger to handle different transformations that the agent has not seen before. Along with these transformations, it is going to have to handle them over a 3x3 plane. After the agent is able to handle those for the final project the agent will have to visually build the semantic network while still using generate and test to generate a possible similarity score then testing each transformation from C to 1-6.

What does the design and performance of your agent tell us about human cognition? How is it similar, and how is it different? Has your agent's performance given you any insights into the way people solve these problems?

The design and performance of my agent tells us a lot about human cognition which I find to be extremely fascinating. As human, we perform many different calculations and implement rapid decision making without even realizing it. From the moment we wake up, we decide what to wear, to make coffee or not, what to eat etc.. also have individual actions to complete each goal. These actions could be seen as separate algorithms for each specific activity. The design of my agent tries to replicate the decision making process and perform the correct actions based on each problem it sees. Us humans think on a high level for decision making while then performing the actions that follow, however the Agent needs to break each individual step down after each decision is made. For example given a problem that states Figure A has the following shape: square, size:small and Figure B has the following shape: square, size: large then the agent will have to make a decision that everything within Figure A has stayed the same expect for the size and apply that for any future transformation. My agent's performance has giving me much insight on the way people solve these problems because people tend to first analyze the pictures visually for any differences which is one of the first things that my agent actually tries to do. Once the differences are found, the human then tries to find the solution from amazing Figure C that would best correspond.