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Knowledge Based AI

Project 1 Reflection

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# Introduction

This project set out to solve 2x2 Raven’s Progressive Matrix (RPM) problems. A production system was used as a tool to solve these matrices. While verbal descriptions were provided, this project attempted to solve the problems visually. While this method proved trivial for solving some RPMs, it proved quite difficult for others.

# Theory of Operation

A production system architecture blended with generate and test was used as the basis for project. While the production system in class contained several types of knowledge, the procedural knowledge subsystem was the focus here. Based on different “percepts” of the world (provided through the RPM data structure) various “actions” were taken (i.e., answers were generated) and then tested against the available answers.

The actions in this case were image transformations. A few operations were trivial: no transformation, rotation 90° clockwise, rotation 90° counter clockwise, reflection across the vertical axis, and reflection across the horizontal axis. Image transformations beyond this became less trivial.

# Implementation

Python was the language of choice for this project. Since visual solutions were generated here, the Python package PIL (URL here) was used to manipulate images. This package contained built in methods for rotation and reflection. For transformations beyond these, combinations of operators were used. For instance,

# Results and Discussion

The implementation was tested several different ways. First was a set of in-sample RPMs provided by the instructor. These results can be seen in Table 1 and fig 1 below. DISCUSS RESULTS HERE.

Table : In-sample Results

|  |  |  |
| --- | --- | --- |
| Problem | Answer | Correct Answer |
| Basic Problem B-0 |  | 2 |
| Basic Problem B-0 |  | 5 |
| Basic Problem B-0 |  | 1 |
| Basic Problem B-0 |  | 3 |
| Basic Problem B-0 |  | 4 |
| Basic Problem B-0 |  | 5 |
| Basic Problem B-0 |  | 6 |
| Basic Problem B-0 |  | 6 |
| Basic Problem B-0 |  | 5 |
| Basic Problem B-0 |  | 3 |
| Basic Problem B-0 |  | 1 |
| Basic Problem B-0 |  | 1 |
| Challenge Problem B-0 |  |  |
| Challenge Problem B-0 |  |  |
| Challenge Problem B-0 |  |  |
| Challenge Problem B-0 |  |  |
| Challenge Problem B-0 |  |  |
| Challenge Problem B-0 |  |  |
| Challenge Problem B-0 |  |  |
| Challenge Problem B-0 |  |  |
| Challenge Problem B-0 |  |  |
| Challenge Problem B-0 |  |  |
| Challenge Problem B-0 |  |  |
| Challenge Problem B-0 |  |  |

Pie chart of correct vs. incorrect vs. not answered

The second test was using out-of-sample RPMs that were also provided by the instructor but that could only be tested a limited number of times. The latest results can be seen in \_\_\_ below. (Note: The answers were randomly ordered, so a table was not useful in this case.) DISCUSS RESULTS

# Conclusions and Future Work