RPM Milestone 1:

CS7637

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1 Abstract

In this paper, I will propose a computational method for solving the image transformation puzzles known as Raven's Progressive Matrices test of intelligence, which involves finding the missing image in a sequence of images based on the transformation applied. My approach utilizes a 2D array representation of the images. The percent change between each image is calculated, and the answer with the closest percent change from the respective slides is selected. I will also perform rotations on the images and quadrant analysis to improve the accuracy of our method.

2 INTRODUCTION

Image transformation puzzles are a prevalent problem in cognitive psychology, which involve finding the missing image in a sequence of images based on the transformation applied to each image. The human approach to solving these puzzles involves seeing patterns and looking for combinations of changes such as shape transformation, rotation, translation, size, and the number of shapes. However, this approach is time-consuming and may not be accurate.

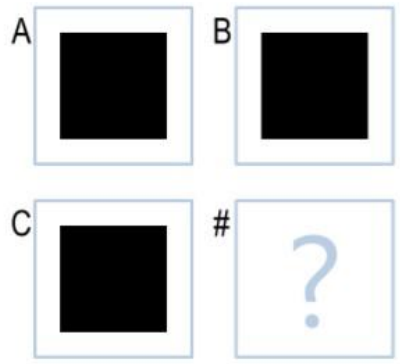
3 HUMAN APPROACH

Humans are good at seeing pa erns even when there aren't any. So the way that I would break these down would be to look for combinations of types of changes such as shape transformation, rotation, translation, size, and the number of shapes.

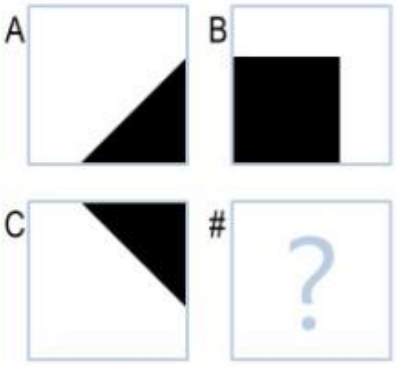
First, we would evaluate change from A-B and look for similar changes in C-#.

Then compare the change in A-C with B-#. Finally for B-C match A-#.

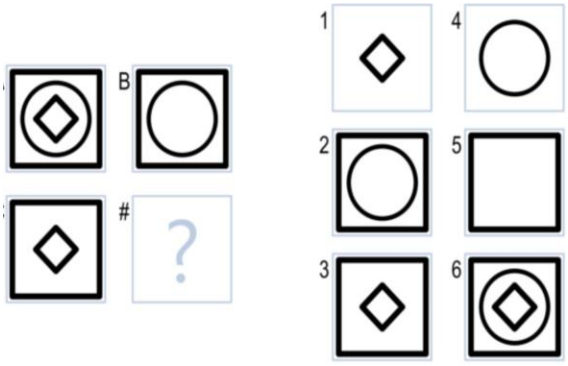
4 PROBLEM SELECTION



For this one, we would see A-B and C are the same and assume # is also.



For this, A-B has an axis flip and then a shape change from a triangle to a square. Then A-C we see another axis flip with the same shape. So for #, we can expect a square in the top left corner.



This one is more difficult if we only use A-B and A-C. In both of those, we see one shape is lost but that lost shape changes in a different direction. But by realizing that A-# also has to follow the same logic we would see 5 makes the most sense.

5 Agent Approach

The problem of trying to get a computer to solve these problems as a human would is with tracking shapes and being able to quickly see what the transformations are between slides.

I instead plan to convert the image into a 2D array of 1s and 0s and check the percent change between the different slides and then look for which answer has the closest present change from the respective slides. I will also perform transformations such as rotating B and C and whichever number of rotations gets the slides closest to A, I will do that number to each of the answers and see which is closest to that percent change. Lastly, I will break each slide into quadrants and look at the change in each quadrant from one slide to the next and try to match that in the answers.

4 Challenge

One weakness of this method is its inability to account for overlapping transitions. It will also not be able to determine shape changes. Lastly, although this should be able to solve the problems for the majority of the sets it is not mimicking how a human would approach these problems and not using any predetermined knowledge like shapes.