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Knowledge Based Artificial Intelligence

Assignment 1

5/29/2016

# Introduction

This assignment attempts to describe the means by which the transformations between images can be determined both verbally and visually. These transformations can then be uses to solve tests of intelligence such as the Raven’s Progressive Matrices (RPMs). While such a task can be simple for humans it can be quite a challenge for computers. Humans have an amazing ability to process both verbal and visual data and infer relationships. Computers need to have all these relationships explained; they are not able to infer these relationships as easily as humans. Production systems are one method that computer scientists use to endow computer with some of the intelligence of humans to infer these relationships. The remainder of this paper describes how Production Systems (and its related techniques) can be used to solve RPMs.

# Problem Description

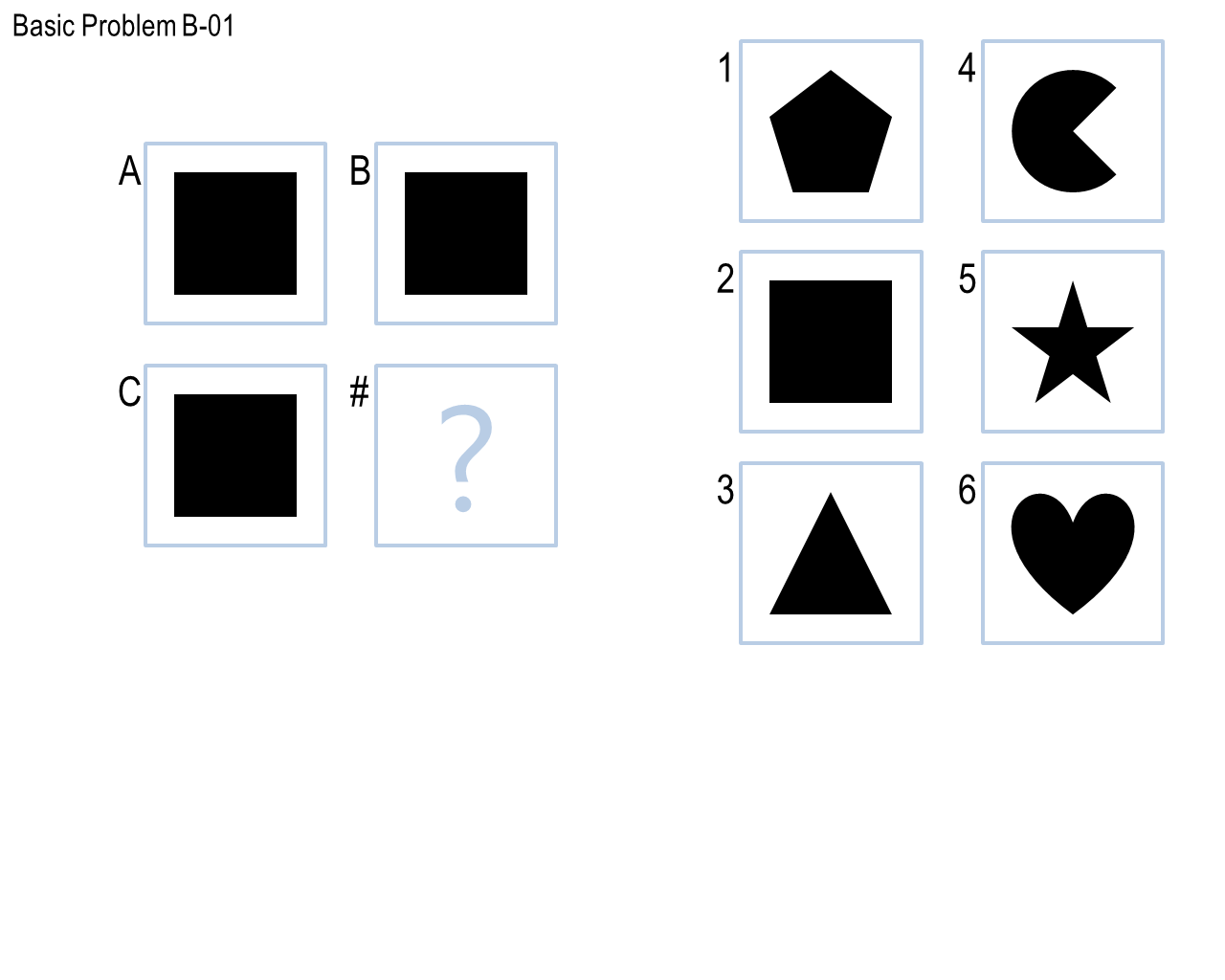


Figure : Example of a Raven's Progressive Matrix

# Approach

As mentioned previously, a production system is one tool that can be used to solve the RPMs. One such widely used production system is known as SOAR. A production system is, as the name implies, a system, and like most systems it has an architecture. See Figure 1 for the architecture of SOAR which consists of a long term memory, each with its own set of knowledge, and a working memory for “scratch work.” The procedural knowledge is essentially a set of *if-then* rules that describe how to do certain tasks. Certain percepts in the world lead to certain actions to be taken. The semantic knowledge contains models and views of the world. The episodic knowledge contains particular instances of events, a means of keeping track of what has happened in the past. All these pieces working together can be a very powerful problem solving tool.

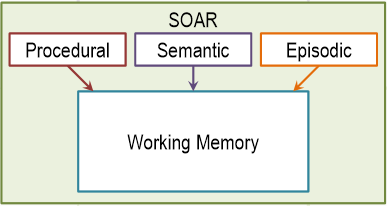


Figure : Production System Architecture

Applying the production system to RPMs, we will assume that we have semantic knowledge about the RPMs – how the elements of an RPM relate to each other for the various size (2x2 and 3x3). The episodic knowledge would store RPMs that have been encountered in the past along with the solution (if it is present). The procedural knowledge would take information about the RPM and determine what the answer should be. For example, one of the easiest and most important distinctions to make would be the size of the RPM. Solving a 2x2 matrix involves different techniques than solving a 3x3 matrix.

Provide some pseudo code for the procedural section

* First would be break on size of matrix
* Second would be whether there is a verbal description or not
  + If verbal, then construct a semantic network
  + If no verbal, solve visually (run image transformations)

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# Conclusion