MACHINE UNDERSTANDING - TESTING PERCEPTUAL ABILITIES OF A MACHINE: THE MATRIX TEST

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Abstract

In this paper the matrix tests were used to test machine ability to solve the complex visual problem. For the purpose of this research, the matrix test was divided into three categories: the geometrical matrix test, the arithmetical matrix test and the finding relationships matrix test. The proposed method of solving the matrix test is based on the introduced by authors notion of the perceptual transformation. Solving the matrix test requires application of the geometrical, the arithmetical or the symbolic perceptual transformation. The geometrical perceptual transformation is applied to solve the low-level perceptual problems such as a geometrical matrix test by application of the processing transformation. Similarly, the arithmetical perceptual transformation is applied to solve the perceptual problems such as a arithmetical matrix test by application of the processing transformation. The arithmetical matrix test is solved by application of the arithmetical perceptual transformation that assigns the i-th type (the shape type) to objects and finds the algebraic relations among these i-th type objects. The symbolic perceptual transformation is applied to solve the high-level perceptual problems. Finding the symbolic perceptual transformation requires transforming the sequence of objects that represent a given visual intelligence test into the set of symbolic names by applying the processing transformations in the visual reasoning process. The reasoning process is a very important part of finding of the solution to the test because the form of the symbolic perceptual transformation depends on the shape categories to which each object is assigned during the visual reasoning process belongs, the type of symbolic representation and form of the symbolic names. The result obtained shows that SUS is able to solve any matrix problem that is well formulated, that means have an unique symbolic representation in terms of symbolic names introduced by authors. Based on this assumption it is possible to extend the validity of the results obtained by claiming that the proposed method based on the machine understanding approach can be applied to any visual intelligence tests. This claim is supported by the result obtained for applying this method to solve other tests such as visual sequence tests or the visual analogy tests.

KEYWORDS: machine understanding, matrix test, geometrical perceptual transformation, arithmetical perceptual transformation, symbolic perceptual transformation, visual reasoning