

## **MACHINE UNDERSTANDING - TESTING VISUAL UNDERSTANDING ABILITIES OF A MACHINE: THE VISUAL ANALOGY TEST**

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### **Abstract**

In this paper the visual analogy tests (VAT) were used to test a machine's ability to solve the complex visual problems. Proposed method of solving visual intelligence tests is based on introduced by the authors' notion of the perceptual transformation. The elementary perceptual transformation is used for generation of objects, members of the selected shape category, the analogy perceptual transformation is used for generation of the analogy objects and the VAT perceptual transformation is used for generation of the test objects. Solving the visual intelligence test can be seen as solving the problem that for a given sequence of objects, representing a test, selects the appropriate form of the VAT perceptual transformation and applies this transformation to generate the solution. The proposed method of solving the visual intelligence test is part of the machine understanding approach testing perceptual ability of a machine to solve the different visual intelligence tests as well as complex visual problems. Solving any visual intelligence test requires application of a geometrical or symbolic perceptual transformation, however in solving the VAT test usually the symbolic transformation is applied, and for this reason, in this paper, only the symbolic perceptual transformation is described. Finding this symbolic perceptual transformation requires transforming of 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 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, the type of symbolic representation and form of the symbolic names. The result obtained shows that SUS is able to solve any visual analogy problem that is well formulated, that means has a 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 test. This claim is supported by the result obtained for applying this method to solve other tests such as matrix tests, visual sequence tests or the odd one out tests.

**KEYWORDS:** machine understanding, visual analogy test, perceptual transformation, visual concept, visual reasoning