

# **ARTag, AprilTag and CALTag fiducial marker systems: Comparison in a presence of partial marker occlusion and rotation**

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## **Abstract**

© 2017 by SCITEPRESS - Science and Technology Publications, Lda. All Rights Reserved. Fiducial marker systems consist of patterns that are placed in environment and are automatically detected with a camera using appropriate for the marker detection algorithm. Marker systems are useful for many modern visual applications such as augmented reality, robot navigation and collaboration, industrial and space robotics, and human-robot interaction. A variety of applications demands certain quality assurance for marker properties. Among the most common criteria are resistance to partial occlusion and rotation, sensitivity to lightning conditions, marker size, false positive and false negative rates. This paper compares three types of markers for their resistance to partial occlusion in various types of occlusion and resistance to normal, lateral, and longitudinal rotations. Intensive experimental comparison of tags is presented with analysis. Detection of markers was performed with a common Web camera. Based on our experimental results, we have selected a marker system, which should be preferred for real world applications when only simple inexpensive hardware is available and appearance of rotation and occlusion disturbances are expected in the environment. Our long term goal is to calibrate humanoid robot manipulators in real-world environment applying a pre-calibrated camera of the robot, while the presented in this paper results help selecting a most suitable marker system for further calibration procedures.

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## **Keywords**

AprilTag, ARTag, CALTag, Experimental comparison, Fiducial marker, Occlusion

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