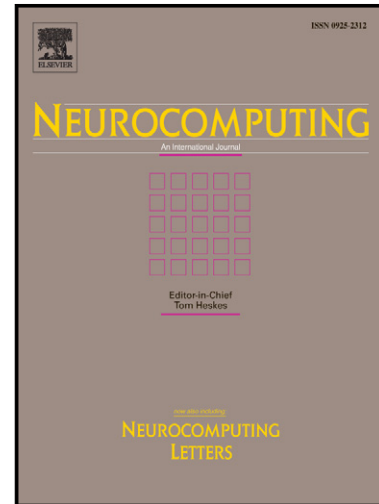


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Scene Understanding

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Logics based on Qualitative Descriptors for Scene Understanding

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Abstract

An approach for scene understanding based on qualitative descriptors, domain knowledge and logics is proposed in this paper. Qualitative descriptors, qualitative models of shape, colour, topology and location are used for describing any object in the scene. Two kinds of domain knowledge are provided: (i) categorizations of objects according to their qualitative descriptors, and (ii) semantics for describing the affordances, mobility and other functional properties of target objects. First order logics are obtained for reasoning and scene understanding. Tests were carried out at the *Interact@Cartesium* scenario and promising results were obtained.

Keywords: qualitative shape, qualitative colour, spatial descriptors, topology, location, domain knowledge, object detectors, logics

1. Introduction

1 In an envisaged future in which we live in smart homes and intelligent robots populate our
2 world we imagine an everyday phone conversation with our home ambient intelligent vision sys-
3 tem (or robot), asking it “Is everything fine?” which the system happily confirms. However, if
4 everything is fine or not at home from the human perspective is not a simple observable fact for a
5 machine. It requires cognitive interpretation. So that an artificial intelligent agent can reach such
6 a conclusion in alignment with the human, the agent needs to be able to observe its environment
7 and interpret the information perceived in a cognitive manner. Let us continue with the example
8 and consider that our robot detects a patch of water on the floor—should that be considered to be
9 normal? Clearly, for a human, the interpretation of such observed information varies, depending
10 on where and when the patch of water was recognized: a patch of water on the bathroom floor
11 close to the shower can be a typical outcome of normal use, while a patch of water on a parquet
12 flooring next to a window after a rainy day is a clear indication of something wrong (i.e. maybe
13 a broken window, maybe a leaking flowerpot, etc.). Interpreting the meaning of a feature occur-
14 rence like the patch of water thus requires consideration of *context*. Due to the variety of possible
15 situations, *reasoning* is required in order to state a hypothesis and reach a conclusion based on a
16

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