OUTDOOR SCENES INTERPRETATION SUITABLE FOR BLIND PEOPLE NAVIGATION

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INTRODUCTION

One important problem for blind people during their navigation in the outdoor environment, is the need for external help while reaching a specific place. This dependence could be reduced supplying the blind person with a smart mobile system capable of giving simple scene descriptions and useful landmarks.

In this paper a system which gives an interpretation of real scenes through single (monocular) image analysis is proposed.

Indoor and Outdoor scenes in natural situations, without any expedient to make image interpretation easier, have been used to validate the system. The main goal of the proposed architecture is to provide help for blind people navigation, but the techniques developed are suitable for robotics applications too. In order to guarantee the maximum flexibility, it is assumed an absolute lack of "a priori" knowledge about the scene contents.

Scenes are described using simple primitives such as surfaces, zones and their spatial relations.

A new vanishing point detection method has been developed.

IMAGE INTERPRETATION APPROACH

The images used in this work come from "Complex Scenes" (Indoor and Outdoor scenes in natural situations, without any expedient to make image interpretation easier). This means that the system has got a very poor "a priori" knowledge about the scene contents. Furthermore the the interpretation process are segments and regions. Regions come from segmentation of the image based on color and brightness information; usually the obtained regions represent scene entities with similar physical proprieties.

Segments come from edges and so they represent important physical and geometrical properties of the objects in the scenes. Using segments, 3D relations from 2D image characteristics can be obtained. In real scenes, that are very variable, the segments alone do not give enough information to obtain a scene description (this is not the case with Indoor applications). In particular there is a lack of general criteria for segment grouping. To explain the problems that a "segment-based" interpretation approach meets working with "Complex Scenes", it is possible to report two examples:

- many applications, like Indoor ones, assume that the scene represent a polyhedral world ("Legoland") [3] and the segments have, at most, only three mutually perpendicular directions in the scene. This simplification can make vanishing point detection, surface extraction and interpretation easier. But in a Real Scene the segments have a lot of different direction (especially on the "Fractal" objects), the useful vanishing points may be more than three or less than one and so on. If the system force the "Legoland" simplification it will introduce a lot of errors in vanishing point detection and then in segments classification and grouping;
- it is very difficult to connect the segments to perform a surface interpretation because they are often incomplete, and the noise and Fractal object introduce many