

(様式2)

学位論文の概要及び要旨

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題 目 Horse-Vision-System-Based Scene Analysis and Single-View Scene
Understanding from Omnidirectional Image

(Horse-Vision-Systemによる環境解析および一枚の全方位画像による環境理解)

学位論文の概要及び要旨

There are two challenging tasks in computer vision. One is to construct a vision system to execute scene analysis in special environment, for the case which humans are not able to do, such as an endoscope for visual examination in hospitals, an omnidirectional camera for surveillance with a large field of view. On the other hand, we want computers to understand our world the way we do, make scene understanding more human-centric, referring to scene understanding.

In this thesis, we focus on the application of omnidirectional cameras in scene analysis and scene understanding. At first, we propose a method of scene analysis based on a horse vision system. A horse vision system (HVS) consists of a pair of fisheye cameras which have a hemispherical field of view, respectively, and are laid to overlap each other partially. The characteristics of the HVS result in a representation which enables a wide omnidirectional monocular vision and a limited-field-of-view binocular vision simultaneously. We present the method for the realization of the proposed HVS and the preliminary experimental results of scene analysis based on the HVS.

Secondly, we study the problem of recovering the structure of an indoor scene from a single image. We introduce a novel method of estimating the spatial layout of rooms from a

single fisheye image. However, fisheye images involve just partial scene, which result in visually open boundary condition, called *open geometry*. A full-view image results in a visually close boundary condition, called *close geometry*. We employ the characteristics of close geometry to explore indoor scene understanding from a single full-view image.

Additionally in scene analysis, we also want to transform the unfamiliar images captured by special cameras into the view similar to that of humans' vision. As a basic processing operation of omnidirectional images, we propose a method of quickly generating the perspective display from a full view image according to users' view direction and zoom-in/out operation.