

A High Speed Face Measurement System

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Abstract

In this paper, A rangefinder system which measures both 3-D shape and color texture of a human face is described. Measurement speed is an important factor for human body sensing, to reduce a burden on the subject. In our system, high-speed face measurement is achieved by using a space-encoding method with laser scanning. This system equips a color CCD camera as an image input device which grabs both range and color texture images. There is the possibility that laser radiation is harmful for human eyes, and our system meets the Japanese radiation safety standards for laser products. In our experiment, this system obtained 3-D shape and color texture information in about 1 second. The measurement error on shape was less than 1 mm.

1 Introduction

The research focused on processing face information has been extensively studied in many years. Most of the research has done with intensity images of the face. However, with the progress of shape measurement, virtual reality and computer graphics technology, there has been growing interest in new fields, such as man-machine interfaces, security and teleconferencing. In these fields, obtaining 3-D face model is highly demanded [4][5]. A face measurement system described in this paper can be used in the above application fields.

In recent years, rangefinder systems obtaining both range and intensity images, especially the color texture on the object surface, have been developed and used for re-

search. For example, Suenaga used a system based on triangulation using slit-ray[3]. However, this measurement system takes about 15 seconds to measure the upper part of a body.

One problem in face sensing, not only the face but also the body, is measurement time. Obtaining a range image takes time compared to an intensity image. Thus, a person must remain stationary during the measurement. This places a burden on the subject, but less attention has been paid. Even if the actual measurement time is about 10 seconds, the person unconsciously moves slightly. Therefore, it is difficult to obtain stable measurement results.

In this paper, a high speed measurement system for 3-D face model at a speed high enough to reduce the burden on the subject is described. In our system, high speed measurement is achieved by using a space-encoding method with laser scanning. Through this method, both high-resolution range and intensity images are obtained in 1 second. We also describe that our system meets Japanese Radiation Safety Standards for laser products.

2 High Speed face Measurement System

2.1 Concepts for the System

We considered the following properties for the face measurement system.

- (a) Obtaining both 3-D shape and color texture.
- (b) Occlusion-less measurement.
- (c) High-speed measurement.

