We are working on a new image compression scheme which does not require decompression for image recognition. Conventionally, image recognition and image compression are two different research areas which are independent from each other, and compressed images need to be decompressed before recognition. With this project, we are developing an image compression method so that the decompression process is not needed for recognition. As another feature of this project, we are working on three-dimensional images, but not conventional two-dimensional images, which include distance information between each object and the camera system.

We have developed a compact three-dimensional image data acquisition system which requires only a personal computer, two plug-in boards, and three TV cameras for real-time operation. The system focuses its computational power on only relevant image regions to achieve its compactness without sacrificing its processing speed. For image compression, we proposed an edge-based method while the main stream of conventional image compression methods use a spatial frequency scheme. Edges are points where the image intensity and/or color change significantly. Images are segmented into small regions by using edge information. The compression system calculates the attributes of each region including distance, color, and intensity. Let's assume, as an recognition example, that we would like to find a red Ford Taurus from a large amount of three-dimensional image database. The image database consists of the following four domains: edge, distance, color, and intensity. The recognition system first uses the color domain to find images which include red color regions. From the corresponding edge and distance domain information, the size of each red region is compared with the expected size. The images with high possibilities of including a red Ford Taurus are decompressed for detailed recognition.

We are evaluating the system as a traffic monitoring video network. The traffic monitoring network consists of a large number of wayside video cameras connected to hierarchical control centers. The centers monitor the number of vehicles per minute and an average vehicle speed, detect vehicle accidents, provide traffic condition information, and control wayside variable message boards.

Recognition of Three-dimensional Compressed Images without Decompression

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