Automatic Scoliosis Detection Based on Local Centroids Evaluation on Moiré Topographic Images of Human Backs

HyoungSeop Kim, Member, IEEE, Seiji Ishikawa, Member, IEEE, Yoshinori Ohtsuka, Hisashi Shimizu, Takashi Shinomiya and Max Viergever, Member, IEEE

This paper presents a technique for automating human scoliosis detection by computer based on moiré topographic images of human backs. Scoliosis is a serious disease often suffered by teenagers. For prevention, screening is performed in schools employing a moiré method in which doctors inspect a number of moiré images of subjects’ backs visually. In order to automate this inspection process, unlike existent techniques based on three-dimensional shape recovery, displacement of local two-dimensional centroids is evaluated statistically between the left-hand side and the right-hand side of the moiré images in the present technique. The technique was applied to real moiré images to draw a distinction between normal and abnormal cases. According to the leave-out method, the entire 120 image data (60 normal and 60 abnormal) were separated into three data sets. The linear discriminant function based on Mahalanobis distance was defined on the two-dimensional feature space employing one of the data sets containing 40 moiré images and classified 80 images in the remaining two sets. The technique finally achieved the average classification rate of 88.3%.