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Patient's actions recognition in hospital's recovery department based on RGB-D dataset

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Abstract
A recovery room is a necessary unit of hospital nursing that should be continued in the operating room. The goal of recovery is to provide high-quality care for patients undergoing post-surgical recovery, in contrast to the effects of anesthetic drugs, such as sudden movements of the hands and legs, standing, or falling from the bed that may occur instantaneously. Due to the shortage of nurses in the recovery room that these units face, the need to use remote monitoring systems for patients is increasing to somehow compensate for the lack of service personnel and that assist staff in better monitoring of patients. In this study, using a combination of geometric features and depth data, a patient's actions are recognized. Then, the actions that are at risk for patients in the recovery room will be identified and notified to the nursing unit before its occurrence to take necessary measures. For this purpose, RGB-D data is collected and analyzed. The proposed methodology steps in this study generally include recording video images using Kinect sensors (457 videos with 640 × 480 resolution), extracting features from video frames (color separation-based approach), training the Hidden Markov Model to classify the indicator vectors, and finally evaluation and validation of the model. Experimental results indicate that the proposed identification method can accurately detect moments that the patient is exposed to danger due to their changes in the hospital bed. The recognition rate for this approach is 91.36%.

Keywords Action recognition · Recovery room · Hospital · Geometric and spatiotemporal features · Hidden Markov Model

1 Introduction

Patient monitoring systems are one of the most important monitoring tools used in hospitals [6]. These devices allow doctors and nurses to continuously monitor the status of their patients

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