Chapter 8

Shape Determination of Aspired Foreign Body on Pediatric Radiography Images Using Rule-Based Approach

Vasumathy M
VIT University, India

Mythili Thirugnanam
VIT University, India

ABSTRACT

Foreign body aspiration (FBA) is a common problem among pediatric population that requires early diagnosis and prompt successful management. Conventionally the radiography image inspection processes are carried out manually by the experts of medical field. Recently automated systems are developed to improve the quality of the radiography images but none of the work carried out especially to determine the characteristics of the foreign bodies in pediatric foreign body aspired radiography images. The proposed approach focuses on characterizing the foreign body shape using sixteen various geometric and edge features. The shapes are determined by using fuzzy logical connectives formed by logically connecting two or more extracted information and a binary decision tree. More than 100 X-Ray radiography images are used to obtained the experimental research. The method proved that the results are more accurate in determining the foreign body shapes as circle, polygon, sharp and irregular automatically with less time.

INTRODUCTION

Worldwide, the foreign body aspiration is considered as most common cause of accidental death of children. First popular diagnostic tool for identifying foreign body is X-ray that can show the presence of abnormal region. This diagnosing tool has complemented the radiologists and medical practitioners to take right decision in right time in the pediatric foreign body aspiration treatment management process. The treatment management of foreign bodies are always depends on their size, shape and location.

DOI: 10.4018/978-1-5225-2053-5.ch008

Copyright © 2017, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.
Hence, it is important to develop an approach to identify the evidence such as size, shape and location for the early recognition and timely treatment of foreign body aspiration. The proposed work utilizes the knowledge of predefined foreign body characteristics and the knowledge of the various image processing operations used in the existing works for image enhancement and segmentation of foreign body aspired pediatric X-ray images. Some of the existing work has been surveyed for assessing the significance of aspired foreign body characteristics of the foreign body in pediatric foreign aspired radiographic images. The experimental test results are presented with classification accuracy to strengthen the proposed work significance in the process of aspired foreign body treatment management.

Related Works

Sajid Ullah Khan et al., (2016) proposed a novel and efficient enhancement algorithm based on image fusion using a discrete wavelet transform on pediatric X-ray image. The proposed algorithm has significant proficiency in the enhancement of degraded X-ray images. Raihan Firoz et al., (2016) proposed morphological transform for medical image enhancement. Contrast of various medical images can be enhanced using proposed approach. The results indicate that this morphological transform method improves the contrast of medical images and can help with better diagnosis. Thacker et al., (2016) discussed about most recent advances in Multi detector CT Diagnosis of Pediatric Pulmonary with imaging information. Reviews of most recent updates on MDCT diagnosis of pediatric pulmonary thromboembolism are presented. Xiao-ying Xing et al. (2015) summarize imaging features of pediatric spinal tuberculosis. The spinal X-ray, CT and MR presentations of 21 patients aged lesser than 18 years old patient’s typical imaging findings are discussed with Pediatric spinal tuberculosis. Kramer et al., (2015), suggested that determining treatment management of FBA requires assessment of foreign body size, type of object ingested, location, clinical symptoms and time since ingestion and concludes, it is important to provide strong evidence base to develop guidelines for the treatment management of FBA. Jasani et al., (2015) discussed about various algorithms for shape detection and texture feature extraction of fruits and conclude that the Circular Hough Transform (CHT) and Edge Detection and Boundary Tracing algorithm are provided the best results. Kaviani et al., (2014), mentioned that the detection of foreign bodies is dependent on the imaging and the characteristics of the foreign body such as the material, size, and its location. Foreign bodies such as metal, stone, glass, and graphite are visible in radiographic images with size greater than or equal to 0.5 mm. Talati et al. (2014) proposed shape context descriptor for image feature extraction. The descriptor improves feature extraction efficiency by using shape parameter and shape representation method by using properties such as translation, rotation and scale invariant and gives good retrieval accuracy in gray scale dataset. Tirpude et al., (2013) conclude that introducing concept of image segmentation techniques in medical images will reduce the process of manual intervention. Park et al., (2013) presented a study to identify the risk factors of complication after foreign body removal. The most common foreign bodies in the pharynx, esophagus, and stomach were coins, fish bones, and springs. The mean size of the foreign body in failed cases is 3.6 cm and the successful cases mean size is 2.7 cm. Z.M. Raahat et al., (2013) Chances of coin impaction are directly proportional to its size and inversely with the age of child. The larger FB (20 to 23mm) tends to impact in the esophagus. Smaller pass into the stomach and intestine. Tian et al.(2013) presented a review on the recent development in feature extraction and provides survey on image feature representation techniques. The global, block-based and region-based features are compared for performance analysis and conclude the combination of all works better for images feature extraction. Erbil et al, (2013) described that plain radiography is
Related Content

Replicating the Role of the Human Retina for a Cortical Visual Neuroprosthesis
[www.igi-global.com/chapter/replicating-role-human-retina-cortical/72035?camid=4v1a](www.igi-global.com/chapter/replicating-role-human-retina-cortical/72035?camid=4v1a)

3D Plant Modelling Using Spectral Data from Visible to Near Infrared Range
[www.igi-global.com/chapter/3d-plant-modelling-using-spectral-data-from-visible-to-near-infrared-range/139598?camid=4v1a](www.igi-global.com/chapter/3d-plant-modelling-using-spectral-data-from-visible-to-near-infrared-range/139598?camid=4v1a)

Direct 3D Information Determination in an Uncalibrated Stereovision System by Using Evolutionary Algorithms
[www.igi-global.com/article/direct-information-determination-uncalibrated-stereovision/55098?camid=4v1a](www.igi-global.com/article/direct-information-determination-uncalibrated-stereovision/55098?camid=4v1a)

Review on Texture Feature Extraction and Description Methods in Content-Based Medical Image Retrieval
Gang Zhang, Z. M. Ma and Li Yan (2009). Artificial Intelligence for Maximizing Content Based Image Retrieval (pp. 44-67).
[www.igi-global.com/chapter/review-texture-feature-extraction-description/4151?camid=4v1a](www.igi-global.com/chapter/review-texture-feature-extraction-description/4151?camid=4v1a)