UNIVERSITI TEKNOLOGI MARA

AUTOMATED DETECTION OF LUNG LESIONS IN COMPUTED TOMOGRAPHY IMAGES USING IMAGE PROCESSING TECHNIQUES AND INTELLIGENT SYSTEM

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ABSTRACT

Lung cancer is a common cause of death among people throughout the world. Lung cancer detection can be done in several ways, such as Radiography, Magnetic Resonance Imaging (MRI) and Computed Tomography (CT). Based on this method CT is suitable for lung cancer detection, that offers a lower cost, short imaging time and widespread availability. Early detection of lung lesion is important for clinical analysis on effective prevention planning by medical authorities to reduce the number of mortalities. Lesion identification on CT images manually identified by experienced radiologists commonly uses visual score. However, the manual method is time-consuming, tedious, labour-intensive and intervisibility. Recently, research on fully automated lung lesion identification that aims to overcome the problems of manual delineation has attracted a lot of attention. This research proposes a method for automatically detecting the lesion in soft lung tissue for CT images. The system is designed to detect lung lesions from CT images using image processing and machine learning techniques. Generally, the proposed automated identification system is divided into five stages. The first stage is image acquisition and data collection. The second stage proposed method involved the development of Deep Convolutional Neural Network (DCNN) architecture that comprises the following steps: Designing a new procedure for lung region segmentation from the thorax region using an image processing technique specifically for lung region. The next stage is the detection of lesions. A lung lesion's characteristics concentrate on image characteristics based on the geometrical properties. The fourth stages present a novel method to predict the possible CT images consisting of lesions using optical flow and statistical analysis. Once the possible images have been identified, the final stage explains an automated lesion identification for further classifying the lesion and non-lesion from CT scan lung images. This is the last stage of lesion identification based on the features selected from the new method using optical flow and statistical analysis. Overall, the method can identify lung lesions in CT images. Finally, a system that utilized the best of above-mentioned methods is proposed to perform the automated lesion detection. The method achieved high capability for automatically identifying lung lesions near the manually delineated lesion by radiologists with 98% accuracy. These findings suggest the potential use of this system as an aided tool for the radiologist in detecting lung lesions.

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