Gray-Level Co-occurrence Matrix Bone Fracture Detection

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Abstract: Problem statement: Currently doctors in orthopedic wards inspect the bone x-ray images according to their experience and knowledge in bone fracture analysis. Manual examination of x-rays has multitude drawbacks. The process is time-consuming and subjective. Approach: Since detection of fractures is an important orthopedics and radiologic problem and therefore a Computer Aided Detection (CAD) system should be developed to improve the scenario. In this study, a fracture detection CAD based on GLCM recognition could improve the current manual inspection of x-ray images system. The GLCM for fracture and non-fracture bone is computed and analysis is made. Features of Homogeneity, contrast, energy, correlation are calculated to classify the fractured bone. Results: 30 images of femur fractures have been tested, the result shows that the CAD system can differentiate the x-ray bone into fractured and non-fractured femur. The accuracy obtained from the system is 86.67. Conclusion: The CAD system is proved to be effective in classifying the digital radiograph of bone fracture. However the accuracy rate is not perfect, the performance of this system can be further improved using multiple features of GLCM and future works can be done on classifying the bone into different degree of fracture specifically.

Key words: Texture analysis, bone fracture, gray-level co-occurrence matrix, image processing, long-bone fractures CAD system, detection system, radiologic problem, femur bone

INTRODUCTION

Today, a large number of x-ray images are interpreted in hospital and computer aided system that can perform some intelligent task and analysis is needed in order to raise the accuracy and bring down the miss rate in hospital. Conventionally, doctors in hospital examine the bone x-ray images based on their experience and knowledge whether a fracture exist. These kinds of manual inspection of x-rays consume a lot of time and the process itself is monotonous and mistakes might be made during the inspection (Wee and Supriyanto, 2010).

This study discusses the development of a system which can differentiate the fractured bone from the non-fractured bone. Other objective includes classification of specific type of fractured femur. This study will focus on femur shaft fracture detection.

Femur is the longest and the strongest bone in the skeleton in our human body. It is not vertical in the erect posture and is separated above from its fellow by an interval corresponding to the breadth of the pelvis, but inclining gradually downward and medial ward, near the line of gravity of the body. The Inclination mentioned is not identical in all people and is greater in the female. Like other long bones, the femur is divisible into three main parts, which are the body (Diaphyseal) and the two extremities.

The fractures of the femur's Diaphyseal will only occur during serious incident. These fractures often happen in the same extremity including the fractures of the femoral neck, posterior fracture-dislocation of the hip, tears of the collateral ligaments of the knee and osteochondral fractures involving the distal femur or patella and fractures of the tibia. It is significant to examine the joint above and the joint below fracture. Films of the uninjured Femur are useful for selecting the correct internal fixation device (Swiontkowski and Stovitz, 2005).

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