Final Report:

Automated Identification of Abnormal Lumbar Vertebrae Pose in X-Ray images

Present to

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By

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2 Background

Burapha University, Thailand, and Korea Institute of Oriental Medicine, South Korea have collaborative research about Adaptive Abnormal Detection of Lumbar Vertebrae Alignment. In this research, 1500 pairs of the spine were collected from Burapha University Hospital and labeled using "DICOMLABEL" software. Lumbar spine dislocation is one of the leading causes of low back pain and is one of the common indications for spinal surgery (Deyo et al., 2010). related disabilities (Fayssoux et al., 2010), which lead to a detriment to the overall economy of the country. The X-Ray images help doctors to determine the location, cause, and severity of scoliosis. Moreover, such information will be used by the doctor in making the decision to refer to a specialist orthopedic doctor. The recommended software to help identify misaligned bone fragments will help doctors work more conveniently, quickly, and accurately. Unfortunately, we lack an automated lumbar spine image segmentation system technology that suitable for the bone structure of Thai people.

To assess medical images and diagnostic decision-making of associated lumbar diseases by clinicians is invariably a subjective, time-consuming, and challenging task. Presently, doctors use either manual or semi-automated computer-aided tools to make relevant measurements for adding a vote of confidence to their grading and evaluation. However, lacking a reliable dataset is critical in this research area. So, in this project, we will collect new X-ray images for being the gold-standard dataset and establish an automatic image processing pipeline for identifying the Lumbar vertebrae pose diseases.

This research project aims to develop a computational algorithm using image processing techniques in lumbar spine segmentation (L1–L5) to assist physicians in analyzing spinal alignment. The lumbar Spine is considered for the diagnosis of spinal dislocation or not. (Spondylolisthesis)

The project consists of 4 main phases. Firstly, 1,500 pairs of human x-ray spines were collected from Burapha University Hospital Database. Secondly, all images were manually labeled by the expert. Next phase, a radiologist will validate and verify all data. Lastly, we will develop Adaptive Abnormal Detection algorithms and apply them to labeled images. The result was evaluated and confirmed by the medical expert.

3 Introduction

The lumbar vertebrae are five vertebrae between the rib cage and the pelvis, which is a very important component of the spine that supports the body and allows movement. The displacement of lumbar vertebrae mostly causes the reasons for spinal disease. Thus, many of spinal diseases can be identified by analyzing vertebrae coordinates. Consequently, Decision Support Systems (DSS) can be developed using vertebrae localization techniques. It will assist the radiologist in diagnosing spinal disease. Recently, image processing and machine learning play an important role in medical routines. The expert's decision, the classification models were developed to determine the vertebral area automatically. In this research, we proposed vertebrae localization techniques using a dataset of 1,500 pairs of CT scan images to develop an algorithm. Our goal in this research is to develop Decision Support Systems (DSS) to provide secondary source information to assist the doctor and radiologist in diagnosing spinal diseases.