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Pancreatic Tumor Detection Using Image Processing

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Abstract

Pancreatic Tumor is one of the leading causes of cancer death worldwide. However, pancreatic cancer can be cured if it is detected at an early stage. In this paper, an attempt is made to detect pancreatic tumour from CT images. It uses image processing techniques and a basic classifier to detect the tumour. After the image pre-processed, minimum distance classifier is used to detect the tumorous area in the image. It is observed that the accuracy of detecting tumour is around 60%.

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Keywords: pancreatic tumour; minimum distance classifier; confusion matrix.

1. Introduction

Pancreatic cancer is the 10th most commonly diagnosed cancer in men and the 9th in women, but the 4th leading cause of cancer death for both men and women in the United States. Pancreatic cancer is the only major cancer with a five-year relative survival rate in the single digits. A recent report issued by the Pancreatic Cancer Action Network found that in 2020, pancreatic cancer is expected to become the second leading cause of cancer death in the United States[1]. However, the annual pancreatic cancer load of India in 2008 was approximately 17,000 patients which is likely to increase in the near future. The situation calls for the need of multicentric studies, more systematic approach to documentation at all levels and the need to identify potentially preventable risk factors associated with pancreatic cancer in India[2]. A major cause of this, is late detection of the pancreatic tumor because there are no

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effective early detection methods available. Also most of the symptoms of pancreatic tumor are vague and could be contributed to many other abdominal conditions. These symptoms include pain (usually abdominal or back pain), weight loss, jaundice (yellowing of the skin and eyes), loss of appetite, nausea, changes in stool, and diabetes. Generally a patient takes an expert advice after experiencing these symptoms for months. So most of the patients are diagnosed with pancreatic tumor after it reaches a stage where surgery is not possible. This is because there are several major blood vessels which cannot be resected. Also if the cancer has spread (metastasised) to other organs the treatment becomes very difficult. So there is an urgent need of a method that will help radiologists in diagnosis of pancreatic tumor at an early stage.

A lot of research has been done on the detection of brain cancer, breast cancer and skin cancer, etc. Many algorithms have been successfully implemented for early diagnosis of these tumors. Artificial Neural Networks (ANN) has been applied for detecting skin cancer[3]. They pre-processed the image to remove noise and enhance the image. Then the features were extracted using wavelet transform and then the tumor was classified using back propagation neural networks. For brain tumor detection wavelet decomposition is used followed by grey level co-occurrence matrix (GLCM) for feature extraction and probabilistic neural network for further classification[4]. Another algorithm for brain tumor detection is by using artificial neural network fuzzy inference system[5]. Various supervised learning techniques are used to detect breast cancer. These include principal component analysis (PCA) for feature extraction and support vector machines and k-nearest neighbor classifier for classification[6]. As seen above, various parametric and non-parametric classifiers can be used to detect and classify different tumors based on the features exhibited by the tumor.

There is not much work done on pancreatic tumor detection. It is found from the literature survey that pancreatic tumor detection is done using the symptoms of the disease and by taking patient history but not using image processing. In this paper, an attempt is made to detect pancreatic tumor from CT scan images. These images are pre-processed using image processing techniques and then a basic classifier is used to classify the tumor area in the image.

2. Methodology

The database of CT scan images of pancreatic tumor is taken from the internet. Pancreatic tumor images are available on educational sites which helps the radiologists to study cases of pancreatic tumor. Figure 1 shows the sample image used for this paper.

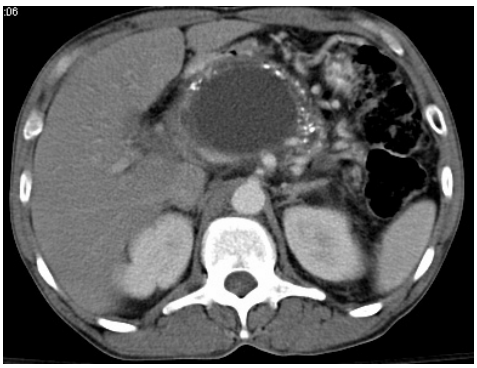

Figure 1. Sample Image

These CT scan images of pancreatic tumor are given as inputs to the system. These images may contain noise because of patient motion, detector miscalibration, etc. So, the first step is to remove the noise from the image using filters. Once the noise is removed from the image, various regions of the image are classified depending on the various parameters. Minimum distance classifier is then used to classify the various organs of the image. Apart from pancreas, the other organs that can be seen in the image are liver, stomach, spleen, vertebra, right and left kidneys, etc. Figure 2 shows the algorithm of the process.