

# **TEETH DETECTION AND DENTAL PROBLEM CLASSIFICATION IN PANORAMIC X-RAY IMAGES USING DEEP LEARNING AND IMAGE PROCESSING TECHNIQUES**

## **INTRODUCTION AND OBJECTIVES OF PROJECT**

In recent years, medical imaging technologies such as computed tomography or X-rays have aided the treatment and diagnosis of different diseases. In the field of dentistry, dental informatics is an emergent field, which, in addition to helping improve the treatment and diagnosis process, saves time and reduces stress during the daily routine. The use of high resolution imaging sensors and biosensors has led to the generation of massive amounts of data, which can be interpreted by computer programs that can help dental professionals in making decisions related to prevention, diagnosis or treatment planning, among others . Radiographies are obtained by the passage of X-rays, produced by an X-Ray generator, through the oral cavity. Radiation can be absorbed by some tissues, or it can pass through the patient being absorbed by a detector. This process is called projective radiography and it generates two dimensional images which represents internal structures of the human body. Dental radiographies can be classified in two categories: intraoral where the film is positioned inside the buccal cavity, and extraoral where the patient is positioned between the source that emanates X-rays and the radiographic film. Most common types of dental X-rays are bitewing, periapical, which are intraoral, and panoramic which is extraoral.

A panoramic dental radiography shows the entire mouth area where all the teeth can be seen. It also shows the jaws and the skull thus giving the dentist an overview about the patient's problems. The panoramic dental radiography is used by dentists to observe problems in hard-to-reach areas or with a poor visibility inside the buccal cavity. The interpretation of the radiography is done manually by the dentist, who identifies each tooth and the existing problem where appropriate. However, if the X-ray radiography is not clear it can cause problems when analysed and thus lead to misinterpretation.

## **HARDWARE AND SOFTWARE REQUIREMENT**

This specifies the hardware and the support software required to carry out the development.

### **Hardware Requirements**

The selection of hardware is very important in the existence and proper working of any software. Then selection hardware, the size and capacity requirements are also important.

- Processor : 64 bit
- RAM : Min 3 GB
- Hard Disk : 10 GB

### **Software Requirements**

One of the most difficult task is selecting software for the system, once the system requirements is found out then we have to determine whether a particular software package fits for those system requirements. The application requirement:

- OPERATING SYSTEM: WINDOWS 10
- FRONT END: HTML, CSS, JAVASCRIPT
- BACK END: Mysql
- IDE: JetBrains Pycharm, Android studio
- TECHNOLOGY USED: PYTHON, JAVA
- FRAME WORK USED: Flask

## **PROBLEM DEFINITION AND INITIAL REQUIREMENTS**

### **Existing System:**

Nowadays dental radiography shows the entire mouth area where all the teeth can be seen. It shows complete images of the jaws and the skull thus giving the dentist an overview about the patient's problems. Dental radiography is used by dentists to observe problems in hard-to-reach areas or with a poor visibility inside the buccal cavity. The interpretation of the radiography is done manually by the dentist, who identifies each tooth and the existing problem where appropriate. However, if the X-ray radiography is not clear it can cause problems when analysed and thus lead to misinterpretation. So there is no existing system compared to proposed system. Here we can see that some researches are done based on this, but no one implemented this. Some of the researches are given below.

- In a research they provide a comparative analysis of 10 segmentation methods applied in dental imaging. The presented solutions are grouped in five categories and they were evaluated and classified according to the following metrics: Accuracy, Specificity, Precision, Recall and F1-score. Unfortunately, none of these 10 segmentation methods was able to completely isolate the teeth due to bone parts present inside the buccal cavity.
- Another one is a solution to identify a person after death by comparing a postmortem dental radiograph with a database of ante mortem dental radiographs according to some specific features. The extracted feature which is proposed in this solution is the teeth contour because it remains invariant over time compared with other features

### **Proposed System:**

Analysis of panoramic dental radiographies help specialists observe problems in poor visibility areas, inside the buccal cavity or in hard to reach areas. However, poor image quality or fatigue can cause the diagnosis to vary, which can ultimately hinder the treatment. In this project I propose a novel approach of automatic teeth detection and dental problem classification using panoramic X-Ray images which can aid the medical staff in making decisions regarding the correct diagnosis.

## **BASIC FUNCTIONALITIES OF PROJECT**

### **User Modules**

There are four types of modules. Admin, Dentist, Lab, User. Each of them have distinct login section each of them can login their account section by conforming their unique username and password.

#### **1. Admin**

Admin can login the system using username and password. Admin can control the overall system and should have the functionality to monitor overall process.

Admin can control the overall workflow.

- Login
- Add details of Dentist
- View Dentist details
- Add lab detail
- View lab details
- View complaints and reply

#### **2. Dentist**

Dentist can login the app using his/her unique username and password and they can do the functionalities that are given below

- Login
- Chat with patients
- View booking details
- Approve booking

- View patient report

### **3. Lab**

Lab can login the app using his/her unique username and password and they can do the functionalities that are given below

- Login
- View request to take X-RAY
- View payment
- Upload X-Ray image

### **4. User**

User can register and login the app using his/her unique username and password and they can do the functionalities that are given below

- Register
- Login
- View nearest lab
- Request to lab for taking X-Ray
- Payment
- View X-Ray image
- View doctor
- Book doctor
- View booking status
- Chat with doctor