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# Tooth Line Analyzer Techniques using Edge-based Corner Detection Method

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***Abstract--- To design the tooth, the basic need is to have the proper measured corners. The corner that camera will capture should not have false value or noisy value in it as it will lead to false tooth design. Thus to solve this kind of issue the paper present the corner detection method that is Edge based corner detection technique. In Edge based method, the input is intra oral camera image and applying corner detection operator to input image, It finds the threshold value of input image, In output corners are detected on the original input image by using non-maximal suppression method.***

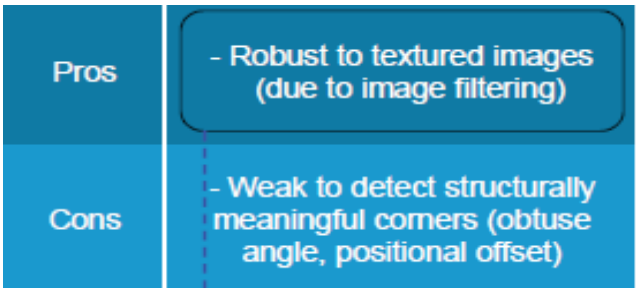
***Keywords— intra oral camera, corner detector, . threshold cornerness pixels, corner detection operator.***

## I. INTRODUCTION

An interest point is one that has a location in space, but no spatial extent. The presence of interest points can reduce the required computation time. As such, these points are frequently used to compensate for many vision problems, such as camera calibration, stereo matching, image registration, structure from motion, motion tracking, object recognition and mobile robot navigation[1]. We are specifically focusing on feature extraction such as robot navigation and manipulation [2,3].

In oral medicine, it is a very attractive technology that simulates the results before the actual treatment, which acquire the parameters of the treatment from the stimulation of treatment automatically. With the use of computer technology in oral medicine and reconstruct with software program, the patients will be able to see the detail of oral cavity of teeth. Oral cavity endoscope is a micro-camera system which collects light, machines and electricity. Because of the lighting and the reflection of the water on the teeth, the brightness of the image is uneven. There will be some "sequins" where the reflection is strong, and there would be big noise that increases the difficulty of the edge detection. One of the major problems encountered in tooth restoration is the bonding faults between the restoration material and tooth[4]. The teeth image have three region soft tissue regions, bone regions and teeth regions all region have different intensity values[5].

Enamel, dentin, and cementum are the three hard layers that comprise the solid structure of teeth. Enamel is the outer shell of the crown that is exposed to the environment and dentin is the inner layer beneath the enamel, where it extends to the root of the tooth. The enamel is internally contiguous with the inner dentin at an interface commonly known as the dentino-enamel junction (DEJ). The use of calibrated, commercial digital cameras for dental applications is promising[6]. Paper presents a stable and accurate corner detection algorithm, which is simple and an efficient means of producing input points of interest for feature-based approaches[7] Research Literature serves the purpose of improvement desires in context of corner detection as found in many of research works, a great deal of efforts has been done by computer vision community in solving the problem of efficiently detecting corners and edges.




All the true corners should be captured with no false corners is interpretation dependent and there would be no defined definition for grayscale corner. The images with clear corners such image is used to improve the performance of corner detectors.

The use of interest points (and thus corner detectors) to find corresponding points across multiple images is a key step for image processing and computer vision applications.

Some of the most notable examples are:
1. stereo matching
2. image registration (of particular importance in medical imaging)
3. stitching of panoramic photographs
4. object detection/recognition
5. motion tracking
6. robot navigation

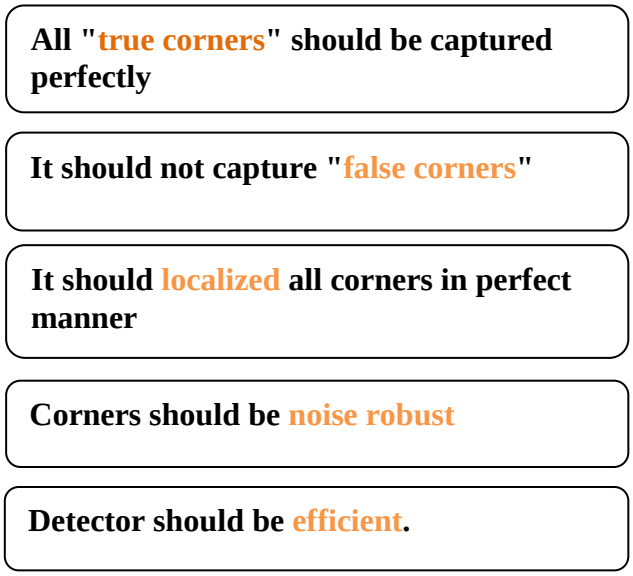



Fig 1: Requirements of a Corner Detector

So the paper divided in subsection in first section introduction of paper is explained, Second section problem definition is explained , Third section shows the method which are used to find the corner of image, Fourth section shows the image auqization, Fifth section shows result of corner detection, Sixth section shows the conclusion of paper.

## II. . PROBLEM DEFINATION

There is no provisions given for computerized measurements of teeth for aligning a teeth , the measurement of teeth was done by a traditional methods by using Vernier Caliper, Gear Tooth Micrometer, the measuring tool will not give an accurate parameters of a teeth. The cost of machinery for measuring teeth are costly as well as require huge space. Older methods for measuring teeth parameters consume more time and it's costly also, and measurements was not taken in point fiction manner , so it was impossible to fit tooth properly at proper position .The measurement of teeth should give correct value of teeth by detecting corners of teeth.

## III. METHODOLOGY

The paper will deal about software that would give accurate parameters for teeth corner detection and which will provide the proper measurements of teeth.

### A. Edge-Based Corner Detection Method:

Here the edges of image are used for detecting the corners of teeth .

#### 1. Apply Corner Detection Operator

Here the input image is captured by intra oral dental camera and applying corner detection operator on input image and then it measures the cornerness value of pixel. The cornerness value is simply a number for indicating a degree to which the corner operator believes this pixel is a corner and the output is cornerness pixels.

#### 2. Threshold Cornerness Pixels

Here as shown in fig 2 the output of cornerness pixel used for calculating threshold image by applying threshold cornerness pixels which is used for avoiding to measure the small corners which are not true corner. So the cornerness pixels would be thresholded. So the threshold value set at high to remove the false corners and also at low to detect the true corners of the input image.

#### 3. Non-Maximal Suppression

The thresholded cornerness pixels have nonzero numbers so it would be captured as corner. so apply non-maximal suppression to each point of thresholded cornerness pixels and gives the output as corners and the corners are detected on the input image.

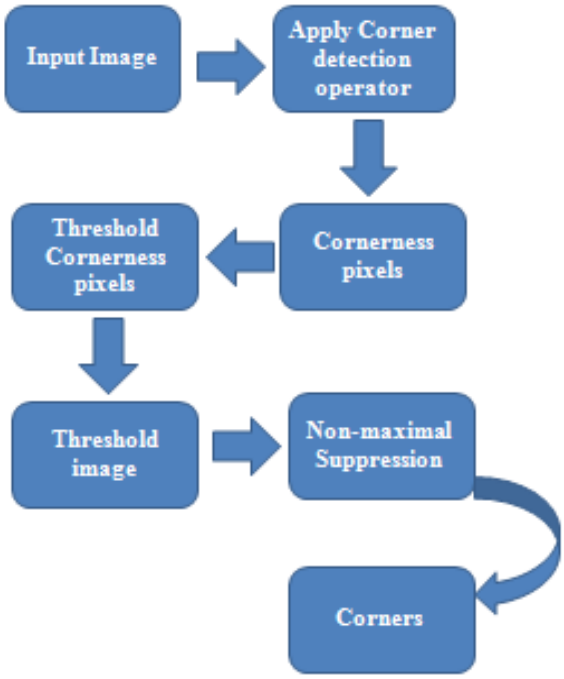



Fig 2: Flow graph for detecting the corners

## III. IMAGE AQUIZATION

The input data is taken as a image of teeth, which is captured by the "Intra Oral Dental Camera" as shown in fig 3 . The input image will undergo through the process of corner detection which will help to calculate the measurement of teeth that need to be aligned and for sharpening of teeth.

All of our operatories are equipped with intra-oral cameras to provide visual for observing, diagnosing and treating the teeth . We use the latest camera systems before and during procedures, using an interactive digital computer screen and the "Intra Oral Camera" attached to computer with the help of USB – which displays the teeth and detailed features of the teeth or infection being treated. Visual images of tooth fractures and nerve exposures etc can be observed and documented; the insight provided through the use of these tools helps in formulating a comprehensive treatment plan with our patients.

Fig 3:Intra Oral camera

The intra oral camera have an LED light on it around the lens of camera and one button on top of camera for on and off purpose of LED light and other button for capturing image of teeth.

## IV. RESULT

Fig 4 shows the input image which is taken by the "Intra Oral Dental Camera". Fig 5 show the edge image of teeth by using non-maximal suppression which is having an threshold value by which it show the edges of teeth. Fig 6 shows the corner captured image of teeth where the corners are detected on original input image by which software will calculate measurements of teeth .

Fig 3: Original Image

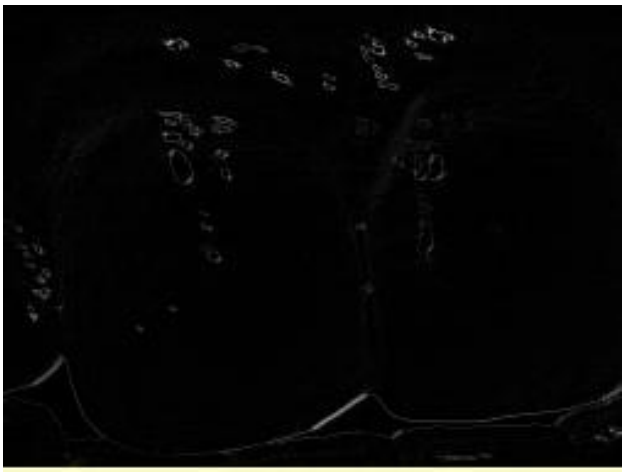


Fig 4:Non Max Suppressed Image

As shown in fig 5 the corners of teeth are shown with white dots and the corners of teeth are calculated using threshold value and sigma value , If threshold value and sigma value changes the corner capturing capacity will changed.

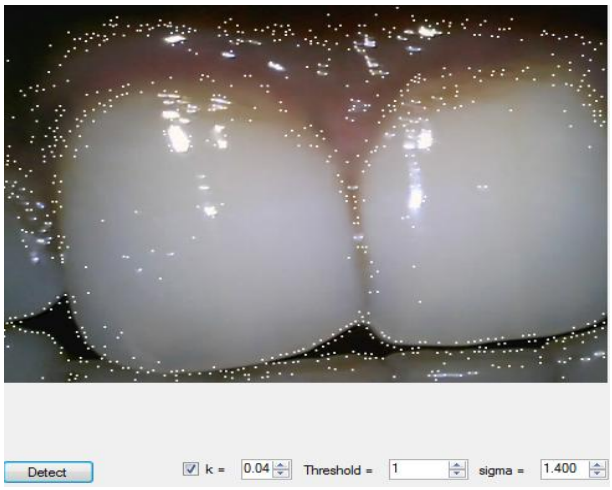



Fig 5:Corner Captured Image

## V. CONCLUSION

The proposed method will be beneficial as there is no such tool available which will take input as a image with intra oral dental camera and help to find the measurement of tooth for its proper alignment. The proposed method will also find the edge and with help of corner detection it is possible for finding the intensity of pixel at each matrix part. The proposed method will also find the threshold value of image and also shows the time required for calculating the measurements of teeth.

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