ENDOSCOPIC SYSTEM FOR MEDICAL INSPECTION

HACETTEPE UNIVERSITY ELECTRICAL AND ELECTRONICS ENGINEERING
PROJECT GROUP MEMBERS: AYBÜKE PERÇİN,HELİN UZUN,UMUT ERSOY
PROJECT SUPERVISOR: PROF. DR. ATİLA YILMAZ

INTRODUCTION

Endoscopic systems are important devices for both diagnosis and treatment of complex pathologies. With the development of endoscopic applications, the feasibility of diagnostic and therapeutic interventions has increased and endoscopy has become the first step for diagnosis and treatment of most diseases. The purpose of the project is to integrate the necessary electronic and mechanical units in order to build an endoscopy system that will particularly be useful for ear examination. Block diagram of endoscopy system can be seen below in Figure 1. The next step is the image processing step for diagnosis and treatment detection. The result of the project is the diagnosis of the disease using the algorithm created with the data obtained from the processed images.

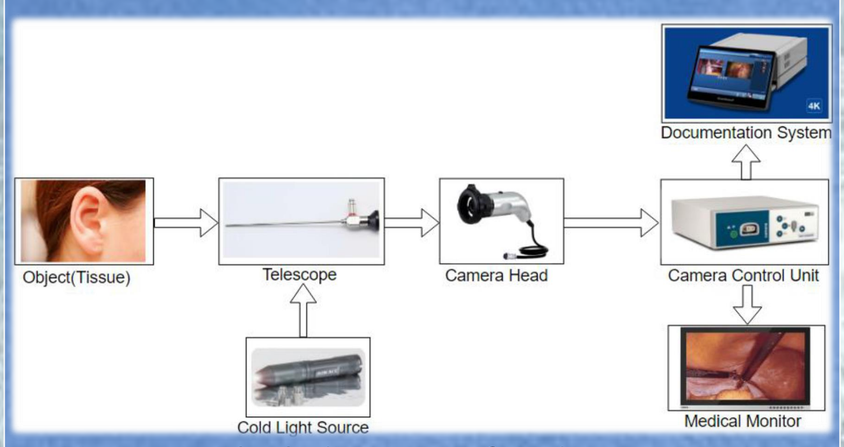

Figure 1: Block diagram of endoscopy system

DESIGN

The designed mechanism which takes images and provide improvement will be chosen as an initial prototype. This prototype must be contain telescope and cold light source together with USB camera. Telescope is a thin tube which consists of lens combination to take effective and large display area. Prototype of hardware is shown in the Figure 2.

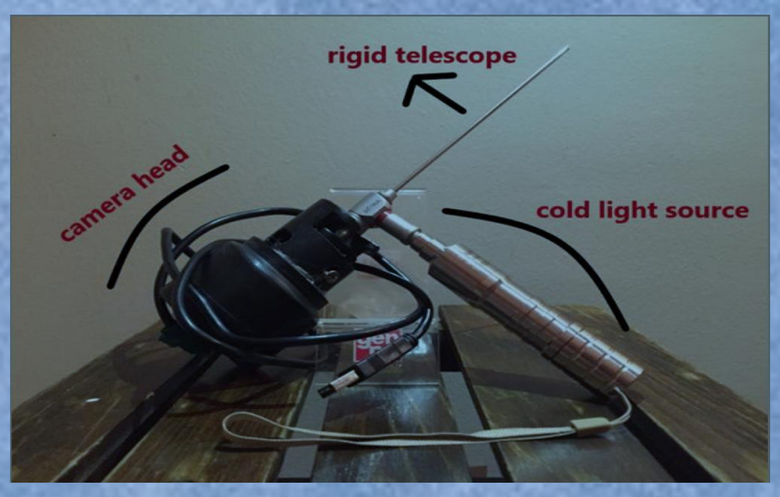

Figure 2: Camera apparatus printed from 3d printer, cold light source and rigid telescope.

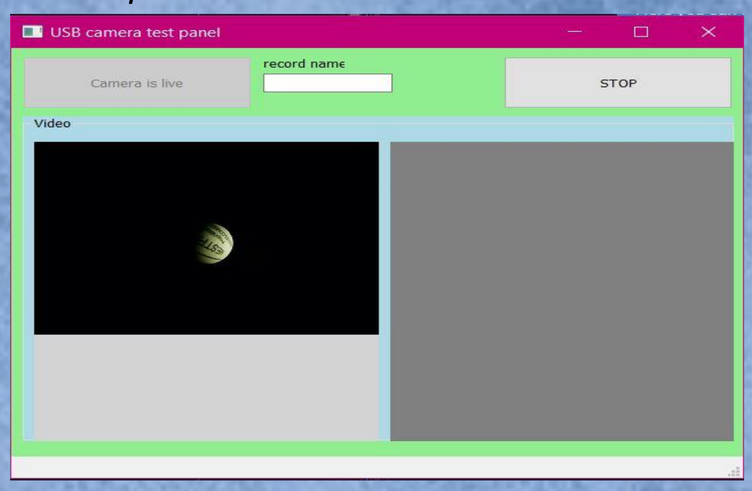

Figure 2: Interface of camera with image from telescope.

METHODOLOGY

All images in the dataset are processed in the algorithm. Looking at the diagnostic results given by the algorithm, the accuracy rate was 53.7 percent.

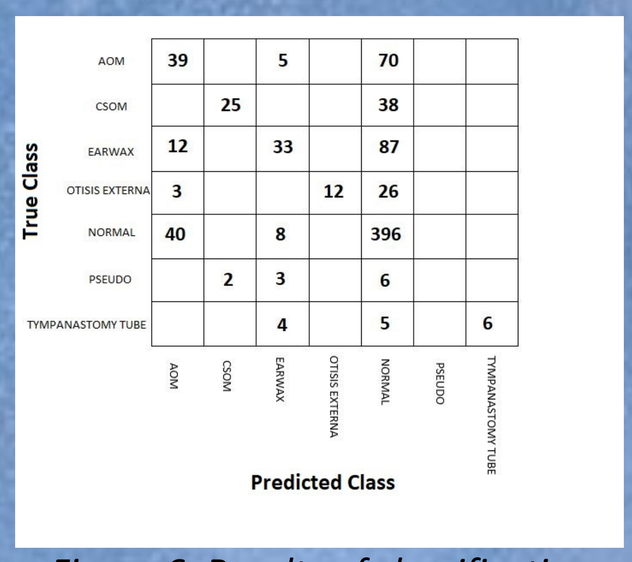

Figure 6: Results of classification algorithm.

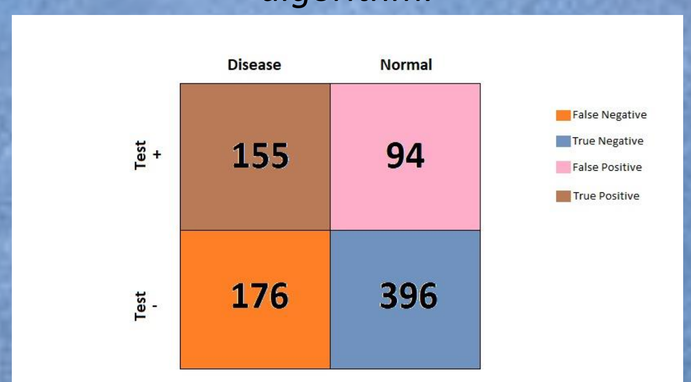

Figure 7: Confusion matrix.

IMAGE PROCESSING

After the image is taken from the camera, the image quality is increased by using the methods shown in below figures. Studies were performed using dataset. The dataset includes images for many healthy tissues and 7 different diseases. There are a total of 535 healthy and 418 diseased tissue images in the dataset. Basic image features were extracted and an algorithm was created to distinguish the diseased tissue from healthy tissue by looking at the obtained values.

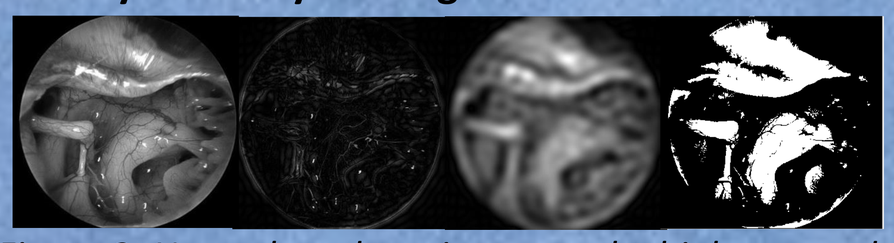

Figure 3: Normal eardrum in grayscale, highpass and lowpass filtered, Thresholded image (resp.).

Figure 4: Gama Correction for light.

mean_pseudomembranes1	123,9734496	122,026	115,649	112,937	118,473	130,933	141,415	116,589
mean_tympanoskleros	111,856756	94,7162	99,8974	114,656	67,8914	106,008	137,62	121,51
median_normal	0,469212371	0	0	0	0	0	0	0
median_aom	0,352141314	0	0	0	0	0	0	0
std_csom	0,197074753	0,07988	0,11876	0,13437	0,14477	0,15264	0,15899	0,16429
std_earventilationtube	0,23770318	0,119	0,1754	0,19702	0,21168	0,22274	0,23131	0,23827
std_earwax	0,222826164	0,09804	0,1457	0,1644	0,17671	0,18579	0,19306	0,19919

Figure 5: Examples of some values used in building the algorithm.

RESULTS AND CONCLUSION

Images were obtained with low-priced hardware solutions. The images taken were processed and developed for classification. The algorithm was created with the values obtained by processing the images in the database. More efficient results can be obtained when the system is redesigned using another high resolution camera compatible with the rigid telescope. The percentage of accuracy can be increased by adding new image processing techniques to the algorithm and improving the images contained in the dataset.

REFERENCES

www.mathworks.com/matlabcentral
www.ctganalysis.com/Content/the-eardrum-database