Designing and Manufacturing Digital Absolang

Javad Alizargar and Shahrokh Hatefi

Student Research Committee, Kashan University of Medical Sciences, Kashan, Iran
Department of Electronic & Computer, Majlesi Branch, Islamic Azad University, Isfahan, Iran

Abstract: One of the items that are commonly used in medical examinations by doctors is a tongue depressor. Commonly a tongue depressor is a blade made of polished and sterile wood used for oral examinations. There are a number of other devices that are designed for facilitating the use of tongue depression, but because of limitations and difficulties of these devices simply, a tongue depressor is still the device of choice for medical examinations. Hygienic as well as many other technical flaws and limitations of previous devices are the underlying motive for making a device named Digital Absolang. This device is resolving disadvantages of previous devices and brings new features. Using replaceable blades resolve the health related problems of previous devices. Using a camera mounted on the device will provide transferring the pictures and recorded videos to the computer during the examination. By using a light source with adjustable light intensity in this device, there would be no need for further use of flashlights by the doctors in their examinations. Using a three-axis rotation of the tongue blade with 360 degrees range can further facilitate the examination.

Key words: Clinical examination and diagnosis • Tongue blades • Medical equipment

INTRODUCTION

With the advancement of science and technology in the field of biomedical engineering, new and improved devices are manufactured and marketed every day to help the diagnosis by the doctors. One of the everyday, widely used medical devices by doctors worldwide is the tongue blade (tongue depressor). A tongue depressor is a blade made of polished and sterile wood used for oral examinations by the doctors [1]. Medical examination is performed with two hands. In this method the physician keeps a flashlight in one hand and a tongue blade in the other hand. It is not possible to change the status of the patient’s head and it lowers the quality and speed of the examination. The examination of a patient can hurt and frustrate the patient. In some cases, it make it difficult to further examine the patient. Lack of a device that drives adjustable sufficient light to be used for the examination of the pharynx and throat and rapid depletion of the traditional flashlight batteries sometimes troubles the examination of the doctors [2].

In the year 2002, a camera was mounted on the tongue blade [3] to facilitate capturing data from the examination. In the year 2008, by using a magnifying glass on a tongue blade, the vision of the doctor in the examination of the mouth and throat increased [4]. In 2010, by placing a camera on a plastic blade the images of the examination were transferred to a computer [5]. In 2011, the curvature of the plastic blade increased maneuverability in the examination [6]. Because of hygienic problems of the unchangeable blades of previously designed devices, high construction costs of such devices and incompletion of the design, simple wooden tongue depressor blades are still used for oral examinations.

The disadvantages and problems that exist in using simple wooden tongue blades are:

- Available tongue blades that are used by physicians are simple and have no other accessories.
- Because of the absence of a light source, the physicians must hold a torch in the other hand.
- Bimanual examination cause both hands of the doctor to be occupied while examining the patient.
- No record of the patient's treatment are available for future references.

Corresponding Author: Javad Alizargar, 5th Km-Qotb-e Ravandi Boulevard, P.O. Box: 87155.111, Kashan, Iran.
Tel/Fax: +98 361 5579028.
Only one physician may view the patient’s throat and mouth at a time.
Repeated examination may irritate the patient.
There is no possibility of maneuvering of the blade in the examination with a simple wooden blade.
There is an inability to adjust the light by the physician since different examination rooms requires different light intensities and a simple torch does not offer this option.
The inability to record the medical examination processes.
There is no ability of reporting special cases to journals.
The inability of the physician to consult physicians that are away from clinic or hospital.

The purpose of designing and manufacturing Digital Absolang is to provide a digital device with a camera and adjustable light source that can rotate 360 degrees. This device resolves the problems of using a simple tongue blade due to its design and construction and has the following benefits:

- Replaceable tongue blade to examine each patient individually and hygienically.
- Presence of four sources of light on the body of the device.
- Lights sources with adjustable intensity.
- Rotatable head to obtain a good angle of wooden blade for convenient examination.
- Ability to examine each patient with one hand.
- To see a clear picture of the examination on the computer.
- The possibility of taking pictures during the examination of the patient.
- Recording patient information during the examination.

**MATERIALS AND METHODS**

To design and manufacture the Digital Absolang, connection between the camera, computer, light sources and circuits must be provided. To make the device, we have to provide a mobile part allowing the physician to examine the patient. The other part of the device is the designed circuits. The overall functional block diagram of the device can be seen in the Figure 1.

**RESULTS**

Digital Absolang consists of three main part. The first part is the head of the device the camera and light sources are mounted on. It also contain a part that has a hanger for a wooden blade. The second part is the handle of the device. The light sources adjustment keys are placed in this part. Head and the handle can be adjusted according to each other. These two parts can be seen in the Figure 2.

The third Part is the power and control circuits. This part also contains data transmitting modules that transfers data from camera to the personal computer. All three parts are connected to each other with data wires. All these three parts in details are:

- Digital Camera: the 8 megapixels camera along with a built-in microphone is used to record pictures and videos of the mouth and throat of the patient and voice of the physician that explains possible related examination information.
- Light sources: four small but powerful light LEDs are placed around the camera.
- Blade hanger: a blade hanger is placed under the camera and light sources to enable the physician to change the wooden blade for hygienic examination of each patient.
- Adjustable axes are placed between head and the body of the device to give the physician 360 degrees maneuverability of the examination (Figure 3).
- Two keys to turn the lights on or off, each allocated to a couple of LEDs.
- A volume to adjust the intensity of outgoing light.
- USB port to establish a connection between the device and a personal computer.
Fig. 2: Head and handle of Digital Absolang

Fig. 3: Adjustable axes of Digital Absolang

Fig. 4: Circuit Box of the Digital Absolang
Fig. 5: Technical map of Digital Absolang’s circuits
CONCLUSION

Our designed device named Digital Absolang solves these flaws and brings new features for the examination of mouth and throat: changeable wooden blade, four light sources, one hand examination of the patient by the physician, taking pictures and recording videos of the examination for further reference, 360 degrees maneuverability of the examination and adjustable light for examination.

REFERENCES