

Licensing and Technology Transfer Opportunity: Manipal University**Title of Technology Available: “AN AUTOMATIC LIGHT POSITIONING AND FOCUSING SYSTEM”****BRIEF DESCRIPTION OF INVENTION:**

The present disclosure provides a system for automatic positioning and focusing of illumination source. The system includes an image acquisition unit to capture a set of images of a pre-determined anatomical area, a computing unit to extract anatomical attributes associated with the set of captured image, select an area of interest (AOI) from the captured set of images, and transmit a set of control signals to the one or more driving means based on the selected AOI to control positional parameters and illumination parameters associated with the illumination sources. The system is configured controls positional parameters and illumination parameters of illumination sources through gesture recognition and a foot-pedal input unit. The system is incorporated in illumination sources of dental chair and/or surgery lights to limit human contact of dentists/surgeons with the illumination sources and other hardware components.

Brief Background of Invention:

There has been an increase in global age-standardized prevalence and incidence rates of diseases. Diseases can be classified as contagious diseases and non-contagious diseases. Contagious diseases spread from person to person in a number of ways. Direct physical contact is the most significant way in which contagious diseases spread. Another way in which contagious disease can spread is when an infectious microbe travels through the air after someone nearby sneezes or coughs. Ebola, Enterovirus D68, Flu, Hantavirus, Hepatitis A, Hepatitis B and HIV/AIDS are some of the examples of contagious diseases. Non-contagious diseases are those diseases that do not spread from person to person. Diabetes, Alzheimer's, cancer, osteoporosis, chronic lung disease, stroke, and heart disease are some of the examples of non-contagious diseases. Both, contagious diseases and non-contagious diseases, can spread from person to person in an unhygienic hospital environment.

Among diseases treated in hospital, more than one-third are nosocomial. Nosocomial diseases are the hospital acquired diseases. These diseases are contracted from person to person in a hospital environment. Nosocomial diseases are spreading at a very higher rate. Treatment of majority of the diseases requires a proper inspection and check-up of patient. There are many invasive and non-invasive methods to detect a disease or infection in any body part of a person, however, these methods may add a new nosocomial infection in the body of a person due to lack in hygiene. For instance, even for a preliminary check-up of any body part of a person using a proper positioning and focusing of light source is required. During process of inspection a doctor comes in contact with a patient and light source at the same time as he tries to position and focus of light source accurately for the proper inspection. This may result in contamination of the light source. When other patients visit the doctor there is a very high chance that they may catch nosocomial infections.

Dentists check and treat oral cavity of a person and handles other instruments simultaneously at a time, which increases the chances of spreading of nosocomial infections. Diagnostic instruments and surgical instruments are cleaned thoroughly and sterilized properly after usage. Injections and syringe are disposed cautiously once they are used. But there is no proper method to sterilize light sources used during dental operations, surgeries and other treatments. Even if there is some method no one considers about cleaning and sterilizing the light sources, which significantly increases the probability of spreading of nosocomial infections during dental operations, surgeries and other treatments.

There is, therefore, a need in the art to provide an improved system for automatic positioning and focussing of light source on a pre-defined area to reduce spreading of nosocomial infections due to contact of light sources with hand during dental operations, surgeries and other treatments.

Describe the final product:

According to an aspect the present disclosure pertains to an automatic light positioning and focussing system, the system including: one or more driving means operatively coupled to one or more illumination sources; an image acquisition unit configured to capture a set of images associated with a pre-defined anatomical area; a computing unit operatively coupled to the image

acquisition unit, the one or more illumination sources and the one or more driving means, the computing unit including one or more processors configured with a deep learning model and coupled with memory, the memory storing instructions executable by the one or more processors, configured to: extract anatomical attributes from the captured set of images associated with the predefined anatomical area; select an area of interest (AOI) from the captured set of images by comparing the extracted anatomical attributes with a first dataset comprising pre-existing anatomical attributes associated with the predefined anatomical area; and transmit a set of first control signals to the one or more driving means based on the selected AOI to control any or a combination of positional parameters and illumination parameters associated with the one or more illumination sources; wherein the controlling of the positional parameters can facilitate automatic positioning and focusing of the one or more illumination sources on the selected AOI.

In an embodiment, the computing unit can be configured to: extract one or more gestural attributes from the selected AOI; compare the extracted gestural attributes with a second data set comprising pre-existing gestural attributes associated with selected areal attributes; and transmit a set of second control signal to the one or more driving means based on a positive comparison to control any or a combination of the positional parameters and the illumination parameters associated with the one or more illumination sources.

In an embodiment, the pre-defined anatomical area can be selected from a group comprising any or a combination of an oral cavity, a surgical area, and hand. In an embodiment, the one or more anatomical attributes can include any or a combination of colour, texture, shape, and size of the predefined anatomical area.

In an embodiment, the computing unit can be configured to store any or a combination of the captured set of images of the pre-defined anatomical area, the anatomical attributes associated with the captured set of images, and the selected AOI, to update a training and testing data set for the deep learning model. In an embodiment, the system can include an input unit operatively coupled to the computing unit, the input unit can be adapted in form of a foot pedal to facilitate configuration of any or a combination of the positional parameters and the illumination parameters the one or more illumination sources.

In an embodiment, the positional parameters can be any or a combination of roll angle, yaw angle, pitch angle, lateral displacement, and longitudinal displacement of the one or more illumination sources. In an embodiment, the one or more driving means can be or a combination of a servo motor, a DC motor, a stepper motor, and an AC motor. In an embodiment, the computing unit can comprise any or a combination of an Arduino chip set, a Raspberry Pi microprocessor, and a Microcontroller. In an embodiment, the one or more illumination sources and the computing unit can be enclosed in a casing.

Technological Domain (Keywords): Dental chair light; oral examination; automation; hygiene; dentistry; Operation Theatre light.

Proof of Concept:

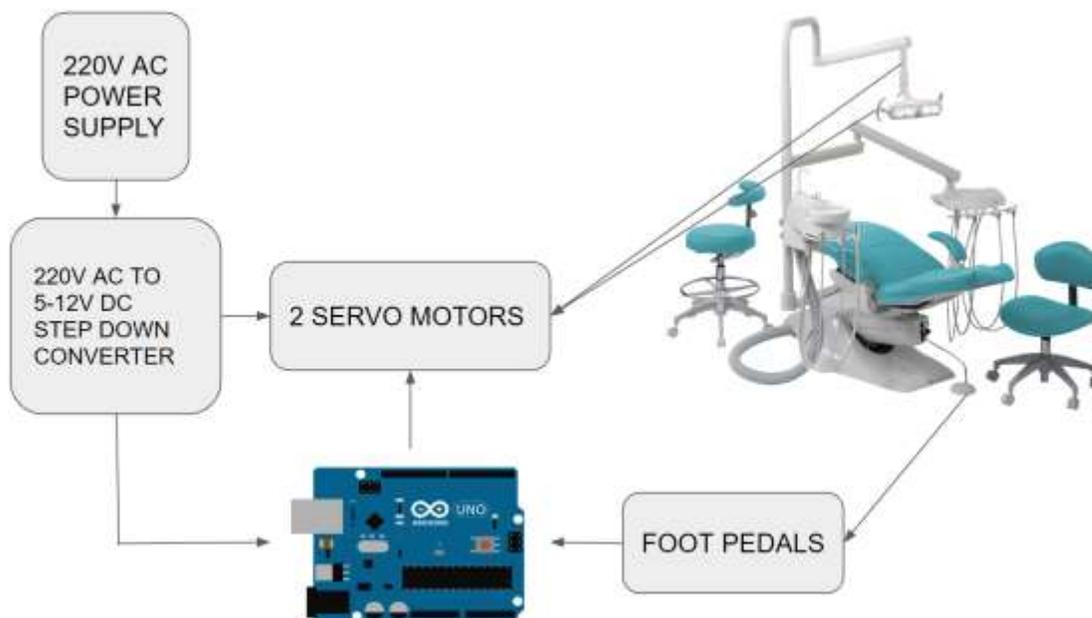


Figure 1: Flow chart for working of the automated dental chair light

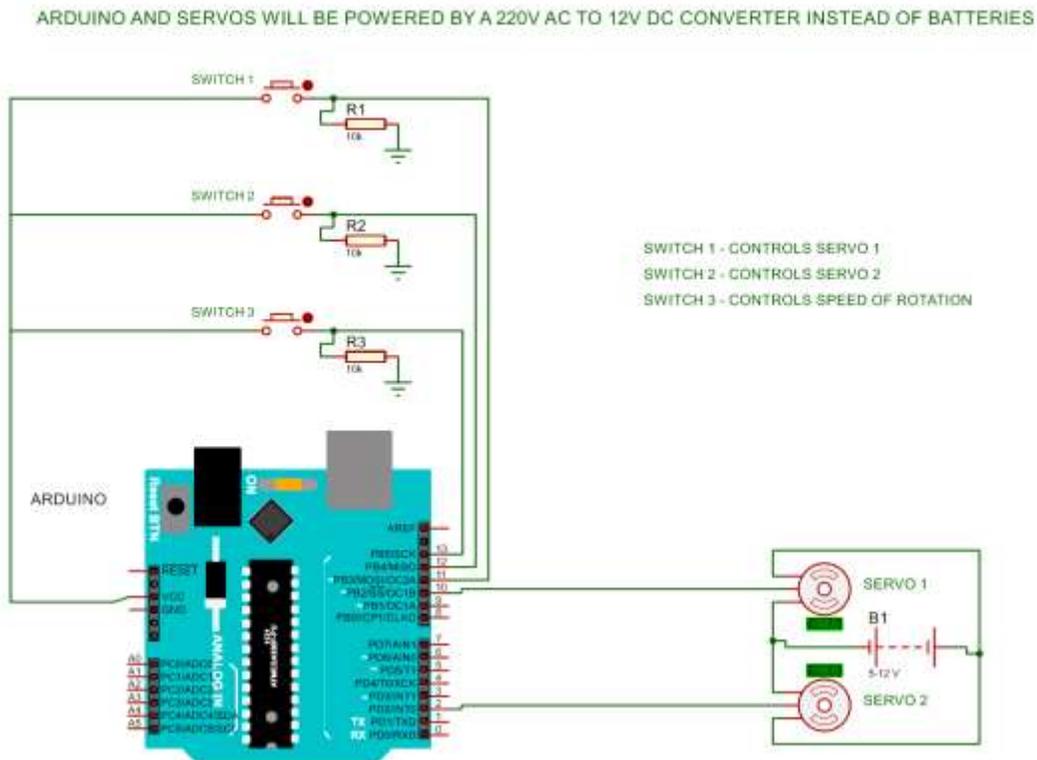


Figure 2: Electronic Circuit diagram of the automated dental chair light

Stage of Development:

Ideation/Prototype/Advanced Prototype/Ready to Market technology

Provide Information on Competitors who manufacture and/or sell similar products: NA

What are the unique advantages your innovation has compared to the competition:

- The existing dental chair light is manual and has no provisions for auto focusing of the light to oral cavity making the dental practice to be unhygienic.
- The present disclosure provides a system for automatic positioning and focusing of an illumination source.
- The present disclosure provides a system for gesture-based positioning and focusing of an illumination source.

- The present disclosure provides a system for foot pedal-based positioning and focusing of an illumination source.
- The present disclosure provides a system for automatic positioning and focusing of an illumination source during operation to prevent spreading of noscomial infections by reducing human contact with illumination sources.

A few potential companies who might be interested in this technology:

- Gladent
- Planmeca
- Belas AB
- ProMed Medical Equipment'
- Techno Dent

Intellectual Property Status: Indian Patent application with number filed in (mention year)

Filed at the Indian Patent Office on **26th February 2020** as a **complete** application **202041008172**

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