CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Vasily A. Tremsin

Project Number

36598

Project Title

Am I Protected from that UV Sunlight? Personal Devices for Prevention and Preliminary Detection of Skin Cancer

Abstract

Objectives/Goals

My main objective was to create a set of affordable devices that will allow people to monitor the efficiency of sunscreen protection in real-time and aid visually disabled individuals to detect the first symptoms of skin cancer. These devices can potentially decrease the number of incidents of the deadly disease and save human lives.

Methods/Materials

The main components of this project are an Arduino microcontroller board and software tools, UV photodiode, RGB sensor, and LCD screen, speaker, and vibrators for real-time representation of measured results. The present intensity of UV radiation and sunscreen efficiency are measured by a UV photodiode, which is insensitive to visible light. Sunscreen efficiency is determined by UV reflection properties of specific areas of skin. The preliminary detection of skin cancer is performed through spectral analysis of the measured skin region. All results are represented to the user in real-time in multiple ways: visual, acoustic, and haptic. This makes the devices useful to visually disabled and colorblind people.

Results

It was found that UV reflectivity of skin with sunscreen is only 42% compared to the bare skin reflectivity. The degradation of sunscreen protection can be predicted as a function of time for a constant environemnt. In reality, a perfectly constant environment does not exist, and therefore real-time monitoring capabilities of my device may be very helpful for sunblock users. The device for preliminary cancer detection proved to be very sensitive to even the slightest skin discolorations and gave effective warnings when tested on photographs of skin cancer patients.

Conclusions/Discussion

I developed a set of compact and low-cost devices for skin cancer prevention and preliminary detection. These devices can be most useful for visually impaired and colorblind people. One device can let the user estimate the time when sunscreen needs to be reapplied in a particular environment. Another device can scan human skin and warn the user for suspicious abnormalities. The results are provided to the user in real-time in multiple ways to suit the needs of users with various disabilities.

Summary Statement

I created a set of affordable devices for real-time monitoring of sunscreen protection and preliminary diagnostic of skin cancer, suitable for visually impaired people

Help Received

My advisers helped me to find background information and the suitable sensors, as well as helped me to find the appropriate amplifier circuit diagrams.

Preliminary