Translation Between the Opacity of Photochromic Dye and UV Index

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The Ultraviolet Index (UVI) is a measure of the likelihood of getting sunburned while outside. Its only limitation is that the UVI is entirely predicted by satellites and is not measured at an individual's specific location. The purpose of this project was to build a portable UV indicator apparatus capable of accurate, localized UVI reporting. An apparatus based on the color change of a photochromic pigment was engineered and built to measure the UVI. UV flashlight tests and data collected during the night served as positive and negative controls, respectively. Programming allowed semi-automated measurement of more than 15,000 images that were converted into UVI values. Data analysis compared the outputted UVI from the apparatus and the reported UVI from https://open-meteo.com under varying weather conditions. Results indicate that the apparatus was accurate in predicting the UVI for both sunny and cloudy days, and more accurately reported the UVI on days that had a mix of sun, clouds, and rain. This apparatus accomplished my engineering goal of making a device that could accurately measure the UVI of an individual's location. Expanding this study could include adding a machine learning model to better calculate the UVI. The usefulness of the apparatus is broad and could include measurement of the UVI where such data is not available or in remote locations, especially for sun sensitive populations.

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