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Junkyard Multispectral Imaging

The purpose of this project was to see if a consumer digital camera can use different spectral bands to create visual differences in items that look the same in white light. The hypothesis stated that two items that appear the same in visible white light will appear different in a digital image when exposed to specific color bands. This experiment involved creating a circuit board with light emitting diodes (LEDs) mounted inside a black box. Two specimens that look the same in white light were placed side-by-side inside the box and exposed to either different bands of light (infrared 880nm to ultra-violet 405nm). Each specimen pair was photographed four times at slow shutter speed and loaded on a computer for comparison. Adobe Photoshop was used to add false color and contrast to show greater differences. Visual differences were addressed at high, medium, low or none. The data collected supports the original hypothesis that a consumer camera can be used to differentiate objects that appear the same in visible white light. Some specimen comparisons like glass vs. crystal and fake pine needles vs. real pine needles showed no difference. However, the pearls showed a high degree of difference under red and ultra violet. For oil and water, differences were seen under violet, ultraviolet, and minimal differences under infrared. Oil pastel and vinegar on paper showed differences under violet. The silver and aluminum coins also reflected differently under infrared, red, green, and ultraviolet. These findings support the idea of using an inexpensive consumer digital camera as a multi-spectral imaging device.