



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Chandan G. Lodha	Project Number J1213
Project Title Enlightenment: Creating the Perfect Picture for Scenes with Large Lighting Variations	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project is to investigate which shutter speeds to use and combine to effectively capture a scene with large lighting variations using a digital camera.</p> <p>Methods/Materials I used HDR shop software (freely available on the web) to combine images captured at different shutter speeds. I captured the images using a Canon Powershot G3 Digital Camera. In addition, I used a tripod, a computer, a printer, and photo paper.</p> <p>First take pictures of several scenes with large lighting variations using every f-stop shutter speed from 1/2000 of a second to 15 seconds. Next, load all the images onto HDR shop software. After that, create several new high dynamic range images, by combining the original images obtained at different shutter speeds using HDR shop. Then evaluate images obtained by using several different shutter speed combination options. Lastly, rate each option, on a scale of 0 to 5.</p> <p>Results After experimenting with several different scenes and shutter combinations, I finally evaluated seven different shutter speed combination options for four different scenes with large lighting variations. Indoor scenes (such as church and a room with a mirror), outdoor scene (such as a building with lots of windows), and an indoor-outdoor scene (looking out from a window) were chosen. Of the seven options, the perceptually based shutter speed option did the best. The next best option with a single image was created using the HDR shop software.</p> <p>Conclusions/Discussion Most cameras provide Automatic Exposure Bracketing (AEB) option. AEB captures three images of a scene, one at the automatically chosen shutter speed and two additional images, one f-stop below and one f-stop above. My hypothesis that high dynamic range image obtained by AEB will be the best, turned out to be false. Instead, images obtained based on perceptual ranking, turned out to be the best.</p> <p>Current technology available with digital cameras of capturing a scene with large lighting variations using AEB does not do a good job when the intent is to capture details of at least two regions of the scene that are lit differently. My results show that using shutter speeds that are sensitive to the regions of interest create much better pictures.</p>	
Summary Statement It is possible to improve state-of-the-art camera technology, by combining different shutter speeds, to create an excellent photograph of a scene with large lighting variations.	
Help Received Alex D'Angelo (Microsoft) helped interpret some parameters of camera software. Father drove me to various locations to take pictures, suggested initial idea, and helped write project abstract. Lynda Rogers (SF Coordinator) gave display tips. Mrs. Kilkenny gave lots of project advice throughout the project.	