



**CALIFORNIA STATE SCIENCE FAIR  
2006 PROJECT SUMMARY**

<b>Name(s)</b> <b>Philip Q. Shao</b>	<b>Project Number</b> <b>S1219</b>
<b>Project Title</b> <b>Density-Based Color Subtraction for Noise Reduction in Motion Detection</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The goal of this experiment was to determine a new way of extracting and tracking a moving object from an inferior movie sequence generated by an inexpensive commercial web-camera.</p> <p><b>Methods/Materials</b> The project studied extraction of moving objects in front of two types of background scenes. 1) Stable background is a white plain scene; 2) Unstable background is a colored scene, strong color variation is considered unstable in the space domain. A Computer algorithm was developed to extract the moving object from a mixed scene, to reduce background noise and to output the location of the moving object.</p> <p><b>Results</b> In order to accurately track the moving object using the low quality, high noise web-camera, the noise reduction methods were established and their effectiveness was studied based on the output tracking accuracy. a) Pixel by pixel Intensity Subtraction Threshold (T-PIS) method used the difference in gray scale intensity as noise threshold scale. The threshold could be adjusted based on the background/object intensities. This method effectively removed most of the random noises due to the low camera quality. b) Threshold applied to Density-based Color Filtration (T-DCF) counted the number of flagged (as moving object) pixels in the area adjacent to a given pixel producing a Flagged Pixel Density percentage (FPD). A threshold could be set to eliminate the noise since the FPD around a noise pixel would be much lower than a moving object. c) The signal to noise ratios resulting from these two filters were plotted and analyzed to illustrate the effect of each threshold on the noise reduction.</p> <p><b>Conclusions/Discussion</b> Using a combination of T-PIS and T-DCF, the experiment was able to produce the low-noise environment necessary for tracking the moving object. The output enables further algorithms for security tracking system and/or data analysis . With this image processing capability, an inexpensive image-capture device can be used in a wide range of Homeland Security applications.</p>	
<b>Summary Statement</b> A study of noise reduction for object isolation and tracking applications	
<b>Help Received</b> Parents purchased camera. Mother proofread report.	