



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

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Project Title Density-Based Color Subtraction for Noise Reduction in Motion Detection	
Abstract Objectives/Goals 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. Methods/Materials 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. Results 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. Conclusions/Discussion 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.	
Summary Statement A study of noise reduction for object isolation and tracking applications	
Help Received Parents purchased camera. Mother proofread report.	