



CALIFORNIA STATE SCIENCE FAIR 2006 PROJECT SUMMARY

Name(s) Vinayak Ramesh	Project Number S0716
Project Title A Collaborative Framework to Enhance Camera-Based Security Systems using Intelligent Wireless Sensor Networks	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals A site council meeting at Oak Ridge High School, highlighted how the school's PTZ camera-based security system was unable to provide adequate security coverage on campus. Addition of more cameras was very expensive. This prompted the idea to build an innovative and cost effective system to enhance the existing security system. The hypothesis is that the camera-based security system, in collaboration with the WSN system, would increase the number of events recorded.</p> <p>Methods/Materials The approach involves a Wireless Sensor Network (WSN), consisting of "motes", to monitor motion around the school. The WSN system uses household wireless motion sensors. A transducer was designed to convert motion to light readings. Motes were programmed to detect light readings and transmit the data wirelessly to other motes in the network using a multi-hop scheme. A base mote channels the data to a PC-based data logger which logs events related to motion. The experiment was conducted in Oak Ridge High's parking lot, monitored by a PTZ camera. Monitored by a 4-node wireless sensor network were two points. A subject was made to run across the areas monitored once every few minutes, 60 times.</p> <p>Results Out of the 60 trials, total, the PTZ had a 12% success ratio, whereas the wireless sensor network had a 95% success ratio. Combined, the wireless sensor network, working together with the camera, would catch 57/60 events, in the worst case, and 60/60 events, in the best case. This indicates that hit detection of the camera system is enhanced by about 750% when working together with the wireless sensor network. A 2-proportion Z-test statistically proved the WSN + camera system to be significantly better than the current system.</p> <p>Conclusions/Discussion By enhancing the current camera system by adding the wireless sensor network, performance in hit detection has gone up by 750%. This wireless sensor network is proactive: it alerts security as an event happens, not after the fact. Without adding new and additional cameras, which are very expensive, the whole school can be covered by a wireless sensor network, in addition to the current cameras; this is a much more cost effective approach. These networks can easily be deployed and moved, as they are wireless and fast to setup. These experiments show that this wireless sensor network setup with motion sensors does enhance the current camera system significantly and at low cost.</p>	
Summary Statement My project is on enhancing current camera-based security systems by adding a wireless sensor network.	
Help Received My father helped with programming; Assistant Principal + school's Security officer helped by allowing me to use the school campus and experiment with the camera system.	