

Senior Project - Gander

Machine Learning Based Object Recognition

Senior Project: 2009-2010

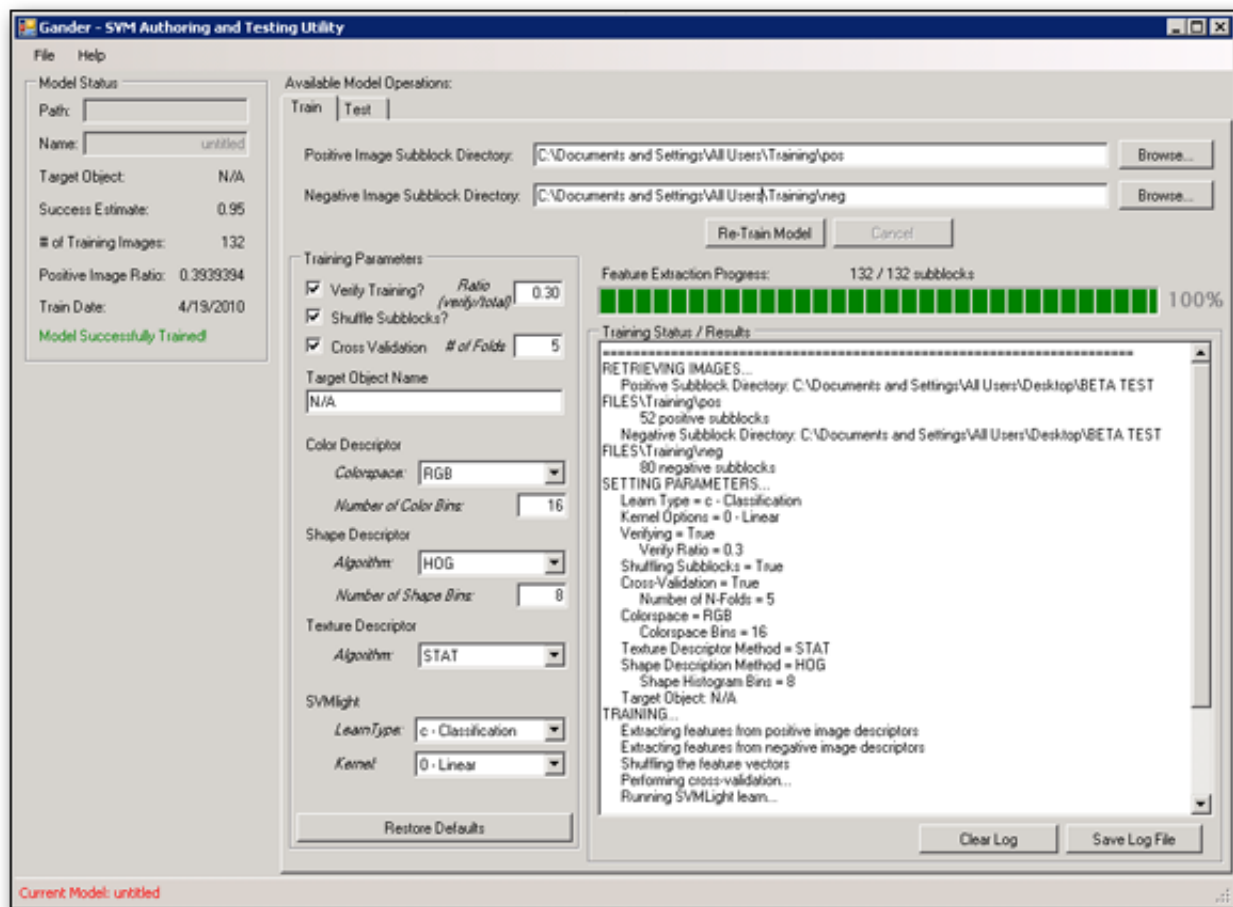
Nicholas Embree, [Zachary Flower](#), Robert Naugle, Michael Russell and [Diana Tamabayeva](#)

TKO Enterprises, Inc.

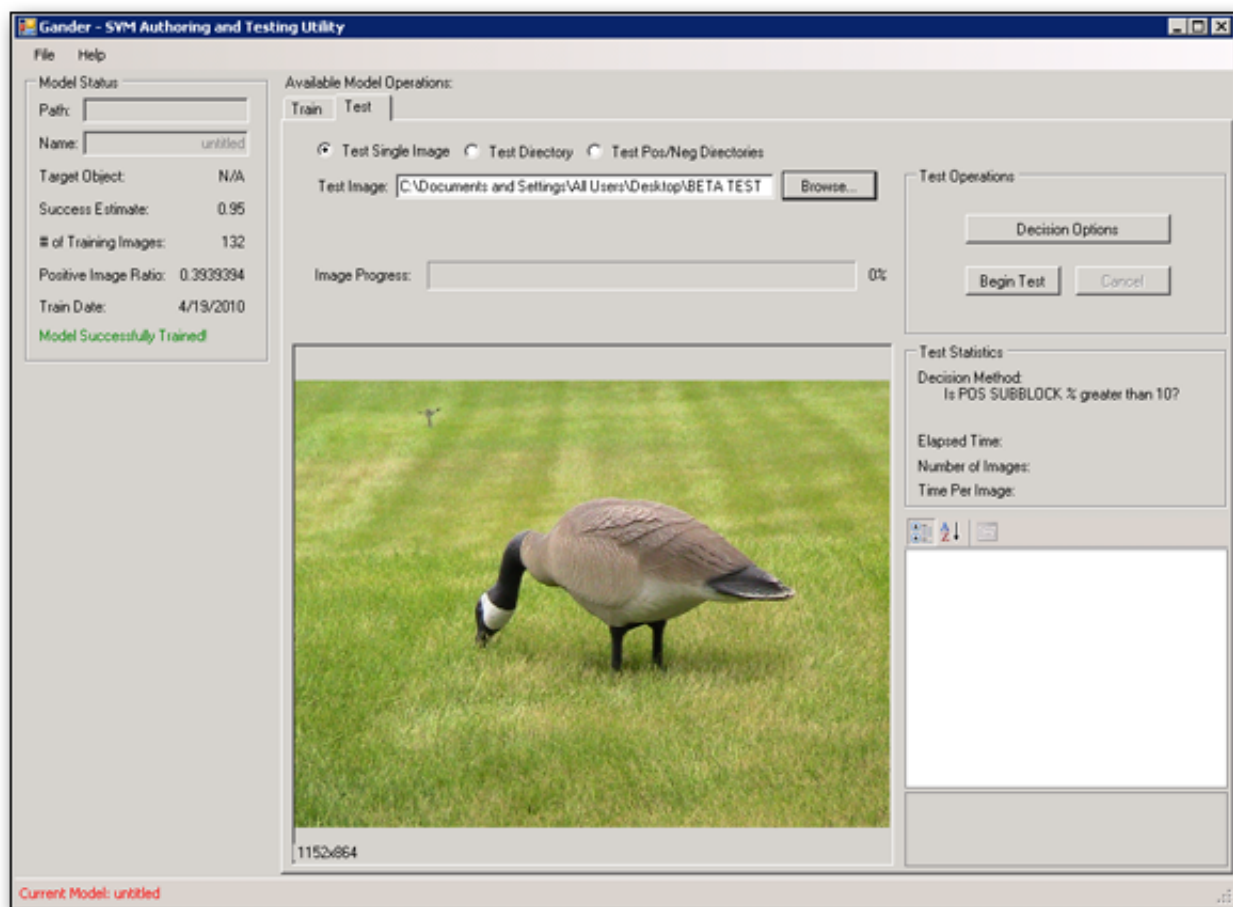
Longmont, CO

Current sensor technology is mostly based on motion/heat signatures. This is insufficient for many applications, and can be problematic when the need is to discern between various stimuli. TKO Enterprises became aware of a lack of a "smart sensor" in the current sensor market, and began work on developing a sensor capable of recognizing the presence of a specific "target" object. Such a smart sensor would use image processing techniques to analyze a sample image, compare it against a baseline or reference, and return a positive or negative indicator, thus improving on the standard motion detector. TKO Enterprises developed the algorithms necessary to process and classify images in [MATLAB](#), a mathematical programming environment. The *MATLAB* algorithms were useful as a proof-of-concept, but were difficult to work with and impossible to embed in a sensor for use in the field.

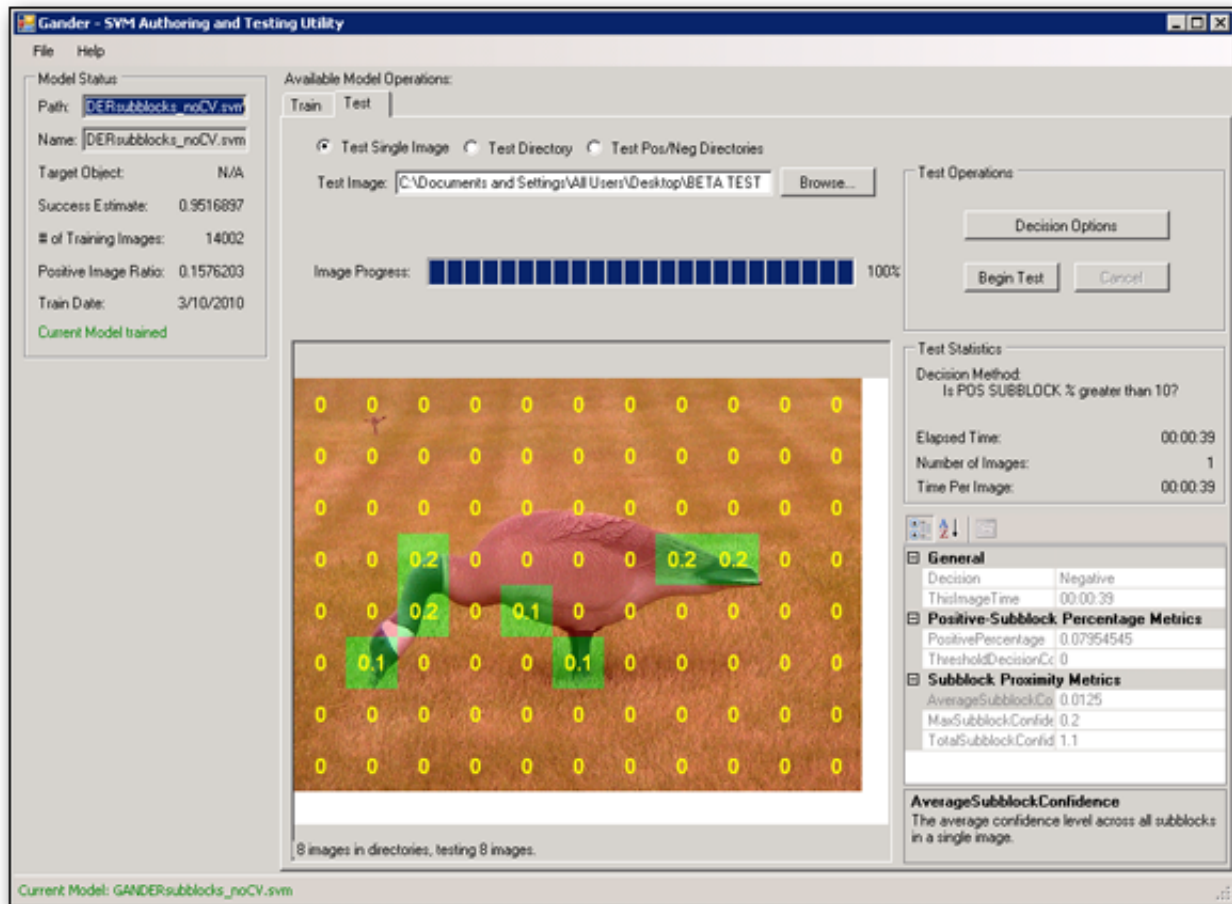
The goal of the project was to improve algorithm usability by making parameters more accessible, converting *MATLAB* algorithms to a useful form for use in an embedded environment, and to optimize and improve recognition capabilities through manipulation of algorithm input parameters. *Gander* solved the problems set forth by TKO Enterprises through a two-part solution. The *Gander Debugging Environment* optimizes and improves the use of the recognition algorithms and will output a positive or negative signal to an external device based on the analysis of sampled images using a set of existing software algorithms. The project will advance the usability and performance of the algorithms through optimization of the configuration data and learning parameters and by providing an organized method for data input and output. *Gander* is able to output the information necessary to identify the target object for later use in separate systems. All of these objectives are performed on a PC platform using a general user interface and run time environment.



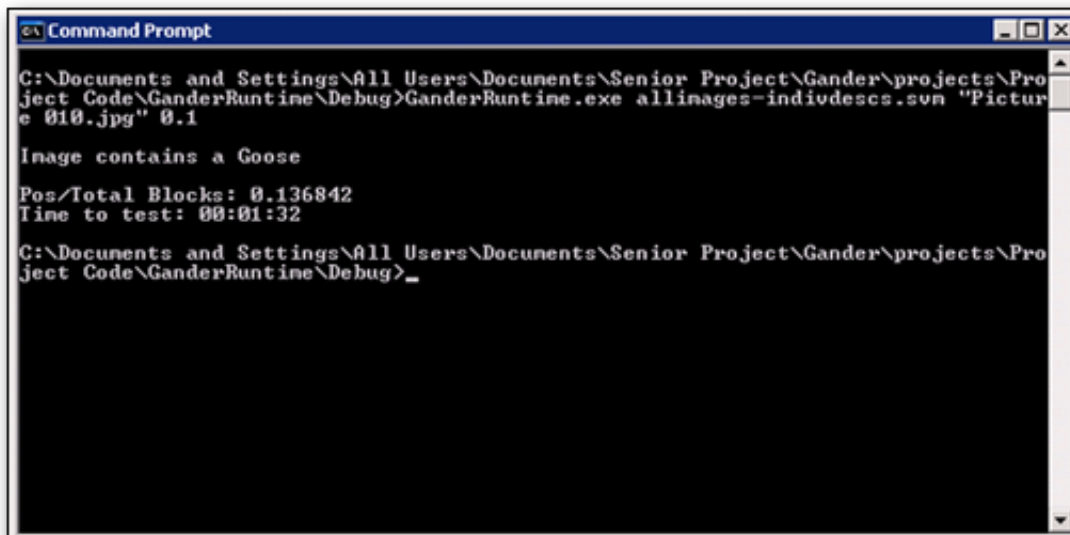
Training



Testing



Tested Model



Run Time System

