Sandy Computer Vision

An Exploration of ML applied to Image Processing at the Beach

When we first started this project, our goal was to build software to be installed on a rover that would clean up beaches more efficiently, cheaply, and effectively than current solutions. To achieve this task, our software uses sliding windows that also vary in size to scan every image that a rover or drone takes, feeding the sub-pictures inside the windows into the next stage of our program. We then apply edge detection and blob detection algorithms to extract those features, and also measure the contrast in color between any sliding window and the rest of the image. These features and more are fed into our giant neural network, which using our 2000 images of training data, will predict whether or not a particular sliding window contains trash. The rover could then travel to that area and scoop up that piece of litter.

We have experimented with many different methods of computer vision. Simply feeding pixels into a neural network fails, yet trying to extract too many features from the images can be difficult as well. One way we are addressing this challenge is by striking a balance, as we are attempting to feed in an image of solely the borders of detected objects into our neural network. As we continue to develop new ways of tackling this problem, we hope to make further progress and program our software to identify trash more accurately by finals block.

We submitted our idea both to the New Hampshire Social Venture Innovation Challenge and the Conrad Spirit of Innovation Challenge to seek an investment into our project. Gaining these funds is essential to the continuation of this project; an investment would allow us to build a prototype rover and apply our software to benefit real beaches.

# Code to look at

Though you can see what we have been working on with the neural networks in the “Testing Grounds” folder, the finished products of computer vision toolkits we’ve designed and are trying to work with are in the folder “Feature Attempts.” In there is a readme on how to use each one. There are two folders of images to play around with: Sample Images and Training Images. One contains sample low-res beach images and one contains real beach pictures we took. Finally, the Social Venture folder contains our final project proposals we submitted to our two contests as well as our script for the presentation we gave at the competition itself. The videos were too large to upload but feel free to ask us for those, we can upload as necessary.

# Setup Instructions

Open a Terminal Window and run the following commands:

### Install Homebrew (A Package Manager for MacOS):

‘/usr/bin/ruby -e "$(curl -fsSL <https://raw.githubusercontent.com/Homebrew/install/master/install)>"’

### Install Python and Supporting Libarries:

‘brew install python’

‘pip install numpy’

‘pip install matplotlib’

‘brew install scipy’

### Install OpenCV2:

‘brew tap homebrew/science’

‘brew install opencv --HEAD’

‘export PYTHONPATH="/usr/local/lib/python2.7/site-packages/:$PYTHONPATH’