Utility Poles Detection

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Introduction

For Telecom operators, the deployment of 5G utility devices is a huge burden. Usually, the telecom device is installed on utility poles across the entire city.

This project is going to use Google Street Imagery to model utility poles in a neighborhood and find matches to install certain equipment. Machine learning & Computer Visions will help us analyze the photos of utility poles and finally display results. If we want to measure real distance in a photo, we need reference, so it's not efficient to analyze hundreds of different photos because it's hard to find reference for each. So in this project we will focus on the technic of machine learning to analyze data.

Methodology & System Architecture

Basically, The procedure is divided into three part establishing dataset, training our data and test it.

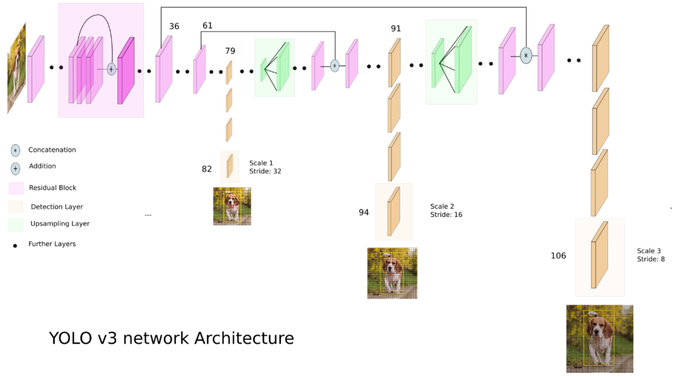
1. Establish Database
2. Annotation
3. Training & Test

The labeled pictures has the coordinates of four rectangular points.
0 means the index of the labeled item. Since we annotate only one object, the index is 0;

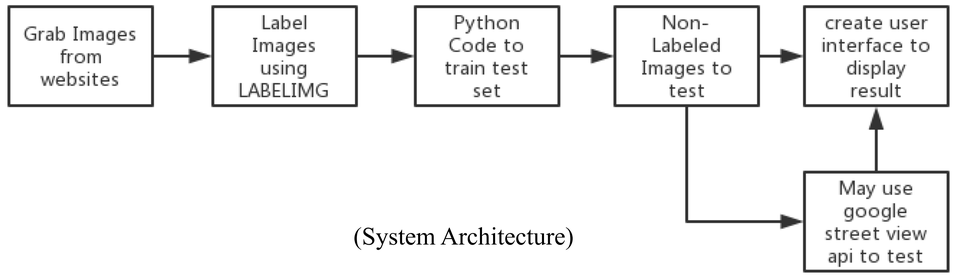

```
0 0.618462 0.370070 0.156923 0.508121
0 0.814615 0.587007 0.072308 0.255220
```

In this project, YOLO3 was applied for the detection part.
the reason for choosing YOLO3 is that

1. Considerably faster compared with other state of art detectors like RetinaNet.
2. YOLO v3 incorporates residual blocks, skip connections and upsampling compared with YOLO2.
3. YOLO v3 performs better in detect small and medium and large size objects compared with YOLO2.



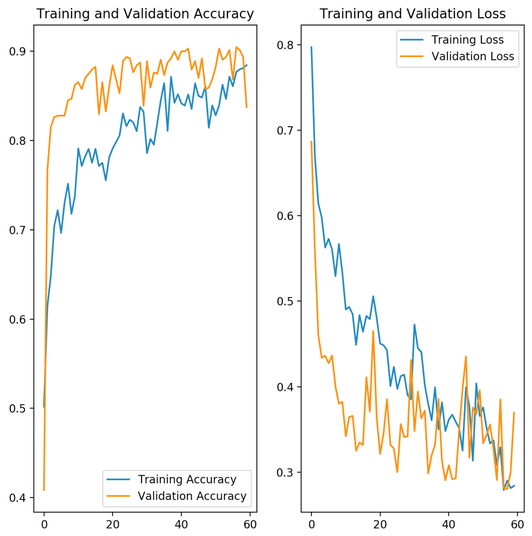
YOLO v3 network Architecture



(System Architecture)

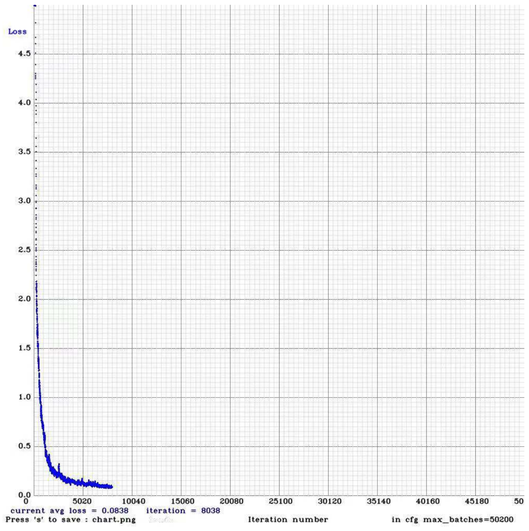
Results

Training result using TensorFlow.



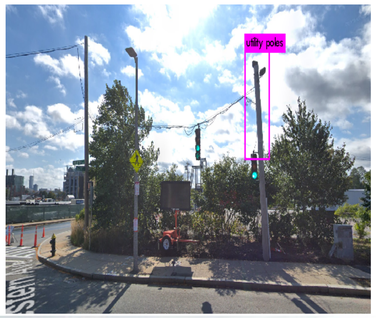
(Earlier training tool)

Training result using YOLO3.



Final training tool, with higher accuracy.

Detection Results



User Interface

The program will get the street view from Google Street view static API with given coordinates and then determine whether there is/are utility pole(s) in the image. Also, the application will show the map of the given location by using Google Map API