VERMONT
AGENCY OF TRANSPORTATION

FACT SHEET

2019 Research Showcase & STIC Annual Meeting

Traffic Signs Detection & Geospatial Localization

PROJECT TITLE

Traffic Signs Detection & Geospatial Localization

STUDY TIMELINE

January 2018 – March 2020

INVESTIGATORS

Safwan Wshah, UVM, PI

VTRANS CONTACTS

Jonathan Nelson, GIS Professional, Daniel Schall, GIS Professional, Vermont AOT – Asset Management

MORE INFORMATION

VTrans Research will add link to the final report and other materials on VTrans website

This fact sheet was prepared for the 2019 VTrans Research Showcase & STIC Annual Meeting held at the Dill Building in Berlin, VT, on September 11, 2019 from 8:30 am– 1:00 pm.

Fact sheets can be found for additional projects featured at the 2019 Symposium at http://vtrans.vermont.gov/planning/research/2019showcase

Additional information about the VTrans Research Program can be found at http://vtrans.vermont.gov/planning/research

Additional information about the VTrans STIC Program can be found at http://vtrans.vermont.gov/boards-councils/stic

Introduction

Our goal is to leverage novel deep learning techniques to construct an automated system which detects, classifies, and determines the GPS location of road signs using images captured from a road vehicle. Furthermore, we introduce a large-scale dataset to serve as one of the very few benchmarks for US. traffic signs recognition (TSR).

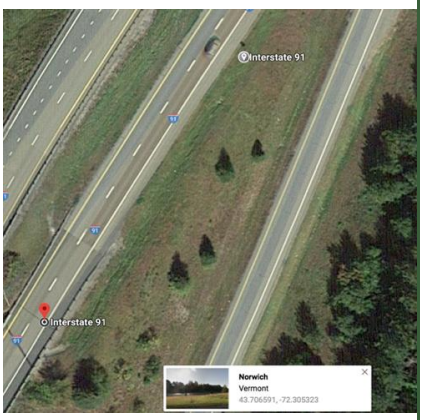

Figure 1: The white color indicates predictions by our network, and the green color refers to the manually labeled ground-truth.

Methodology

Our baseline system uses a heavily modified version of RetinaNet, a state-of-the-art object detector using deep learning. To convert the detections from the RetinaNet into specific sign locations, we train a neural network to distinguish between detections belonging to different signs and use the Hungarian Algorithm to match detections belonging to the same signs. In terms of dataset creation, we adopted an open-source tool called *labelImg* to serve as an easy, yet a cross-platform tool for data annotation.

Conclusions

Our best model currently achieves a 75th percentile mean average precision of 83% when performing sign detection and classification. The system scores an average of 5.32 meters' geospatial margin of error, which is particularly impressive given that no depth information is fed into the deep network.

Potential Impacts and VTrans Benefits

Our research helps identify and localize road assets to assist with assessments and maintenance plans. Additionally, we plan on our dataset reaching approximately 40K annotations by the end of our research. This will make it the largest dataset available for TSR, and the first-ever dataset to feature object-related GPS information, which will support future research VTrans may wish to perform in this field.