

Object Tracking and Geo-localization from Street Images

PROJECT TITLE

Object Tracking and Geolocalization from Street Images

STUDY TIMELINE

March 2018– Jul 2023

INVESTIGATORS

Safwan Wshah, UVM, PI
Daniel Wilson, UVM

VTRANS CONTACTS

Rick Scott
Rick.Scott@vermont.gov;
Alex Geller
Alex.Geller@vermont.gov;
Ken Valentine
Ken.Valentine@vermont.gov;

KEYWORDS

Traffic Signs, Object Geolocalization, Deep Learning, Computer Vision

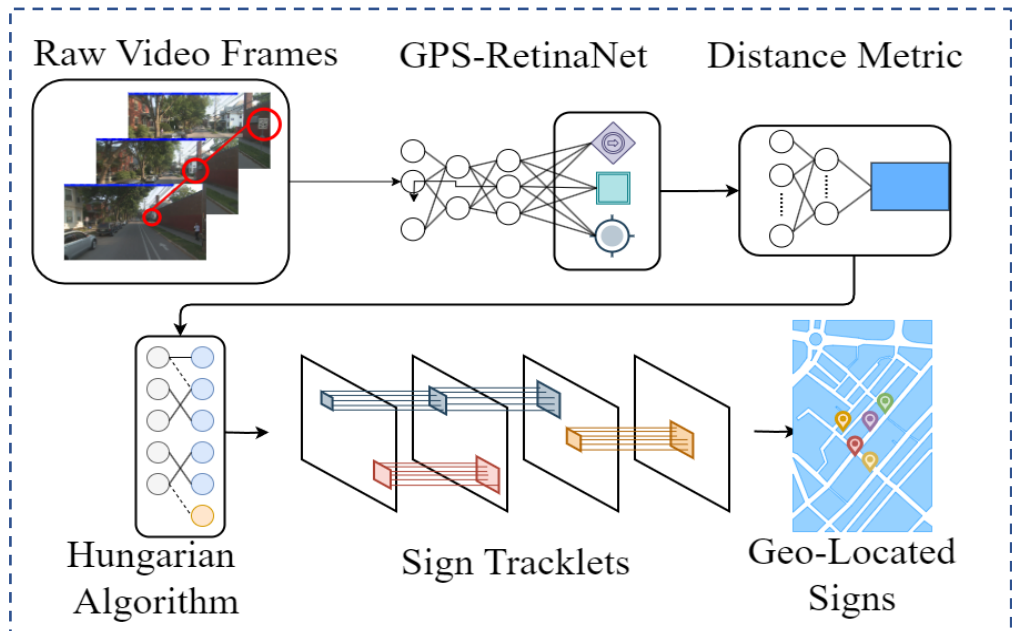


The University of Vermont

More information about the VTrans Research Program, including additional Fact Sheets, can be found at: <http://vtrans.vermont.gov/planning/research>

Introduction or Problem Statement

Our project applied novel artificial intelligence algorithms to construct an automated system which detects, classifies, and geo-localizes traffic signs using roadside images as input. We have also constructed a viewer widget which enables users to view signs, their class types, and locations on a GIS map.



Methodology or Action Taken

We have constructed a deep learning-based object detector which uses a cascade of convolutional networks to predict sign classes and coordinates. We have built a new semi-supervised dataset containing over 100,000 images. To merge repeated occurrences of the same sign from separate images, we have constructed a “tracker” which consists of a neural network to compute a similarity score between detections, and match repeated signs using the Hungarian Algorithm. Finally, we have built a multi-year tracker which detects repeated occurrences of the same sign across different years.

Conclusions or Next Steps

We have completed our fully functioning AI pipeline, and have applied it to process over 5 terabytes of Vermont street imagery from 2018-2022. The resulting images and AI predictions can be viewed using the developed web viewer widget.

Potential Impacts and VTrans Benefits

Our research provides an automated system to construct a GIS map of signs from street-side images, and a widget which visualizes the output signs and allows the user to interact with them. These tools enable more efficient inventory assessments and maintenance plans. Additionally, the large dataset we have constructed will support future research VTrans may wish to perform in this field.