DEPARTMENT OF

Electrical and Computer Engineering

11-203 Donadeo Innovation Centre for Engineering
9211-116 Street NW
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Community Science Traffic Counter

Objective

Develop a traffic counter to collect and store real time traffic volume and composition data. The counter must be easily deployed and maintained at community scientist locations (e.g. residences, community halls, schools).

Motivation

The Tomorrow Foundation for a Sustainable Future (TF), an Edmonton environmental charity, has a focus on creating projects that are grounded in the collection of data using community science. Currently they have a project to install air quality monitors at community locations, in conjunction with the Alberta Capital Airshed (ACA). The TF would like to add further context to the air quality data being collected by gathering traffic data at the same location.

Most Suitable Background for the Project

Engineering Physics	2
Electrical Engineering	2
Computer Engineering	1
Computer Engineering – Software	3

Description

The challenge is to create a traffic counter that is low-cost, can be easily installed, and is easily maintained by community members who may not have technical knowledge. The traffic counter shall count all traffic passing a specific location, and be able to distinguish between motorbikes, cars, trucks and bicycles. The location is likely to be either a community hall or a community member's residence, and so will have power and WiFi available, and the computer can be installed inside, if the camera is outside and functional (security and extreme temperatures will be a consideration).

The expected outcome is a prototype of the counter, including instructions showing consideration of installation procedure/ requirements, as well as future operation and maintenance (for at least one year). The TF has developed a prototype already which can be used to build upon (test for suitability, or otherwise propose something new).

A trade study to investigate viable platforms optimized for size, weight, and power that provide real-time performance of the functional and performance requirements is highly desired.

Functional and Performance Requirements / Objectives

1. Real time identification and counting of different types of traffic (cars, trucks, motorbikes) - data

2. Collects data and stores it in the cloud for at least one year

3. Can be installed (connect to power and WiFi) in a typical residence with little to no maintenance (ease of operation and maintenance is a factor, including e.g. what happens if the community member changes their WiFi password)

4. Additional consideration of data visualization

Specifications / Constraints

The final prototype design should have the following elements:

1. Connection to power supply

2. Connection to WiFi

3. Ability to upload data to the cloud

4. Outdoor mountable camera

5. May be based on the original project done by the TF, but not necessarily

   - A proposal for a different approach can be entertained.

Information Resources / Links

The original prototype developed by TF referred to the following links for the open source code:

https://github.com/opendatacam/opendatacam

https://www.balena.io/blog/using-opendatacam-and-balena-to-quantify-the-world-with-ai/

The following equipment was used:

Outdoor Camera (suggested)

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https://www.amazon.ca/Wyze-Wireless-Camera-Android-Version/dp/B076H3SRXG

Box (installed inside house) $35.99

https://www.amazon.ca/Waveshare-Case-Specialized-Jetson-Nano/dp/B08PBXVP1X/ref=sr_1_1?crid=YHJDUN0T7IKJ&keywords=waveshare+metal+case+specialized+for+jetson+nano&qid=1662506335&s=electronics&sprefix=waveshare+metal+case+specialized+for+jeston+nano%2Celectronics%2C112&sr=1-1

Memory Card $12.99

https://www.amazon.ca/SanDisk-Ultra-microSDHC-Memory-Adapter/dp/B08GYBBBBH/ref=sr_1_3?crid=234E0L02LOHPX&keywords=sandisk+64+gb&qid=1662506386&s=electronics&sprefix=sandisk+64+gb%2Celectronics%2C116&sr=1-3

Power supply $18.99

https://www.amazon.ca/Waveshare-Power-Supply-Applicable-Jetson/dp/B07X8P1LFD/ref=sr_1_1?crid=33JOO7XZK2FUW&keywords=waveshare+power+supply+applicable&qid=1662506462&s=electronics&sprefix=waveshare+power+supply+applicable%2Celectronics%2C124&sr=1-1

Wireless NIC module $28.99

https://www.amazon.ca/Waveshare-AC8265-Wireless-Supports-Bluetooth/dp/B07SGDRG34/ref=sr_1_2?crid=3AUQ6AZP6XMLV&keywords=waveshare+wireless+NIC+Module&qid=1662506516&s=electronics&sprefix=waveshare+wireless+nic+module%2Celectronics%2C109&sr=1-2

Developer Kit Board $799

https://www.amazon.ca/NVIDIA-Jetson-Developer-Computer-Development/dp/B07SHF9V4J/ref=sr_1_2?crid=1NB1S6BM3OEWB&keywords=jetson+nano+developer+kit+single+board+computer&qid=1662506594&s=electronics&sprefix=jetson+nano+developer+kit+single+board+computer%2Celectronics%2C125&sr=1-2

or Developer Kit Board $150 (is there a newer version?)

https://www.sparkfun.com/products/16271#reviews

Prototyping/Testing Resources

No specific testing resources required other than power and WiFi, and a location that has traffic that can be counted. Testing may be preferred in a community scientist location, if that can be arranged.

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Intellectual Property Restrictions

Note: Public presentation and, hence, disclosure is a course requirement.

- All results and intellectual property created will be owned by the sponsor with the student capstone group having the right to use same royalty-free (written agreement required).

- The sponsor reserves the right to open source the project.

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