WGU C964

Task 2 - Section A

PROJECT RECOMMENDATION

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**Problem Summary**

Zee Car Company (ZCC) is looking for a way to deliver parts autonomously from the onsite warehouse to various locations on the factory floor and campus. The factory runs 24 hours a day and so ZCC needs a solution that does not require explicit supervision by a human (employee).

ZCC would like a solution that requires minimal infrastructure change and a solution that can either adapt or easily change to suit multiple factory layouts.

The proposed solution is a self-driving delivery vehicle (electric) that can navigate a set of painted lanes. The solution will be able to adapt to different routes set out using the painted lane method.

The scope of this solution includes all software development, the training of the machine learning models in order for the vehicle to navigate autonomously, and one physical delivery vehicle with software installed. It does include multiple physical vehicles, software licenses for more than one vehicle, and ongoing maintenance to the software or vehicle.

**Application benefits**

ZCC currently relies on delivering parts by hand from it’s onsite warehouse to various locations on the factory floor. This process requires staffing 24 hours a day. It is also slow and inefficient. ZCC does not want to invest in permanent infrastructure, such as tracks, in order to deliver the parts as the factory layout is prone to changing and they have multiple factories with different layouts.

The proposed solution will be completely automated and will be able to operate unsupervised. It also does not require any significant infrastructure. The only requirement is a painted lane on the factory floor. The routes and the factory floor layout can be changed and the self driving vehicle will be able to adapt. Once the pilot program has been implemented, it can be rolled out to ZCC’s other factories with relative ease.

**Application description**

The proposed solution will be a fully electric delivery vehicle which will use a battery as its main source of power. This is both quiet and environmentally friendly especially in a factory environment.

It will carry an onboard computer capable of processing images through two machine learning models in real-time. The first machine learning model will enable the vehicle to navigate a painted lane on a factory floor. The vehicle will be able to navigate unseen routes. The second machine learning model will allow the vehicle to detect objects in close proximity and make decisions based on those detected objects. These objects include specially designed signs, for example a speed limit sign, and other potential hazards or persons.

**Data description**

The data that will be used in order to train the models will be collected and processed by X-Soft. X-Soft will construct training routes (painted lanes) inside environments similar to that of a ZCC factory and use a vehicle similar to that of the final solution to gather information as it is driven by hand through various training routes and environments.

X-Soft will also collect, process and produce the images needed in order to train the object detection model.

**Objective and Hypotheses**

The objective of this project is to produce a fully autonomous vehicle that can deliver parts to various locations within a ZCC factory.

If the proposed solution is able to navigate an unseen path without deviating from the path, and the proposed solution is able to detect predetermined objects in close proximity and make decisions based on those detected objects, then the proposed solution will be able to operate autonomously, therefore fulfilling the primary objective.

**Methodology**

Development will follow the SEMMA methodology. Sample, Explore, Modify, Model, Asses.

This methodology is particularly effective for data modelling which will make up the majority of the proposed solution. We believe that a self-driving vehicle needs to have a 100% success rate and therefore the modelling process has to be extremely rigorous. We can not deploy the vehicle until it is able to navigate the designated lanes and detect particular objects without failure.

**Funding requirements**

The total cost for this project will be approximately $58,000 for software development and $92,000 for one physical vehicle. This does not include any ongoing maintenance of the software or the physical vehicle. The cost does not include extra software licenses for additional vehicles.

**Stakeholders impact**

The proposed solution will have a direct impact on the parts fulfillment office. The method by which they will deliver parts will be completely changed.

Any parties on the factory floor will be directly or indirectly affected by the vehicle. The manner in which various departments receive parts will be affected.

Human resources will be affected as certain functions within the organization will be rendered obsolete.

**Data precautions**

There will be no collection or storage of sensitive data. When the vehicle is in the final stages of training, there will be images collected of the factory floor (with painted lines). Although the camera is orientated in such a way that it could potentially take photographs of sensitive material (within the factory), once the images are processed for machine learning purposes, there will be no sensitive material visible within the training set.

Should any images contain persons or information that we do not have the rights to, these images should be discarded and excluded from the data set.

**Developer’s expertise**

X-Soft is an industry leader in the development of self-driving golf carts. It’s CEO Warren Harper, has published multiple academic papers on the development of convolutional neural networks and how they can be used to accomplish deep learning within the computer vision space.

We believe that these credentials make us a suitable candidate for the proposed solution of building a self-driving vehicle for ZCC.