SUMMARY

The aim of the thesis was to enable the development of autonomous vehicles in a virtual environment by bringing the real world geography to the convenience of simulation softwares. Scanning and mapping an area based on RGB and LIDAR data to create a 3D model of it was the main goal. Overall the workflow can be digested into 3 sections:

- Data acquisition
- Processing of obtained data
- Outputting of 3D model

Data acquisition was done by using a drone equipped with an RGB camera and a LIDAR module installed on a personal car. The main method used to obtain the data was aerial image capturing by utilizing different camera angles per flight, and the positioning information was corrected with the help of accurate GPS readings of the GCPs that were strategically laid on the ground. LIDAR data from the ground was also collected, however it was not included and is being held for future development.

For further processing of the captured data, a photogrammetric software called MetaShape Pro was used. The obtained data was imported into the software and camera aligning is performed in order to acquire a sparse point cloud. After aligning procedure has been performed by the software, dense point cloud creation tools of it have been utilized. The dense point cloud was obtained in 3D and has been manipulated in order to classify the objects in the data.

The 3D model was then extracted by using the MetaShape software from the previously created dense point cloud. Since the data captured had RGB color data, no further manipulations were needed to colorize it.

The resulting 3D object had texture in RGB, and resulted in a successful model for importing into any supporting 3D manipulation software as well as simulation purposes.

In the future, the LIDAR data is planned to be used alongside a 360 RGB camera, in order to obtain much higher resolution output with color. The higher resolution models will provide more detail and broader sense of environment to serve better in testing of autonomous vehicles in further development.