Summer Internship 2019 Report

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Internship Period : May 28, 2019 – August 30, 2019

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About the company:

Veoneer is a spin-off company formed out of a well know automotive passive security system company called as Autoliv.

Veoneer works on active safety systems primarily on automotive radar sensors. Veoneer sells automotive radar to top automobile manufacturers like Subaru, BMW, Mitsubishi, Renault Nissan. Some of the other products by Veoneer's are including brake control systems, radar, night vision, driver monitoring systems, advance driving assistant system, electronic control units, and camera vision systems and produce pedestrian protective systems.

Lowell facility of Veoneer primary works on development of Radars sensor on 77Ghz and 24 GHz. 77Ghz radars help in developing a solution to a problems like blind-spot detection, rear cross-traffic alert, adaptive cruise control lane change assist, Safe door opening, forward and rear collision avoidance system, free space detection, and autonomous emergency braking

Veoneer driving monitoring system can help identify distraction while driving by taking measurements of the eye and head movements. This feature allows the development of a level two autonomous vehicles.

Veoneer's Sweedish facility works on the development of Lidar. Lidar performs a better job than radar sensor in detection of pedestrian, detect lane markings and in the creation of 3D map of the road.

Background Information

At Veoneer, sensor data is collected from the car to test and develop the automotive radar sensor. Multiple radar sensors at different locations of the vehicle are used along with auxiliary sensors such as camera and Lidar. Multiple sensor data is packed into a single file using an in house developed tool.

My role in the internship:

My task was to work on developing a plugin for an automated framework. The framework provides a storage management interface and a platform to execute the applications to process the data and stores the results in an organized form.

The framework provides libraries to develop custom plugins. At Veoneer Lowell location custom tools have been developed to extract information from sensor bundle file as per requirements. Requirements such as requirement of images, meta data, performing validation check on the data etc. My task was to develop plugins to execute these tools. A plugin creation requires understanding of the project structure of the framework and buildin functions of the framework to perform any operations. These operations are executed on a server, the operations are scheduled by the framework. These API functions were different from functions in common java syntax. Since the program executes on a server thus in order to test the code out it is required to make a package of the code and then upload the package to the server to see the output of the code.

Task performed at the internship:

Following were the main tasks:

A. Finding Bugs in existing plugins and work on bugfix for normal operation

B. Developing new plugins or add new features to existing plugins

C. Performing integration and merge the code developed by multiple developers

A. **Finding Bugs in existing plugins**

A.1 Finding fix of an issue in an existing plugin which extracts images out of the sensor data bundle. Code was added to obtain files from the multiple output directories. Different Input arguments belonging executable were tested to avoid the case where no output images are obtained through the data bundle contains images.

A.2 Debugging a non-operational plugin which performs BSM Blind spot monitoring.

A small feature was added in java to pipe the response of the executable to a string an to display the string on the logs of the operation. The executable runs as a background process in the framework. SQL database query generated by the executable was piped and analyzed. Further, modification to C# code was done to create a new executable to solve the issue.

B. **Developing new plugins or add new features to existing plugins**

B.1 Added a new feature of to an existing plugin which obtains detections from radar sensor data. The feature allowed the plugin to store detections from sensor data obtained multiple radar sensors at a different location in a single operation which earlier was done individually.

B.2 Developed and added functionality to existing plugins to send email notifications to the user, the notification contains the status and location of the output of the operation.

B.3 Developed a plugin to obtain GPS coordinates from the sensor bundle file: A plugin was developed to execute the tool which extracts GPS data file from the sensor bundle. My task also included the part to find and store this data file, to obtain the geographical coordinates out of the data file and to create a geographical map from these coordinates. Javascript based API was used to generate the map.

B.4 Developed a plugin to allow the user to upload detection to a storage server: A file upload function option was created which find and add files to an existing storage unit.

B.5 Developed plugins to perform compression and decompression of the sensor data bundle belonging to different drives. Different methods of compression were performed to ensure fast and reliable compression of the file.

B.6 Developed a plugin to connect and update the columns of a SQL database

C. **Performing integration and merge the code developed by multiple developers**

C.1 Different plugins developed by different developers were integrated into one single project

C.2 Changes made on a single file by multiple developers was merge by using merge tools such as Beyond Compare.

C.3 Integration testing was performed to validate if the plugins are operational after integration.

D. **Other projects**

D.1 Offline execution of different tools to understand the working and editing the Metadata of the sensor data bundle files having the wrong information.

D.2 Work with Garage team which was facing difficulty in uploading the driving data using the storage API of the framework.

In house Training Attending

Opportunities to attend practical training lessons at Veoneer were provided to learn more about software engineering. Following is brief information about the training session that I attended.

1. Software configuration management: In this training session software configuration management using bit bucket and its usage through a framework called Source tree was discussed. After attending the training I got more familiar with the process of creating a new branch of the project, understand the branch tree and managing different branches while creating new features and merging

2. Software Development Processes: In this training session different standard of software development process were discussed. Different stages of development and different required components such as software requirement sheet, project estimation plan, project terminology sheet were discussed. These stages and component provide an organized manner to develop a big software project.

What I learned from Internship:

1) Programming using Java, JavaScript and C#
2) Gain experience in SCRUM based software development methodology
3) Opportunity to work and visualize vehicular sensor data and understanding problems in intelligent transportation systems.
4) Collaborating with software developers from different countries.
5) Attended training on software configuration management system and software process
6) Learn how to develop server-side applications
7) Learn to use different software development tools such as JIRA, Beyond Compare, Maven, Bitbucket, Smartbear Code review client

Acknowledgment:

1) Nathan Kurtz: Supervised the results of my tasks and provided me the details of the requirements
2) Paul Galla: Provided my suggestions as a regular user of the framework
3) Gaurav Pathak: Lead developer of the team who reviewed my code.

References:

1) http://www. .veoneer.com
2) https://smartbear.com
3) https://maven.apache.org/
4) https://www.scrum.org/