Coordinator Partners

InDrive project

Automotive EGNSS Receiver for High Integrity Applications on the Drive

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Document Change Record

Version	Date	Author(s)	Description
1.0	29/06/2017	E.Bruci	First release

Table of contents

List of figures

1 Introduction

This document describes the Vision algorithms developed by Magneti Marelli.

1.1 Scope

This document is intended to introduce the main features of the vision components within the InDrive architecture.

2 Vision Components

MM is in charge of the following functions based on vision:

- Feature detection
  - Lane detection
  - Vehicle detection
  - Pedestrian detection
- Motion measurement
  - Visual odometry

2.1 Feature detection

2.1.1 Lane detection

The Lane Detection System is a forward-looking, vision-based system that uses image processing algorithms to interpret video images, detect lanes and estimate lane type and lane positions. The images are captured by a camera placed in the central higher position of the windshield inside the vehicle. The algorithm processes the captured images to detect lane markings on the road, estimate roadway alignment and provide the distance from the center of the lane.

2.1.2 Vehicle and Pedestrian detection

The InDrive demonstration vehicle will have the ability of automated driving, thus it is mandatory to perceive the obstacles surrounding the vehicle in order, for the system, to take decisions on the trajectory to be followed by the EGO vehicle.

The obstacle category on which we focused our development are Vehicle and Pedestrian. The purpose of the algorithms is to create a list of the vehicles and pedestrians in the field of view of the camera with the dimension of each obstacle and the coordinates in the EGO vehicle reference system.

Figure 1 - Vehicle detected surrounded by referenced Bounding Box

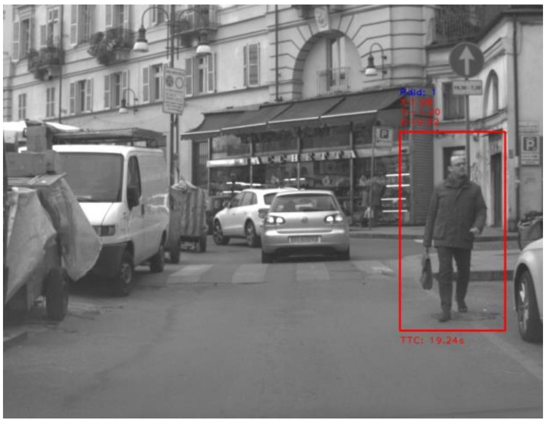

Figure 2 - Pedestrian detected surrounded by referenced Bounding Box

2.2 Motion Measurement: visual odometry

Visual odometry will constitute an independent source to measure the movement of the EGO vehicle.

At each new frame coming from the camera this function will calculate the difference of position and heading of the EGO vehicle with respect to the previous frame.

The information will be in meters and radians, Namely:

Output value	Measure unit
DX (East axis)	meter
DY (North axis)	meter
DQ (Heading change, clockwise positive)	radians

3 Architecture

Feature detection and motion detection will run on separate, but similar computational platforms

VPC1 for:

- Lane detection
- Vehicle detection
- Pedestrian detection

VPC2 for:

- Visual odometry

All the algorithm use the images delivered by a single monocamera installed on the windshield of the car.

3.1 HW Architecture

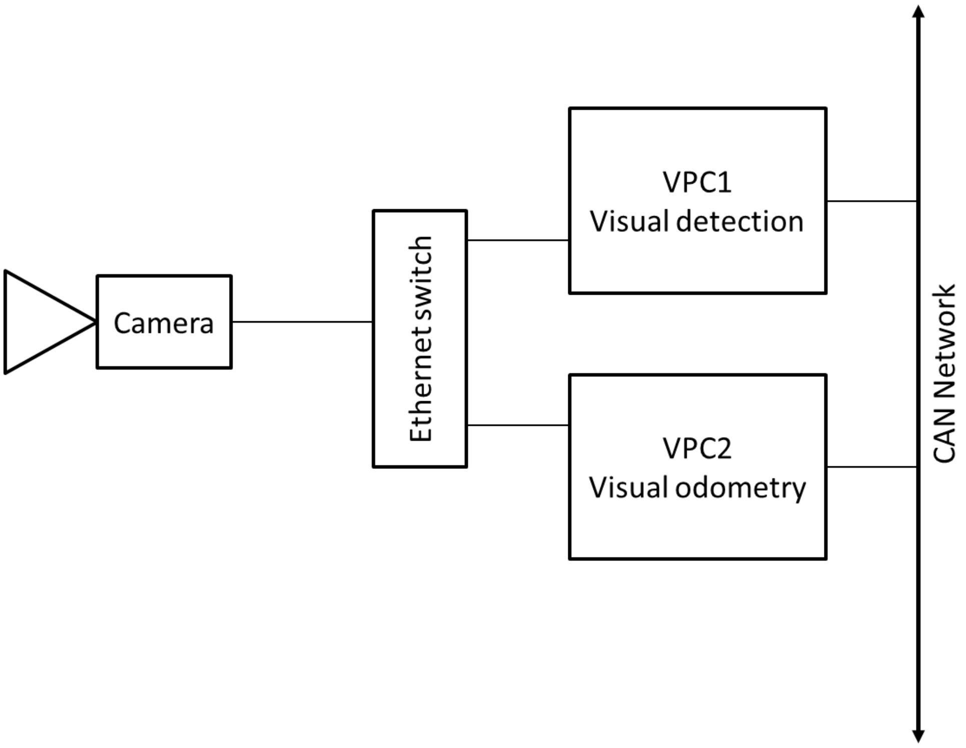

Figure 3 - Interconnection among visual HW compnents and the InDrive system

Figure 4 - VPC1 and VPC2 with installation case

3.2 SW Architecture

The following figures show the general SW architecture of the developed functions

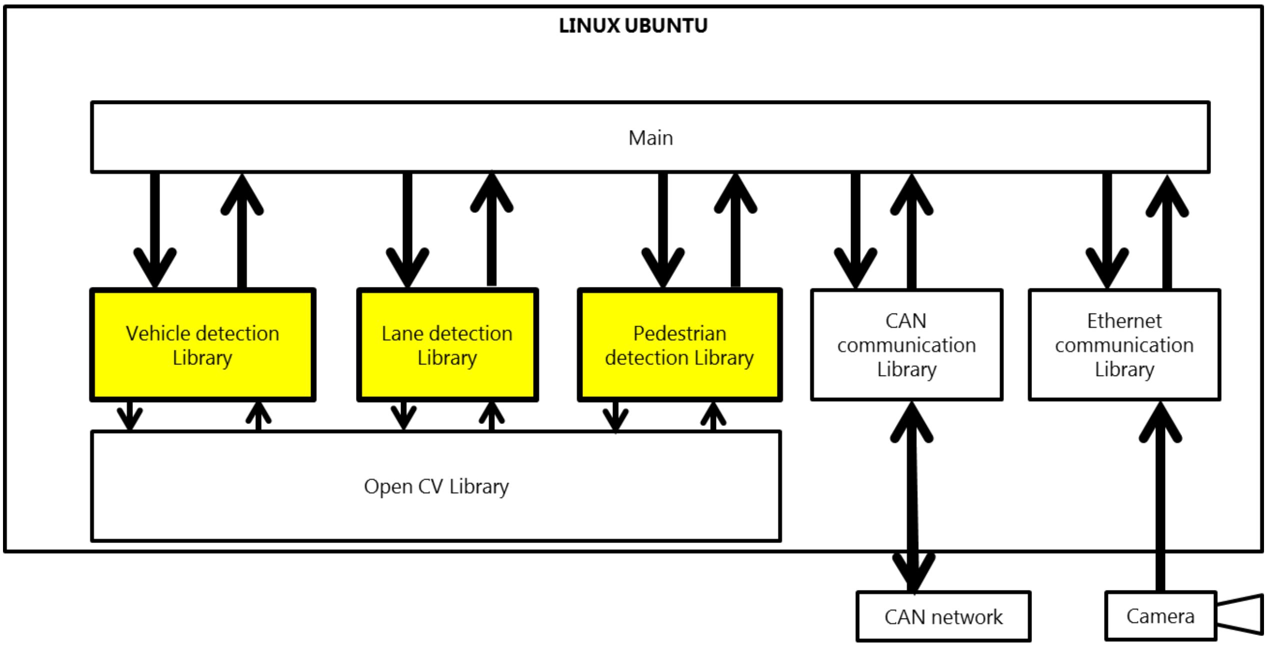

Figure 5 - Feature detection SW architecture

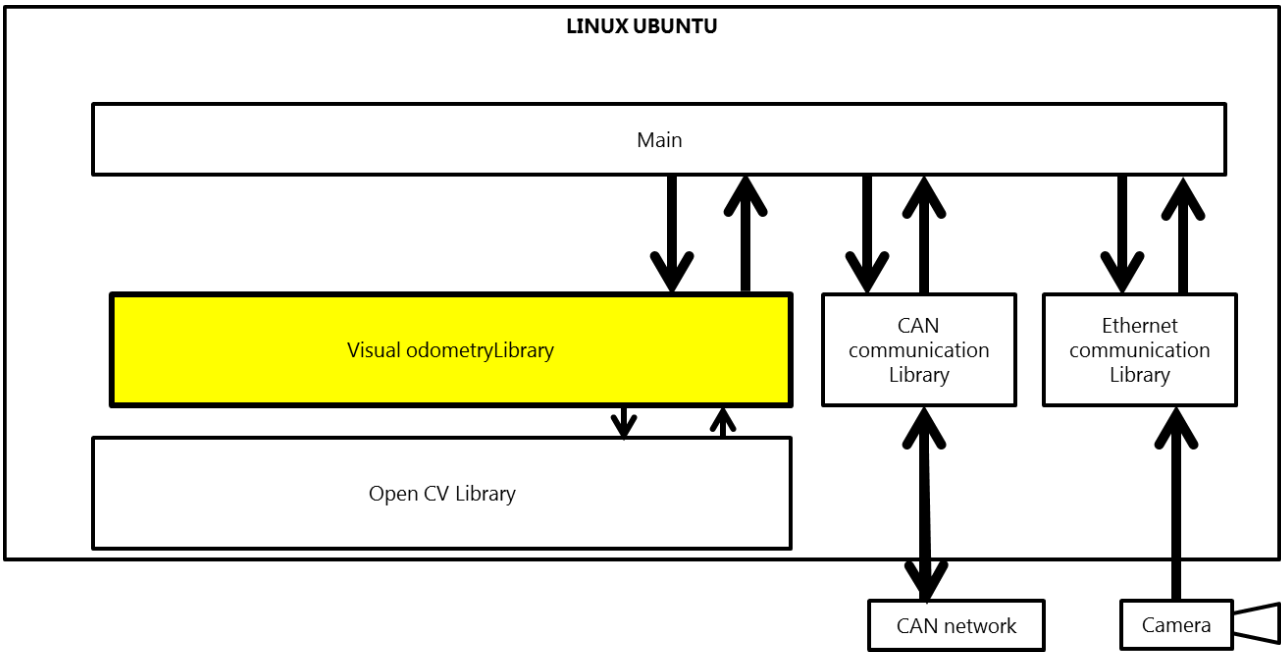

Figure 6 - Motion detection SW architecture