Lane Detection Based on Improved Feature Map and Efficient Region of Interest Extraction

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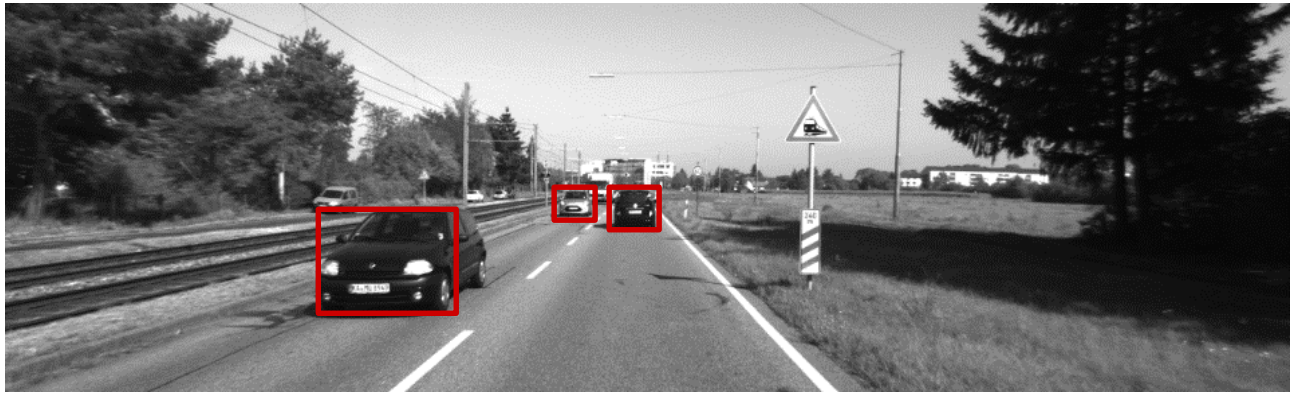
Introduction

- The main cause of traffic accidents is driver error [1]
- Solution: Advanced Driver Assistance Systems
  - Obstacle detection
  - Traffic sign recognition
  - Lane Detection
- Already being implemented in commercial and/or Autonomous vehicles

[1] Department for transport, Home Office, Reported Road Casualties Great Britain, 2009

Advanced Driver Assistance Systems



- **Obstacle detection**
- Traffic sign recognition
- Lane detection

[2] A. Geiger, P. Lenz, C. Stiller, and R. Urtasun, “Vision meets robotics: The kitti dataset," The International Journal of Robotics Research, vol. 32, no. 11, pp. 1231{1237, 2013.

Advanced Driver Assistance Systems

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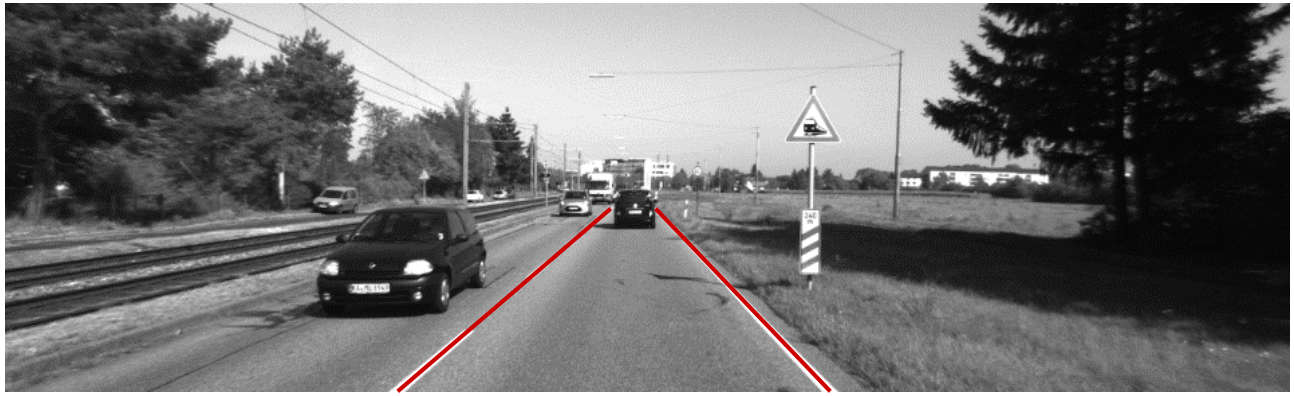
Advanced Driver Assistance Systems



- Obstacle detection
- Traffic sign recognition
- **Lane detection**

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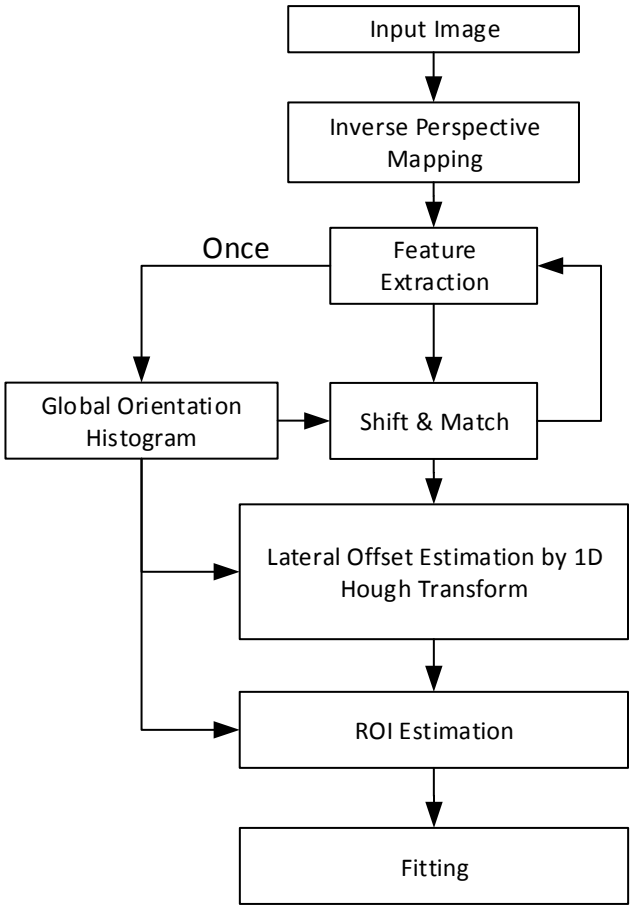
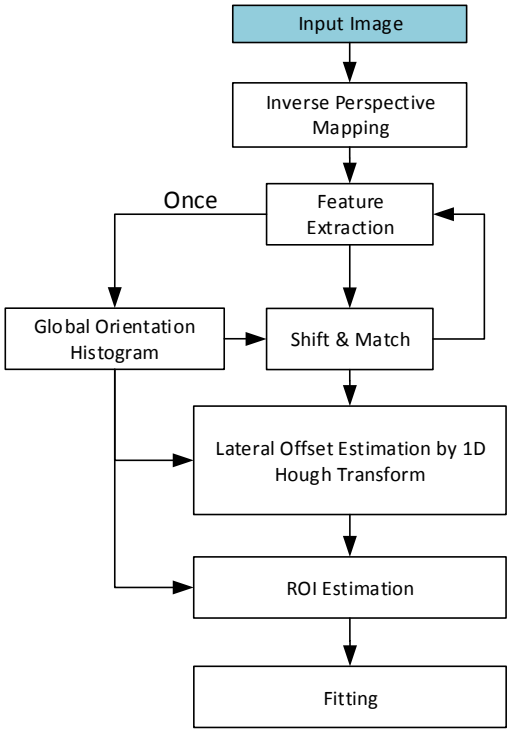


Fig 1. Block Diagram of the System

Fig 2. Example road image [3]

[3] “Bridge-point road markings”, 2015, [Online], Available: http://www.bridgepointroadmarkings.com/services/road-studs/inset-cat-eyes/

Averaging Consecutive Images



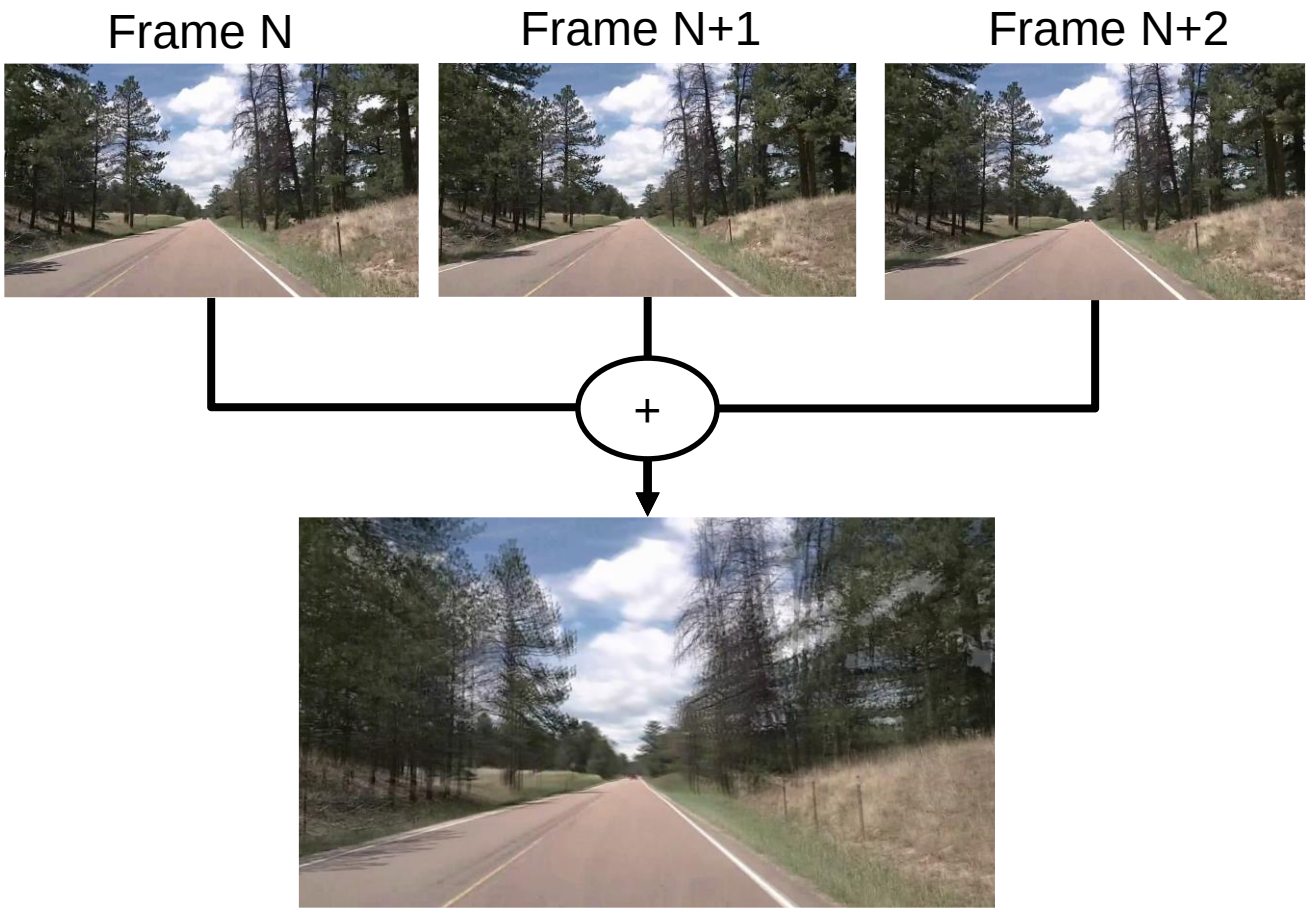


Fig 3. Averaging Consecutive frames

Inverse Perspective Mapping

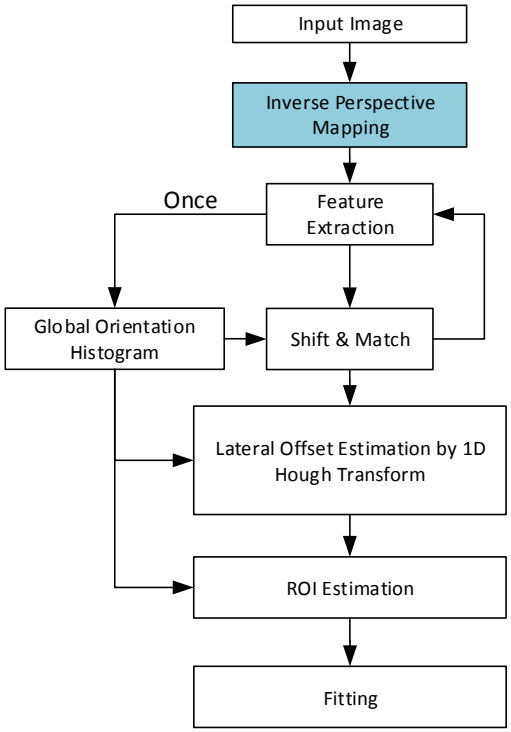
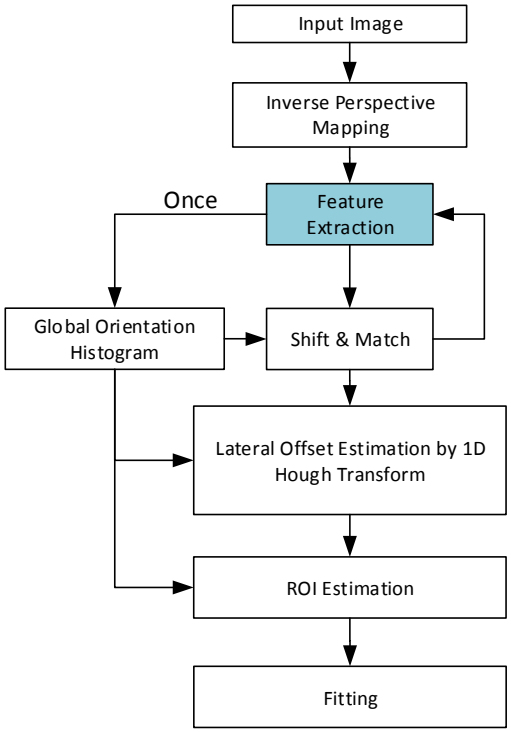


Fig 4. Input image and its remapped image using Inverse Perspective Mapping [4]

[4] M. Bertozzi and A. Broggi, “Gold: A parallel real-time stereo vision system for generic obstacle and lane detection,” Image Processing, IEEE Transactions on, vol. 7, no. 1, 1998, pp. 62–81.

Averaging Consecutive Images



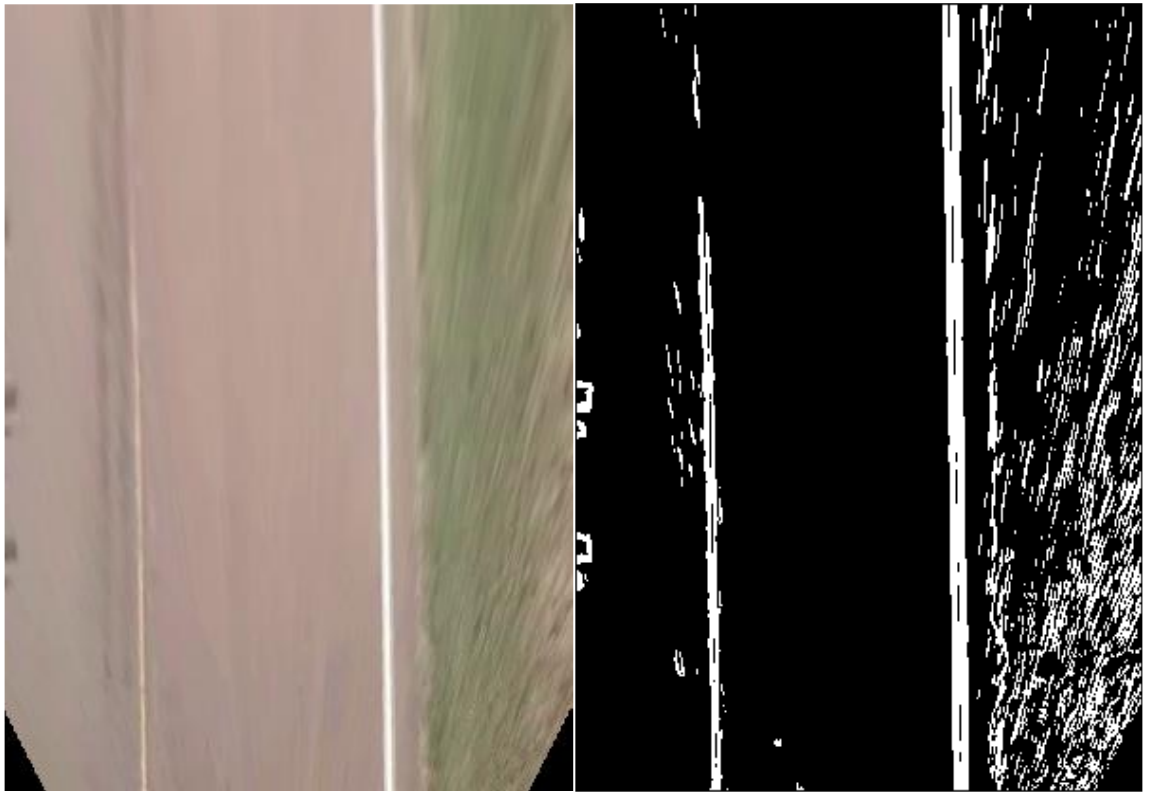
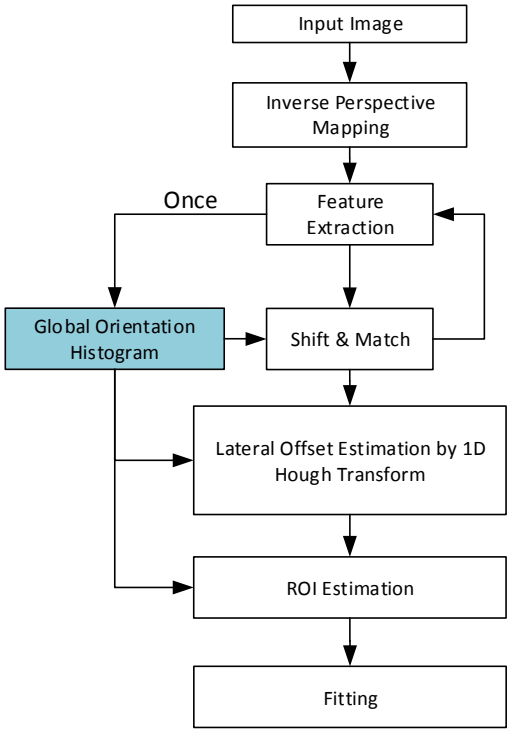
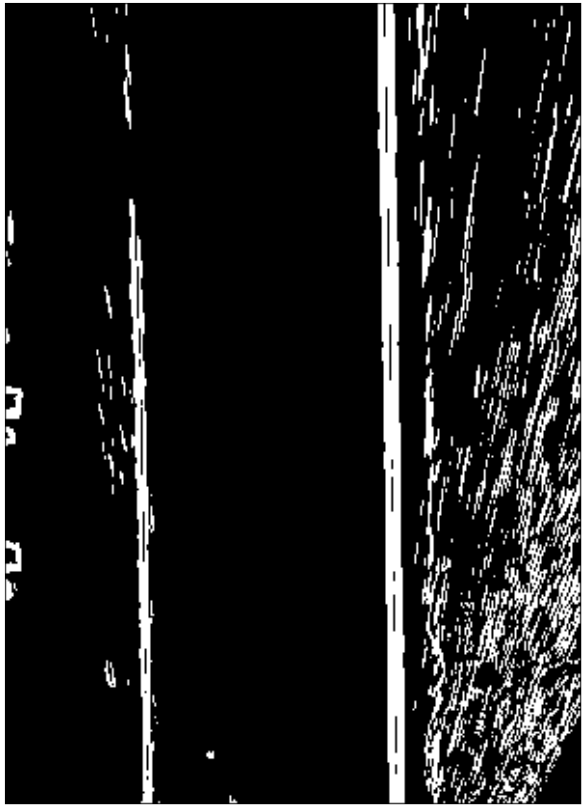


Fig 5. Input image and its edge map

Orientation Histogram.





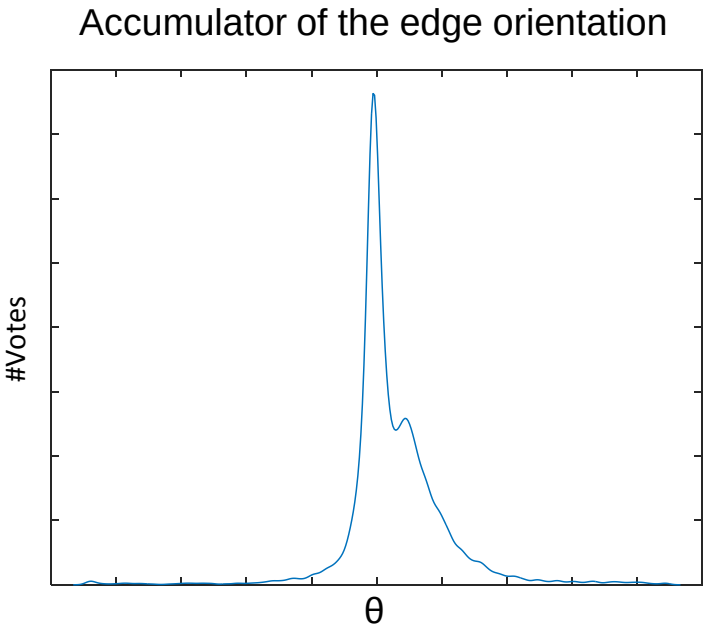
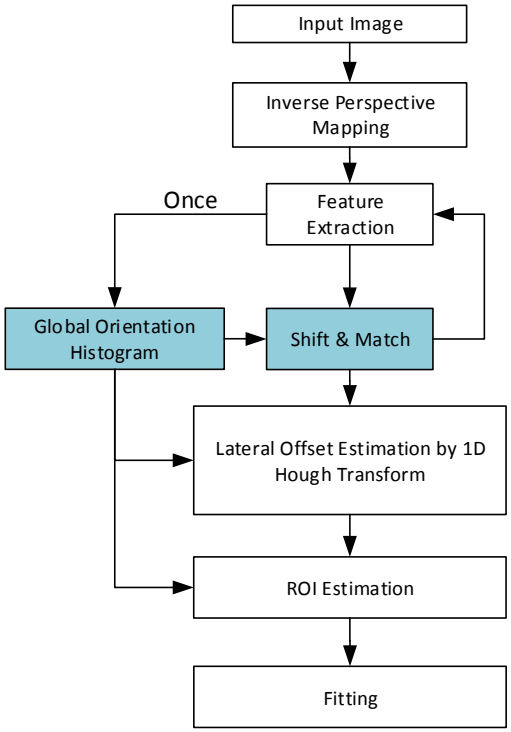


Fig 6. Input edge map and its edge orientation histogram

Matching Feature Points



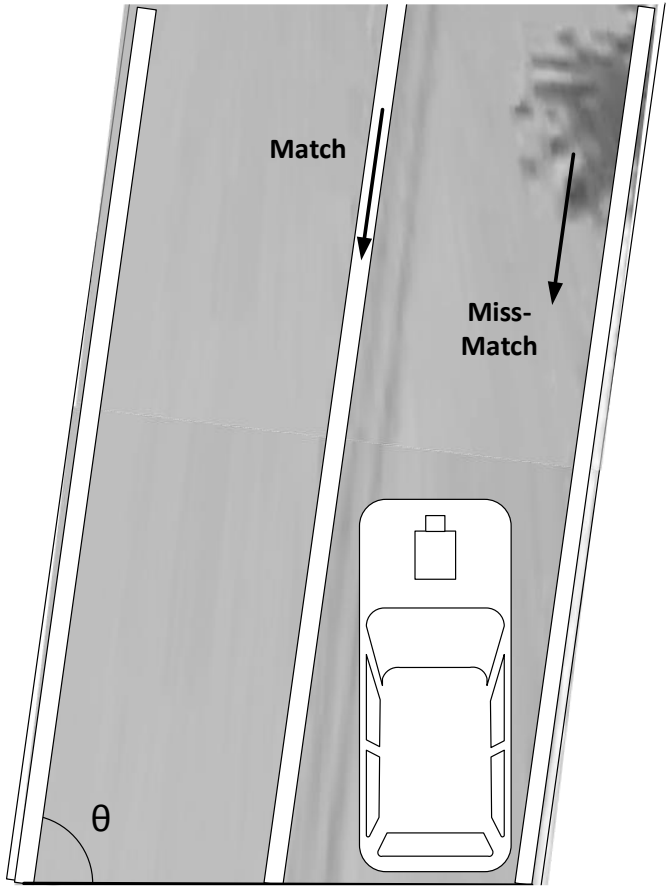
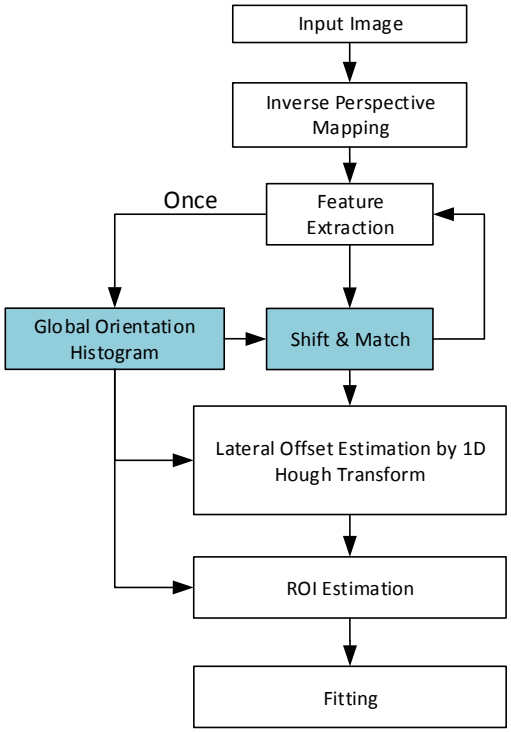


Fig 7. Shifting feature points towards the estimated lane orientation

Matching Feature Points



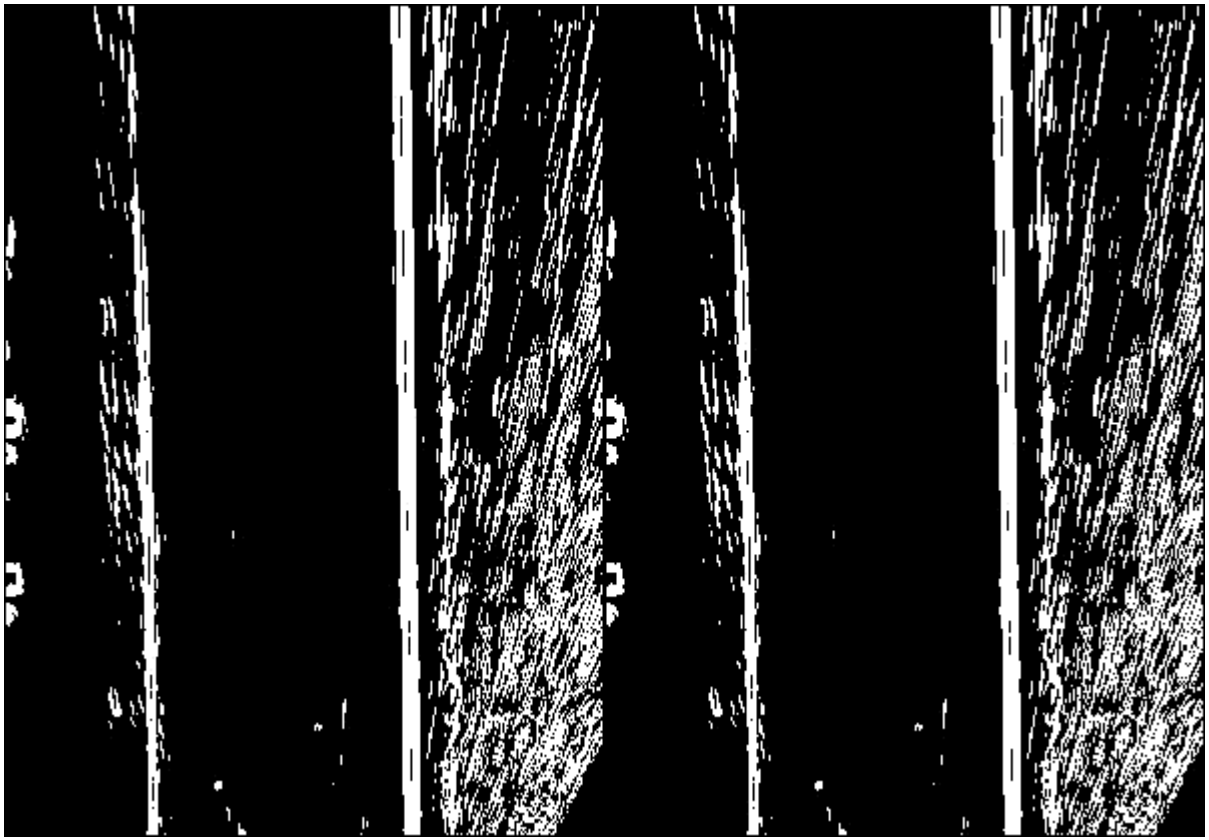
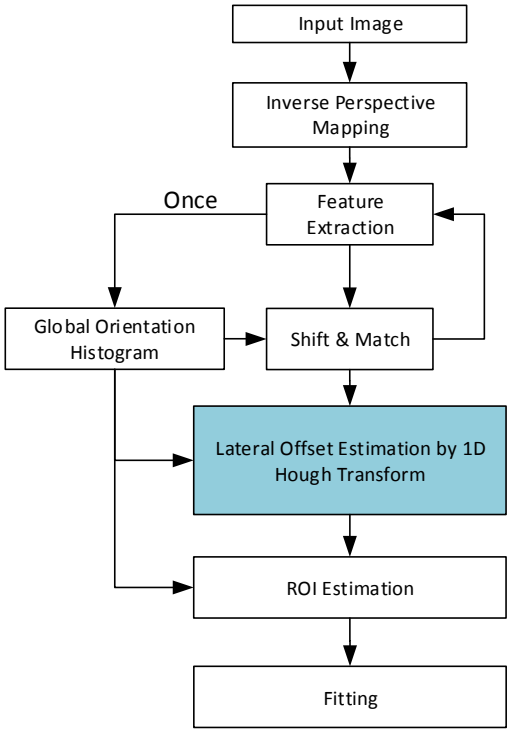


Fig 8. Improving SNR of the feature map (video sequence).

Hough Transform



$$\rho = x.\cos(\theta) + y.\sin(\theta)$$

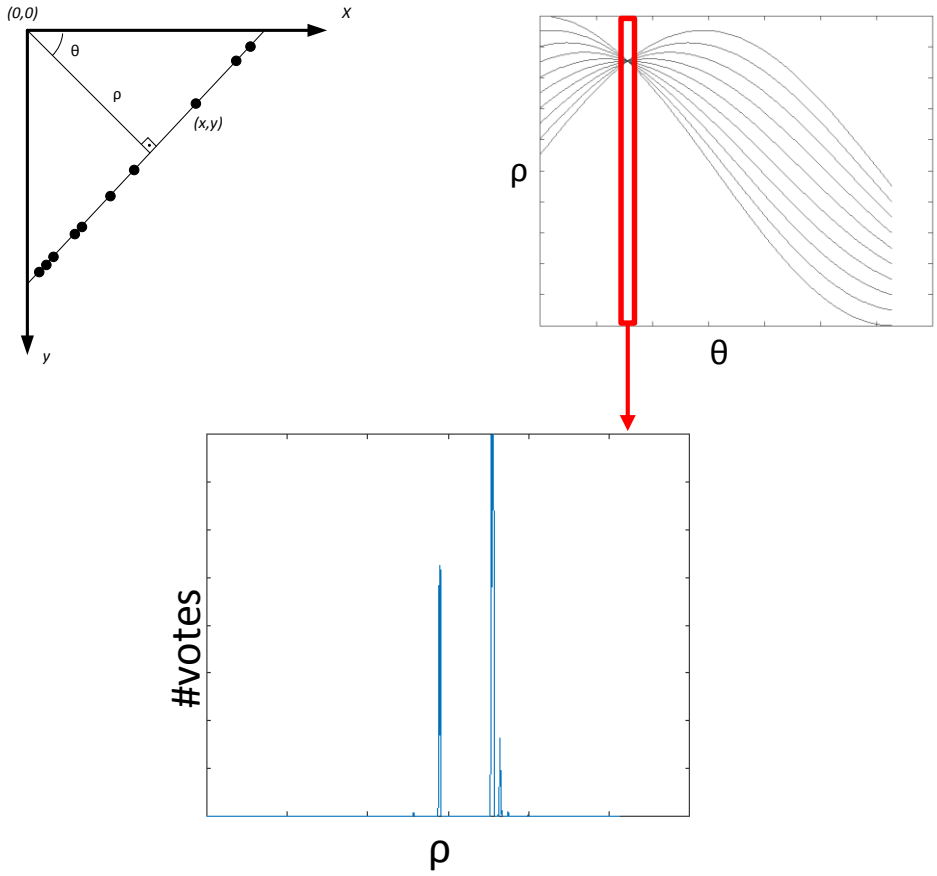
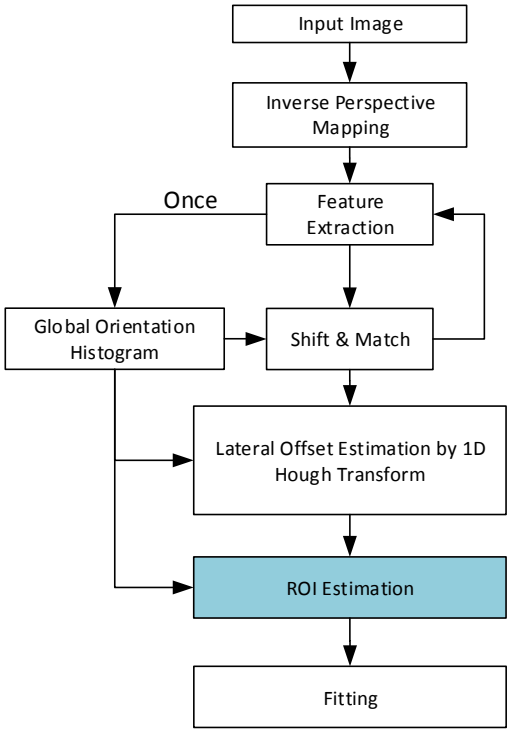


Fig 9. 1D Hough transform with known global lane orientation

Region of Interest Estimation



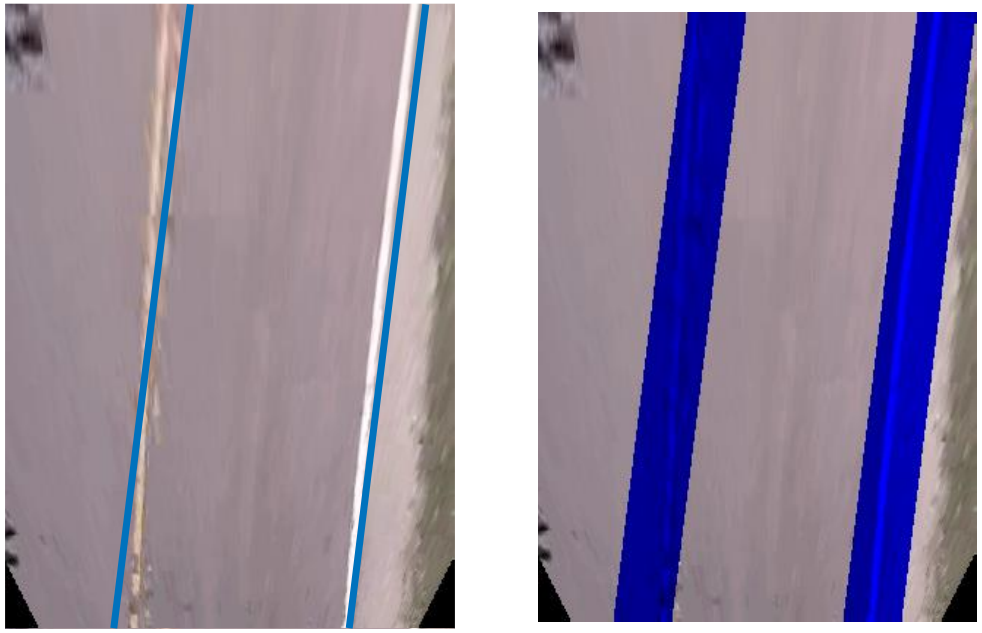
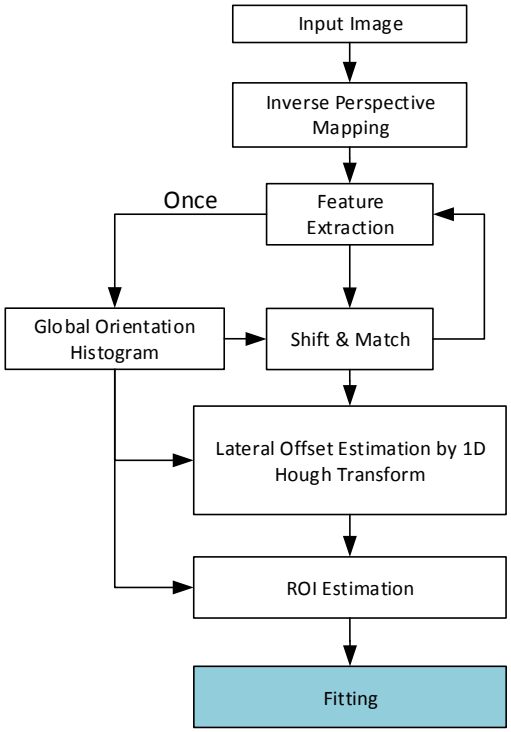


Fig 10. Initially estimated lane positions and created Regions of Interest

Parabolic Fitting



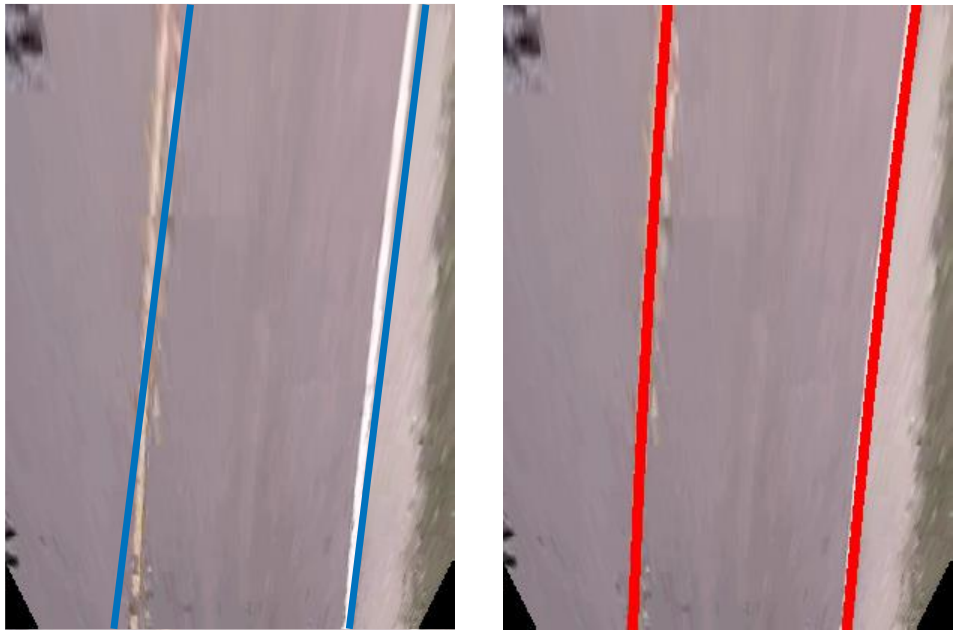


Fig 11. Initially estimated lane positions and estimated lanes after polynomial fitting

Sample Sequence

Fig 11. Input image and detection results (video sequence)

Future work

- Tracking
- Testing different feature extractors such as steerable filters.

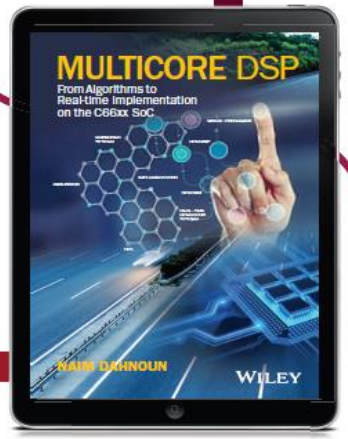
New Book

Multicore DSP: From Algorithms to Real-time Implementation on the C66xx SoC

Naim Dahnoun

978-1-119-00-3823
400 Pages | Cloth

€87.75 | £72.95 | $115.00
September 2016



The use of multicore Digital Signal Processors (DSPs) has increased significantly in recent years, with the emergence of data-intensive applications, such as medical, high-end imaging, high-performance computing, core networking and high-speed Internet browsing on mobile devices. This presents complex challenges in terms of data traffic, processing power, and core-to-core and device-to-device communications, which increase demand on processors and associated software.

Introducing the concepts of multi-core architectures and its development environment using Texas Instruments' multi-core device, the C66xx System-on-Chip as the primary focus, this book navigates a complex topic by providing comprehensive details on the architecture of the processor, development tools, operating systems, OpenMP, OpenEM, software optimization, debugging tools and a wide range of DSP algorithms and their implementation. It analyses each element of the SoC and how these elements work together, addresses performance, functionality and related constraints, and assesses real-time audio and video applications.

Key features:

- Provides a complete overview of a complex system offering unique and comprehensive coverage of the fundamentals of multicore DSPs in terms that are easy to understand.
- Bridges the gap between DSP theory and its implementation aided by various real-time audio and video application examples and tested algorithms.
- Delivers the reader the information needed to take advantage of maximum performance and functionality of the processor, and be able to easily use the tools, implement DSP algorithms and debug multicore applications.
- Includes a companion website hosting PowerPoint lectures, a laboratory book with exercises, solutions and source code for Texas Instruments' Code Composer Studio.

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END. Thank you.

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