Survey Paper based on Lane Detection for Self Diving and Self Driven Cars.

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Abstract

Lane detection systems are a type of safety systems which alert the driver whenever the car begins to move out of its lane.

Out of the several approaches we have studied three proposed methods:

1. **Robust Lane Detection Using Multiple Features [1]**
2. **Vanishing Point Detection for self-driving car using harmony search algorithm[2]**
3. **A Precise Lane Detection Algorithm Based on Top View Image Transformation and Least-Square Approaches [3]**

[1] Tejus Gupta_, Harshit S. Sikchi_ and Debashish Chakravarty, “Robust Lane Detection Using Multiple Features”, 2018 IEEE Intelligent Vehicles Symposium (IV) Changshu, Suzhou, China, June 26-30, 2018, pp 1470-1475

[2] Yoon Young Moon a, Zong Woo Geem b, *, Gi-Tae Han a, “Vanishing point detection for self-driving car using harmony search algorithm”, Swarm and Evolutionary Computation 41 (2018) 111–119

[3] Byambaa Dorj and Deok Jin Lee, ”A Precise Lane Detection Algorithm Based on Top View Image Transformation and Least-Square Approaches”, Journal of Sensors Volume 2016, Article ID 4058093, 13 pages

Introduction

The Lane Detection Systems have been successful in reducing accidents due to driver error, distraction and drowsiness

These systems are being designed for self driving cars.

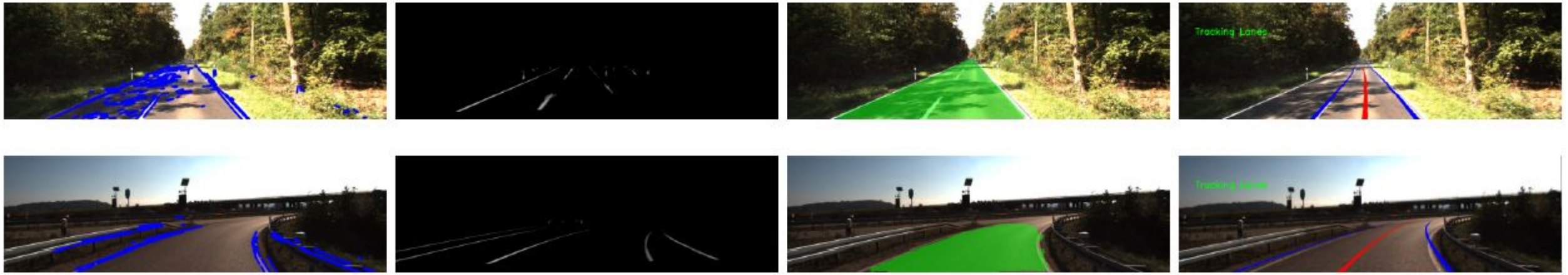
We realise that although many algorithms and approaches are proposed, no algorithms is best for all situations

Hence the authors have proposed certain algorithms that aim to help and improve these lane detection systems

Proposed Methodology and Results

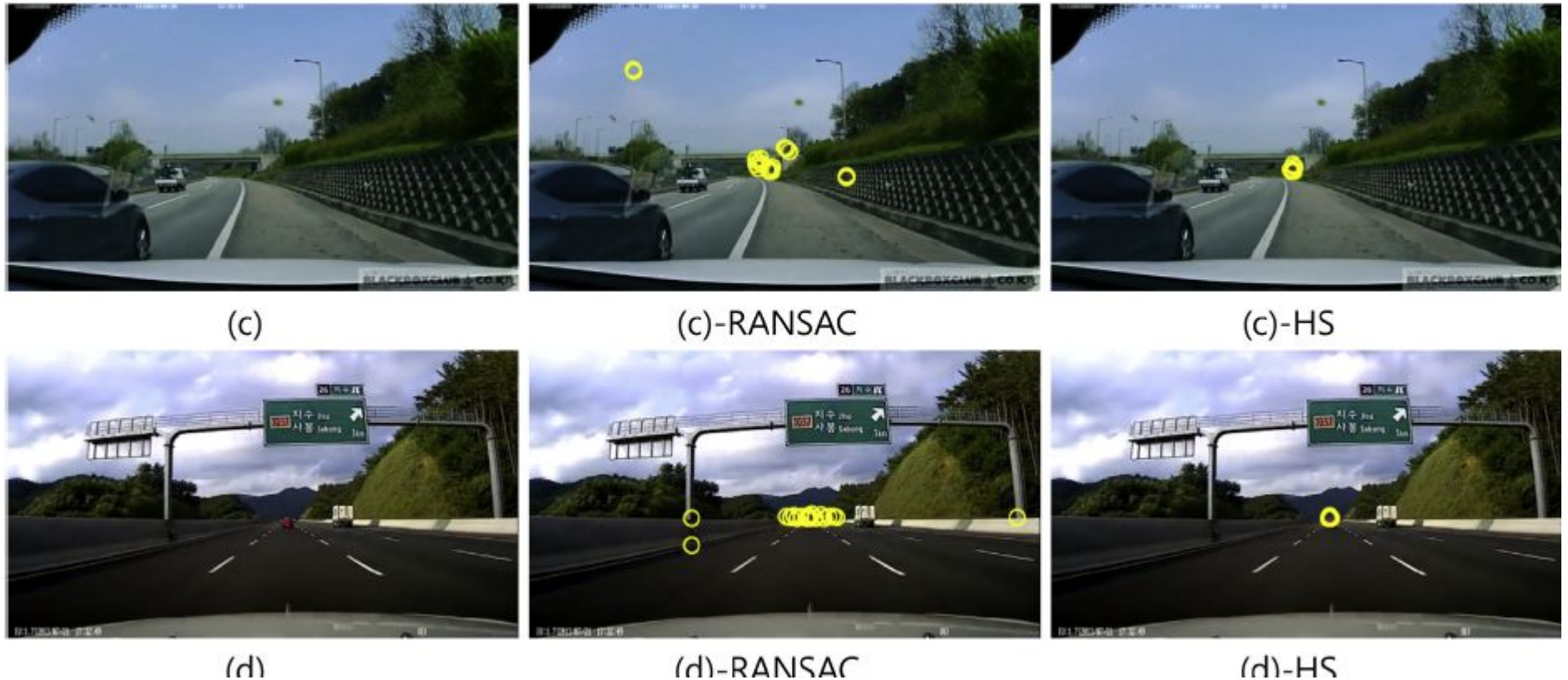
Robust Lane Detection [1]:

The Lane detection is done through extracting several features of the lane.



Vanishing Point By Harmony Search[2]:

The authors have proposed generating the vanishing point using the Harmony Search algorithm and proved why it is better than the RANSAC algorithm.



Top View Image Transformation[3]:

The authors have used the top view image of the road to generate the lane for longer distances

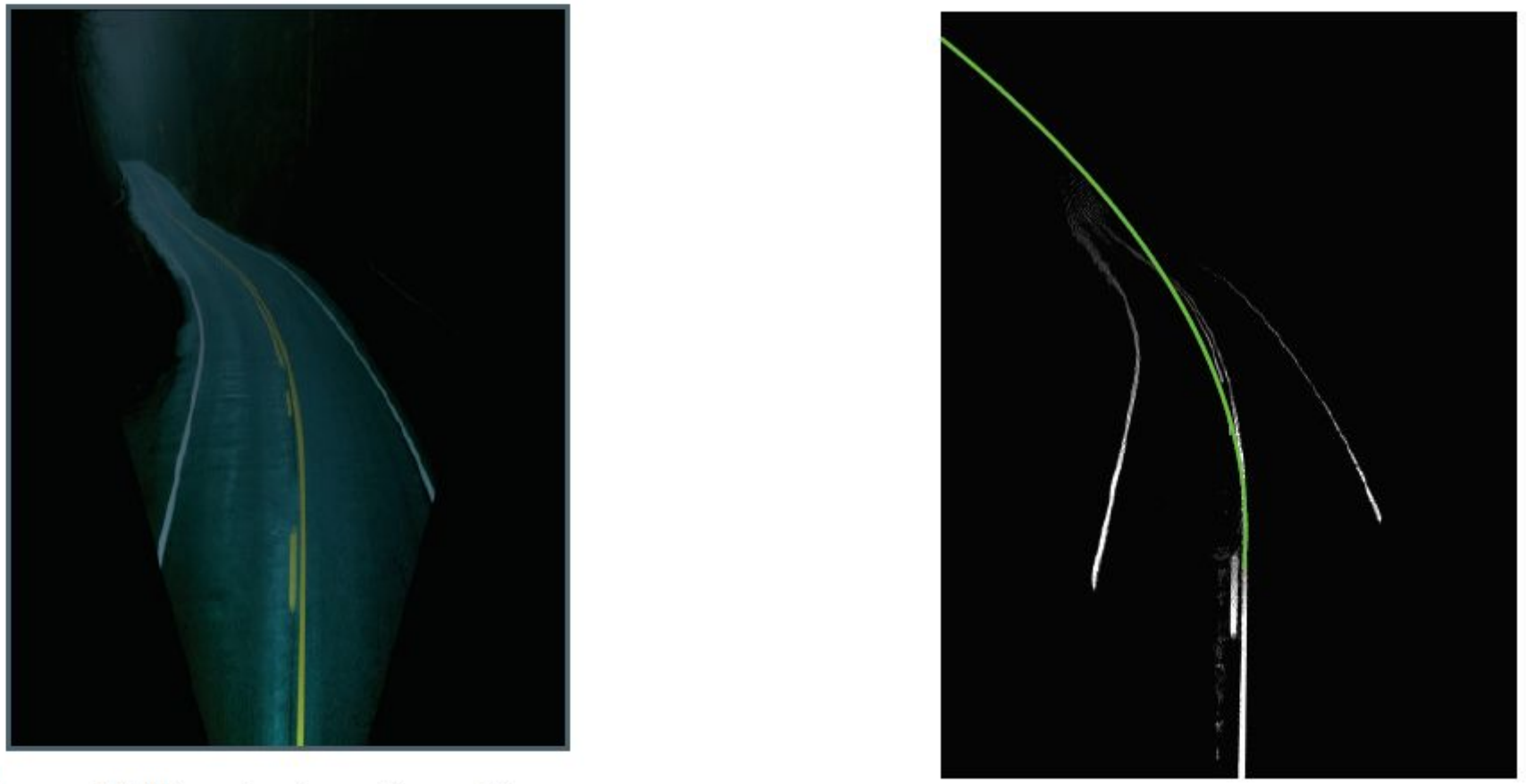


FIGURE 23: Top view transformed image.

Comparative Analysis

We have compared the three methods on three parameters. Key features , pro and cons

On checking with the DOE guidelines, all the papers have abided with the DOE guidelines

Although the three papers under the same domain, each of them target a specific area of lane detection.

A table based on the parameters has been created

Title	Key Features	Pros	Cons
Robust Lane Detection Using Multiple Features	• Lane detection using gradient, intensity and texture based features.. • The algorithm is proved to be better than the vanishing point algorithm.	• Lane detection possible even when the road has shadows. • Works for curved roads	• The algorithm does not work when there are diversions or potholes on the road • Lane width is fixed, o the algorithm would fail when the lane width is variable
Vanishing Point Detection for self-driving car using harmony search algorithm	• The vanishing point generated for self-driving car is compared with the RANSAC Algorithm.	• Returns almost the same result when run multiple time. • Requires a fewer sample size than the RANSAC algorithm	• Doesn't work for curved roads • Not tested in bad weather • Doesn't work on non-highway roads
A Precise Lane Detection Algorithm Based on Top View Image Transformation and Least-Square Approaches	• This method focuses on better lane detection than straight line and front view image lane detection methods.	• Longer range for Lane Detection • Detection of curved roads possible due to top view image	• Only applicable for single lane roads. • Doesn't work at Intersections

Research gaps

The following problems have not been addressed by these methods:

- The lane detection algorithm does not work for turns. So for example if a car has to take a U-Turn, the detection will not work.
- Also the algorithm might detect lane when two lanes are merging, e.g. On a highway
- There is no reference to testing the algorithm at night time.
- The lane detection becomes only active at high speeds (e.g.60 km/h)

Proposed Solution

The proposed algorithms can be improved by using a Lidar camera and CNN based lane segmentation.

Real life implementation will lead to better design of the methods.

Using computational photography, the lanes have to be detected at night time.

Also an algorithm has to be proposed so that the lane detection doesn’t stop at 90 degree turns and merging lanes etc.

Conclusion

Hence we have studied the proposed methods.

Each algorithm returned accurate results.

Each methods has its pros and cons.

The gaps in the research have been identified and solutions to these issues have been proposed.

References

[1] Tejus Gupta_, Harshit S. Sikchi_ and Debashish Chakravarty, “Robust Lane Detection Using Multiple Features”, 2018 IEEE Intelligent Vehicles Symposium (IV) Changshu, Suzhou, China, June 26-30, 2018, pp 1470-1475

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