Rear View Vehicle Classification Using Computer Vision

Tech ID: 31665 / UC Case 2011-712-0

BACKGROUND

Vehicle classification is important to autonomous navigation, traffic analysis, surveillance, security systems and transportation management. A common approach to vehicle classification utilizes a vision-based method, employing external physical features to detect and classify a vehicle in still images and video streams. Accomplishing this process with a computer is not simple. For a computer to successfully analyze and classify a vehicle using an automatic vehicle classification system, it would have to take into account a number of real world variables in order to classify the vehicle by using visual data.

BRIEF DESCRIPTION

Professor Bir Bhanu and colleagues at the University of California, Riverside, have developed a robust vehicle classification system based on video images from the rear-side view of a vehicle. This system classifies a vehicle into one of four classes: sedan, pick-up truck, SUV/minivan, and unknown. The system validates detected moving objects by a simple frame differencing approach.

Table I FALSE ALARM PERCENTAGES COMPARISON

Classifier→ Vehicle Class↓	kNN	LDA	SVM	HDBN
Sedan	0.17	0.07	0.06	0.04
Pickup	0.04	0.05	0.03	0.02
SUV/Minivan	0.04	0.02	0.04	0
Overall	0.09	0.05	0.04	0.02

Table II PRECISION PERCENTAGES COMPARISON

Classifier→ Vehicle Class↓	kNN	LDA	SVM	HDBN
Sedan	88.46	95.05	96.07	97.05
Pickup	80.64	78.13	86.20	90.00
SUV/Minivan	85.29	91.67	87.17	100
Overall	84.80	88.28	89.81	95.68

Table I shows the false alarm percentages over the different methods used to classify vehicles.
Table II shows that the UCR method has the highest accuracy when compared to other known methods.

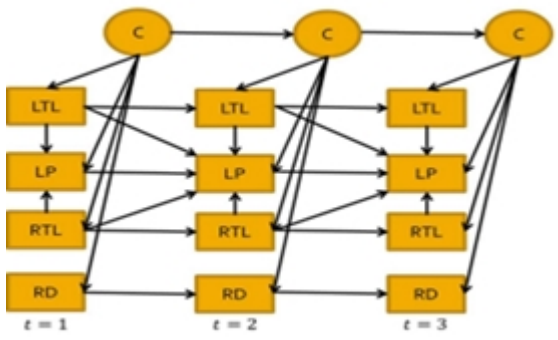

Figure 1 is the Dynamic Bayesian Network structure created by extracting data from surveillance. In conjunction with the car being spotted the Left Tail Light (LTL), License Plate (LP), Right Tail Light (RTL), and Rear Dimensions (RD) are identified simultaneously and set within the Dynamic Bayesian Network to accurately classify and identify the vehicle.

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OTHER INFORMATION

KEYWORDS

computer vision, vehicle classification

CATEGORIZED AS

- Imaging
  - Security

RELATED CASES

2011-712-0, 2011-369-0, 2012-863-0, 2012-885-0

SUGGESTED USES

- Classification of vehicles for identification and/or surveillance

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,466,000	10/11/2016	2011-712

RELATED MATERIALS

- Kafai, M. et al. Dynamic Bayesian Networks for Vehicle Classification in Video. IEEE Transactions on Industrial Informatics, Vol. 8,No. 1, February 2012 - 02/01/2012

RELATED TECHNOLOGIES

- A Video Based Hierarchical Vehicle Classification System
- Vehicle Make and Model Identification
- Vehicle Logo Identification in Real-Time

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