Robust Real Time Detection and Recognition of Traffic Sign Boards

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ABSTRACT

Automatedrecognitionoftrafficsignboardsfacilitatesthegrowthofemergingtechnologyforautonomousvehicles.Here,weimplementanovelfeatureextractionstrategyfortrafficsignboardsrecognition.Anoveltreestructuredmulticlass Adboostalgorithmisproposedtouseasaclassifier. AnewdatasetoftrafficsignboardsaroundVellorecityiscreatedandusedinourexperiment.Thedatasetcoverswholereal-timescenarioswithlotofvariations,e.g.,varyinglightingconditions,dissimilarbackground,motionblur,dayandnightetc.Ourproposedmethodexhaustivelyscansallthefeaturesandselectthebestoptimumfeaturetoreducefalsealarmandimproverecognitionrate.Comparisonwiththeexistingmethodsisdonetodemonstratetheperformanceoftheproposedmethod.Furtherimprovementsarealsodiscussed.

INDEX TERMS—
Trafficsignrecognition; featureextraction; Multiclass; Adboost

INTRODUCTION

Recognitionoftrafficsignboardshasbeenachallengingtaskforintelligentdriverassistancesystem,automaticvehicles,andinventorypurposes.Atthepresenttime,manystudiesarebeingconductedworkingtowardtheimplementationofanIntelligent TrafficSystem(ITS).Trafficsignsprovidethedrivervariousinformationforsafeandefficientnavigation.Basically,mostoftheapproachesinlocatinganddetectingoftrafficsignsarebasedoncolorinformationextraction.Sincethetrafficsignboardsarepaintedwith distinctivecolorstheycanbeeasilydetected.However colorinformationissensitivetothechangeofweatherorlightingconditionand,therefore,itissometimedifficulttoextracttrafficsignsreliablyonlybycolor.Roadsignshaveuniqueproperties which distinguish from other outdoor objects. The detection of sign boards from outdoor images is a complex step in automatic traffic sign recognition system. There are many issues which makes the automatic detection system difficult such as lighting conditions (lighting varies according to the time of the day, season, cloud cover and other weather conditions) presence of other objects on the road (traffic signs are often surrounded by other objects producing partial occlusions, shadows, etc.). The current image processing methods still fail to solve the main problem given the underlying issues for road sign detection.

These issues include:
(1) Poor quality of image data, especially of color at large distances for conventional camera systems,
(2) A fast detection procedure that determines the true object out of many potential object positions as required for real world applications. Hence, any robust automatic detection and recognition system must provide straightforward results that are not affected by perspective distortion, lighting changes, partial occlusions or shadows. Predictions state that approximately 40% of traffic accidents could be prevented by reducing forwardinattention among the drivers. It is possible that accidents can be prevented by utilizing an automatic road sign reco

gnitionsystemtoprovidetrafficinformationto thedriver,includinginformationabouttheroa dinfrontofthevehicle.

EXISTING METHOD

Differentapproacheswereusedinthepastf ordetectingroadsigns.Trafficsigndetecto rmustbebothsufficientlydiscriminativea ndcomputationallyinexpensivesothatitis abletoworkinrealtimeevenintheworstcas escenario.

Drawbacksintheexistingmethod:
1.Manualcroppingforalltheimages
2.Multiplethresholdingforsi ngleimage
3.Timeconsumptionwhilesc anning
4.Complexbackgroundsarenot considered
5.Inclinedboardsarenotdetecte d

MANUAL CROPPING

Croppingofimagesmanuallyforahugedat abasemaytakealongtime.Thecurrentexist ingsystemeitherusesmouseorcursorasani nputforcroppingwhichdoesn'tsupportthe automaticdetection.

MULTIPLE THRESHHOLD VALUE

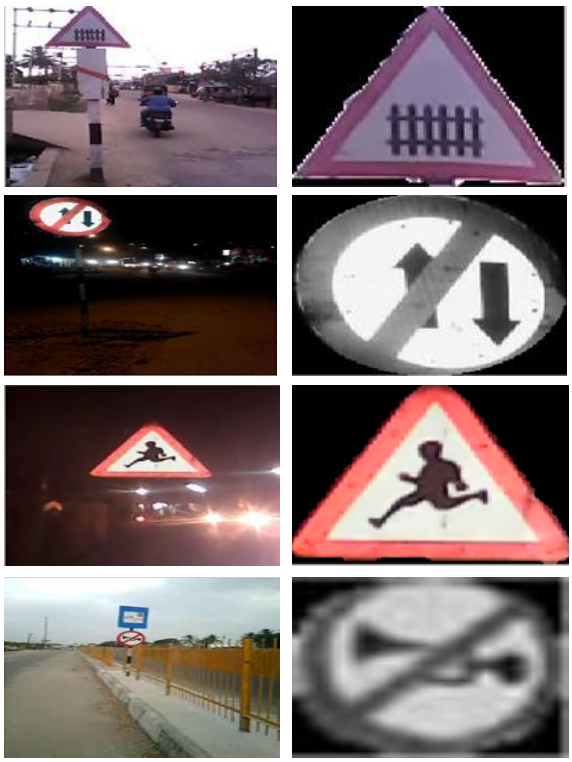
Every image has a threshold value and it varies according to the distance. There exist a difficulty to extract the exact sign when the threshold value varies even for a single board.

COMPLEX BACKGROUND

In existing methods sign boards with complex backgrounds are not considered. If the sign boards are inclined it makes the system quite difficult to detect the exact sign.

PROPOSED METHOD

Inourproposedmethodimagesarecroppedautomaticallyandnotmanually,whichincreasesthe processingspeedandalsotimeconsumedbythesystemisreduced.Andtheproblemofmultiplethre sholding,complexbackgroundanddetectionofsignboardsatvariousanglescanbeovercome.



FEATURE EXTRACTION

InthispaperHistogramofOrientedGradients (HOG)isusedasafeatureextractor.Theessen tialthoughtbehindtheHistogramofOriented Gradientdescriptorsisthatlocalobjectappea ranceandshapewithinanimagecanbedescrib edbythedistributionofintensitygradientsore dgedirections.Theimplementationofthesed escriptorscanbeachievedbydividingtheima geintosmallconnectedregions,calledcells,a ndforeachcellcompilingahistogramofgradi entdirectionsoredgeorientationsforthepixel swithinthecell.Thecombinationofthesehist ogramsthenrepresentsthedescriptor.Forim provedaccuracy,thelocalhistogramscanbec ontrast-normalizedbycalculatingameasureoftheint ensityacrossalargerregionoftheimage,calle dablock,andthenusingthisvaluetonormaliz eallcellswithintheblock.Thisnormalization resultsinbetterinvariancetochangesinillumi

nationorshadowing.

TheHOGdescriptormaintainsafewkeyadvantagesoverotherdescriptormethods.SincetheHOGdescriptoroperatesonlocalizedcells,themethodupholdsinvariancetogeometricandphotometrictransformations,exceptforobjectorientation.Suchchangeswouldonlyappearinlargerspatialregions.

CLASSIFIER

The final step in object recognition using histogram of oriented gradient is to feed the descriptors into some recognition system based on supervised learning. The support vector machine classifier is a binary classifier. Once trained on images containing some particular object, the SVM classifier can make decisions regarding the presence of an object, such as a human being, in additional test images.

CONCLUSION

This paper proposed a method for extracting the features of road signs and recognizing hat each of these road sign means. Various kinds of sign were used, consisting of a maximum of four colors and relatively simple designs. We verified that the method is able to correctly recognize the signs in real time. With the proposed method, good identification and recognition results were achieved with a moving image obtained under normal and complex lighting conditions, and at a faster processing times than the existing methods.

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