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Safeguarding Street Traffic using ANPR and Red Light Violation Detection (RLVD) Systems

Prof. Vipul Kushwaha¹, Vishal Bhere²

¹Asst. Professor, Department of Master of Management Studies, Alamuri Ratnamala Institute of Engineering and Technology ²Student, Department of Master of Management Studies, Alamuri Ratnamala Institute of Engineering and Technology ¹vipulkushwaha@gmail.com, ²vishalbhere55@gmail.com

ABSTRACT

In Mumbai, where annually more than one million people die on the road, Lack of road traffic safety emerged as one of the major problems across the globe, resulting in increasing road accidents chances. Road traffic deaths and injuries have a terrible impact on individuals, communities, and countries. They involve a huge cost to overburden health care systems, occupy scarce hospital beds, consume resources, and end in significant losses of productivity and prosperity, with deep social and economic repercussions.

The presented system would involve multiple CCTV cameras which will be mounted at a certain height, where nice footage can be recorded at various Red Lights across the cities. The designed system mainly focuses on the 'seat belt wearing' parameter of four-wheelers, i.e whether a driver is wearing a seat belt or not. The system will extract relevant images from footage for the image analysis and with the help of the computer vision; the system will determine whether a driver is wearing a seatbelt. Similarly, our aim is to use technology to make the traffic environment more friendly and safe for everyone and every second. Now to make sure that people follow all the rules, we need to tell them their faults and see to it that they pay the fine. This will ensure that the person pays for his/her mistake and does not make them again in the future. Doing so will also increase the knowledge of traffic rules in the community.

Keywords: Computer Vision, E-Challan Generation, Optical Characters recognition, Automated Number Plate Recognition, RLVD, Computer Vision, Seat Belt, Image processing[1]

1. Introduction

The aim of this research paper is to ameliorate the current problems being faced daily. For a better traffic environment for the cities and towns, the situation needs to be dealt with. To do this, technology will play an important role. The ability of technology to change our lives has been observed and is also being observed daily. Today we have the entire world connected with each other through a mobile device that we take for granted. We can access any file stored anywhere in the world in a split second, the technology of the cell phone is a simple example of what great wonders we can achieve. Similarly, our aim is to use technology to make the traffic environment more friendly and safe for everyone ensure that the person pays for his/her mistake and does not make them again in the future. Doing so will also increase the knowledge of traffic rules in the community.

In this research paper, it is explained how an environment can be created where traffic violators are captured with the help of a camera and computer vision application during the violation of rules, and the fine is sent to the violator right that moment. The smart analytics system will use the Automated Number Plate Recognition (ANPR) system, Red Light Violation Detection (RLVD) system. The system will provide assistance in detecting, Violators using a Cell phone while Driving, Absence of helmet, Triple Riding Detection, Data Visualization to name a few. and every second. Now to make sure that people follow all the rules, we need to tell them their faults and see to it that they pay the fine.[1]

2. Proposed System

An overview of the system can be seen in Fig. 1.1. The system is composed of two subsystems:

- 1) Automatic Number Plate Recognition
- 2) Automated Challan Generation System

2.1 Automatic Number Plate Recognition

Number plate recognition is a deterrent for serial traffic offenders. The software helps with reactive security as well, which includes inspections, forensics, investigations, and legal proceedings. No matter from the perspective you look at it, automatic license plate recognition seems like a necessity for ensuring our safety on the road. In fact, it could also be particularly useful when it comes to detecting stolen vehicles. The use of ANPR in this way has proved to be important in the detection of many offences, tackling uninsured vehicle use and uncovering cases of major crime. It also allows officers' attention to be drawn to offending vehicles whilst allowing law-abiding drivers to go about their business unhindered attention to be drawn to offending vehicles.

The role of ANPR is the key to ensuring that the violators pay fine and do not continue without doing so. Its use will give an easy way for the police to find the people who might abscond from the law. ANPR is an invaluable tool in the campaign to make our traffic environment smoother and safer. As ANPR has become established, equipment costs have dropped and technology improved which has allowed ANPR to be adopted by the Police.

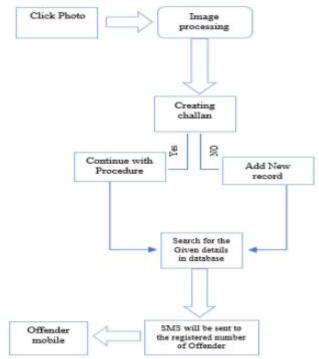


Fig 1.1 Proposed system overview

Automatic Number Plate Recognition (ANPR) is important for modern traffic enforcement and safeguarding public road safety in an ever-increasing road traffic volume. Automatic Number Plate Recognition systems identify unique vehicle number plates and generate vital traffic statistics to help government agencies to better monitor, maintain, and manage traffic situations, also as road system design and development.

2.2 Automated Challan Generation System

An automatic E-challan generation for a traffic rule violation is an IoT based project module that will automatically detect violating vehicles and punish them accordingly. This module is designed to reduce the work of traffic police officers so that they can focus on other violations like illegal parking, driving on the wrong side, and drunk & driving. This module will work in order to reduce the violations and make the city a better and safe place for pedestrians and vehicles. The need for automation is increasing due to the growing number of vehicles on the road every day.

3. Implementation

The presented system uses the captured images of the 4 wheelers for analyses. The developed software checks the seat belt parameter from the images. If a violation is found then the system moves for Automated Number Recognition process, where the captured images of the car are scanned, and the number plate is identified. The vehicle number is used as a key pointer and searches for all the data related to the vehicle's information such as the registration number, owner's name, type, etc.

3.1 Image Analysis

When images are to be utilized in different areas of image analysis like visual perception, it's important to scale back the quantity of knowledge within the image while preserving the important, characteristic, structural information. For achieving better results, Hough Line Probabilistic Transformation is applied to the digital images. A line is often represented as y = mx + c or in parametric form, as Where ρ is the perpendicular distance from origin to the line, and θ is the angle formed by this perpendicular line and horizontal axis measured counter-clockwise.

 $\rho = \mathbf{x}\cos\theta + \mathbf{y}\sin\theta$

3.1.1 Pre-processing

For the present system pre-processing involves two processes: Resize – The image size from the given input image. It is to be resized to a feasible aspect ratio. Normally, these images will be in RGB mode, with three channels (red, green, and blue). The number of channels defines the amount of color information available on the image. The image has to be converted to grayscale.

3.1.2 Localization

For the present system pre-processing involves two processes: Resize – The image size from the given input image. It's to be resized to a feasible ratio. Normally, these images are going to be in RGB mode, with three channels (red, green, and blue). The number of channels defines the amount of color information available on the image. The image has to be converted to grayscale.

Localization is done by using an image processing technique called Thresholding. The pixels of the image are truncated to two values depending upon the value of the threshold. Thresholding requires pre-image analysis for identifying the suitable threshold value. The adaptive thresholding technique determines a local threshold value for every image pixel so as to avoid the matter originating from non-uniform illumination.

3.1.3 Character Recognition

Finally, the selected blobs are sent to an Optical Character Recognition (OCR) Engine, which returns the ASCII of the license number. The optical character recognition (OCR) aspect of the process can be seen in the following figure 3.1.3.[3]

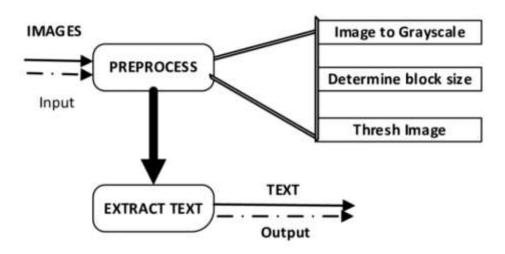


Fig 3.1.3 OCR Process Flow Chart

This database will then be used for Automated Challan Generation System and the violator is fined right at the moment.

A sample of the data collected is shown in table 3.1.

Sr	District	Police Station	CRNO	Reg Date	RegNo	Chasis No	Engin No	Make	Model	Color	Manuf acture Year
									DISCO		
	MUMBAI	DINDOS		13/02/20	MH01B	DSVBL	DSVBL		VER	ORA	
1	CITY	HI	72/2019	19	A****	K****	K****	BAJAJ	DTSI	NGE	
								HERO			
	MUMBAI	VILE		13/02/20	MH02H			HONDA	SPLEN	SILV	
2	CITY	PARLE	53/2019	19	A****	****	****		DOR	ER	
						MD2DS					
	MUMBAI	CHUNAB		13/02/20	MH03A	JBZZR	JAMBR		BAJAJ		
3	CITY	HATTI	28/2019	19	Q****	WF****	F****	BAJAJ	TEMPO		2008
										YELL	
						MD2836				OW	
	MUMBAI	M.R.A.		13/02/20	MH01BJ	FZ5CC	JLZCCG		PULSA	LIGH	
4	CITY	MARG	44/2019	19	****	G****	****	BAJAJ	R	Т	
				-		MD2DH					
	MUMBAI	M.R.A.		14/02/20	MH01X	DH22N	DHGBN		PULSA	BLAC	
5	CITY	MARG	47/2019	19	A****	CC****	C****	BAJAJ	R	K	
-	MUMBAI	VILE		15/02/20	MH02D	~~~	~	HONDA	ACTIV		
6	CITY	PARLE	55/2019	19	M****	****	****	HONDA	A		
0	CITT	TAKLE	55/2019	19	IVI				Л		
				10/02/20	MILADE	ME4KC	VC00E4		UNICO		
7	MUMBAI	DKC	22/2010	16/02/20	MH43S* ***	098D7* ***	KC09E4 ****	HONDA	UNICO	DED	2007
7	CITY	B.K.C.	32/2019	19	***	~ ~ ~	****		RN	RED	2007
										BLAC	
										K	
									AUTO	AND	
	MUMBAI	CHARKO		15/02/20	MH02V				RICKSH	YELL	
8	CITY	Р	59/2019	19	A****	****	****	BAJAJ	AW	OW	
						MB8DP					
	MUMBAI			15/02/20	MH02E	11AHJ*	AF21**	SUZUKI	ACCES	BLAC	
9	CITY	POWAI	74/2019	19	Y****	***	**		S 125	K	2018
						ME4KC					
	MUMBAI	R A K		14/02/20	MH46A	09CBE*		HONDA	UNICO	BLAC	
10	CITY	MARG	34/2019	19	A****	***			RN	Κ	
									DISCO		
	MUMBAI	R A K		15/02/20	MH01B	DSGBL	DSVBL		VER		
11	CITY	MARG	35/2019	19	A****	****	L****	BAJAJ	DTSI	RED	2005
	MUMBAI	MALVA	182/201	17/02/20	MH02C						
12	CITY	NI	9	19	E****			TATA	TEMPO		
	MUMBAI	RAK		17/02/20	MH01A				PULSA		
13	CITY	MARG	40/2019	19	U****			BAJAJ	R	RED	
		-				ME4KC					
	MUMBAI	DHARAV		17/02/20	MH01B	09CHD*	KC09E8	HONDA	UNICO		
14	CITY	I	60/2019	19	N****	***	655****	nonbri	RN		
11		<u> </u>	00.2017		1,		000		AUTO		
	MUMBAI	MALVA	184/201	18/02/20	MH47D				RICKSH		
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15	CITY	NI	9	19	191 191 191 191	······	191 191 191 191	BAJAJ	AW		
						144000		MARUT			
				10/02/20	10000	MA3ER		I			
	MUMBAI		00/0010	19/02/20	MH03C	LF1S00		SUZUKI	-	WHIT	
16	CITY	KURLA	90/2019	19	M****	****			EECO	Е	

Table 3.1 Violating Vehicle data retrieved by Number plate Analysis (RegNo, ChasisNo, EngineNo Redacted for confidentiality)

	MUMBAI	DINDOS		19/02/20	MH47A	MD62**	EG4LJ1		JUPITE	BLAC	
17	CITY	HI	86/2019	19/02/20 19	МП4/А К****	**	1F****	TVS	R	K K	
17	CITT	п	80/2019	19	K		11	143	ĸ	к	
		DBIDOG		20/02/20	MUO2D	ME4JC6 5BH***	IC(5E72			CDEV	
10	MUMBAI	DINDOS	97/2010	20/02/20	MH03D B****	звн*** *	JC65E72 26****	HONDA	CUINE	GREY	2019
18	CITY	HI	87/2019	19	B	*	20*****		SHINE	DLAG	2018
								MADUT		BLAC	
						MA3EV		MARUT I		K AND	
				19/02/20	MITOTA		FODINIA				
19	MUMBAI CITY	R A K MARG	43/2019	18/02/20 19	MH01A T****	B11S0 ****	F8BIN4 29****	SUZUKI	OMNI	YELL OW	2010
19	CITT	MAKU	45/2019	19	1	4-4-4-4	29****		OMINI		2010
										BLAC K	
									AUTO	K AND	
	MUMBAI	SAMTAN		19/02/20	MH02C				RICKSH	YELL	
20	CITY	AGAR	69/2019	19/02/20 19	Т****	****	2****	DATAT		OW	
20	CITT	AUAK	09/2019	19	1	4-4-4-4	2.000	BAJAJ	AW		
										BLAC	
										K	
		CAMTAN		19/02/20	MUOOT				AUTO RICKSH	AND	
21	MUMBAI	SAMTAN	(0/2010		MH02T A****			DATAT		YELL	
21	CITY	AGAR	69/2019	19	A	MDLILL	114.105	BAJAJ	AW	OW	
		M.H.B		10/02/20	MUOOD	MBLHA	HA10E	HERO	DAGGIO		
22	MUMBAI	COLONY	77/2010	18/02/20 19	MH02B F****	10EL8G A****	B8GA3* ***	HONDA	PASSIO		
22	CITY		77/2019	19	F				N		
		DADIZ		17/02/20	MUO2D	ME4KC 09CDE*	KCOOFO		UNICO		
22	MUMBAI CITY	PARK SITE	92/2010	17/02/20	MH03B R****	09CDE* ***	KC09E8 671****	HONDA	UNICO		2014
23	CITY	SHE	82/2019	19	K		0/1*****		RN		2014
		DBIDOG		20/02/20	MU01C	ME4JF5				CDEV	
24	MUMBAI	DINDOS	00/2010	20/02/20	MH01C	05CGT2 ****	JF50ET3 25****	HONDA	ACTIV	GREY	2016
24	CITY	HI	89/2019	19	G****			UEDO	А		2016
	MUMPAT			10/02/20	MIIOID	MBLIA 12ACD	JA12AB	HERO	DACCIO	DLUE	
25	MUMBAI	MATINA	55/2010	19/02/20	MH01B O****	12ACD	DGM2* ***	HONDA	PASSIO	BLUE	
25	CITY	MAHIM	55/2019	19	`	GM****	~~~	HONDA	N		
25	MUMBAI	MALVA	187/201	19/02/20	MH02D			HONDA	OUDT		
26	CITY	NI	9	19	E****				SHINE		
	MUMBAI	NIRMAL		20/02/20	MH04D			HONDA	ACTIV		
27	CITY	NAGAR	60/2019	19	****				Α		
						ME4JC3					
	MUMBAI			16/02/20	MH08T	66L8***	JC36E92	HONDA		GREY	
28	CITY	MAHIM	51/2019	19	****	*	8****		SHINE		2000

4. System Screenshots and Output Fig 4.2 Challan by Traffic Police

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		16:00-006644	Towards_Hunda(_Lane)	34/05/2022 25:03	3D	

Fig. 4.1 Application for Number Plate recognition and live video

Figure 4.1 shows the user interface of the system[4]. Figure 4.2 shows the challan generated by the system[2].



Challan Details

Challan No :	MTPCCC1800	19354					
Offense Date :	2018-10-04						
Offense Time :	16:58:00						
License No :	NA						
Vehicle No :	MH47K1135						
Offender Mobile No :	NA						
Payment Status :	Pending						
Compounding Fees :	1000						
0.6	Sections	Offenses	Fine Amount				
Offences	51/177 MVA	Fancy Number Plate	1000				
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5. Conclusion and Future Research

In this research paper, our focus was to make a safer traffic environment. But in the future, this video analytics system can be integrated into other places as well. For example, the system can be used to secure a particular residential society or secure an airport by identifying threats with the help of AI. Using cameras, sensors and powerful algorithms coupled with Artificial Intelligence holds a lot of potential in the future. This combination is what the next generation will be leveraging in their everyday life. It is our time to develop technologies that would benefit future generations and see to it that simultaneously a safer environment is also achieved.

References

[1] Amer, A. *et al.* (2012) 'Novel Stochastic Procedure for Designing Yellow Intervals at Signalized Intersections', *Journal of Transportation Engineering*, 138(6), pp. 751–759. doi: 10.1061/(ASCE)TE.1943-5436.0000381.

[2] Ayd, M. (2017) 'Utilization of a New Methodology on Performance Measurements of Red Light Violations Detection ...', (April).

[3] Bie, Y. and Liu, Z. (2015) 'Evaluation of a Signalized Intersection with Hook Turns under Traffic Actuated Control Circumstance', *Journal of Transportation Engineering*, 141(5), p. NIL_39-NIL_48. doi: 10.1061/(ASCE)TE.1943-5436.0000763.

[4] https://www.lntecc.com/smart-world-solutions/surveillance-infrastructure-companies-lnt-construction-mumbai-surveillance-project/