# ANALYSIS AND OVERVIEW OF UNIVERSAL FOG MONITORING SYSTEM FOR A VEHICLE

## SANDARBH AGARWAL

*B.E., DR. DY PATIL SCHOOL OF ENGINEERING &TECHNOLOGY, PUNE, INDIA*

-------------------------------------------------------------------------***-------------------------------------------------------------------------

**ABSTRACT-** *FOG could also be a clear aerosol consisting of small water droplets or ice crystals suspended within the air at or near the surface. Fog are often considered a sort of low-lying cloud usually resembling stratus and is heavily influenced by nearby bodies of water, topography, and wind conditions. Fog reduces visibility to a serious extent, generally, 1/4 kilometer or less, and makes driving a challenging experience. It's a serious issue, especially within the morning and in the dark time. Because the safety of the driving force is paramount there's a requirement to put in a secure and reliable fog camera for better visibility and safety of occupants during a vehicle (Wikipedia). This paper aims to use a camera within the system and style an efficient which can increase visibility and supply a safer driving experience.*

**KEY WORDS: Fog, Fog Camera, Visibility, Safety, Fog Monitoring System, Vehicle**

## 1. INTRODUCTION

According to the international definition in meteorology, fog is defined as a cloud touching the bottom. If the result's a visibility reduction of fewer than 1000m it's called fog, otherwise mist. The visibility range is thereby defined because the longest distance, at which a black object of adequate size could be seen against the sky. For our application, this definition of fog is unrewarding because a driver isn't suffering from fog until the visibility range decreases considerably more. Hence a fog detection system for driver assistance should also react on visibility ranges but 1000m. To derive a definition of fog in our application, we ask the German road traffic regulations (StVO). Consistent with the StVO, a road user is merely allowed to drive as fast as he can control his vehicle. Especially, he has got to adjust his driving speed on the present road, traffic, visibility, and weather.

Modern vehicles are equipped with many cameras and their use in many practical applications is extensive. Camera-based driving assistance systems are one among the core technology trends in intelligent vehicles. Well-known applications are, for instance, lane departure warning, road sign detection, or beam assistance. of these systems detect tangible objects within the camera images like lane markings, road signs, light sources of the vehicles ahead, or forthcoming vehicles (Belzner, Pavlic, Rigoll, & Ili'c', 2012). Among the embedded sensors, video cameras are among the foremost promising ones since they will be low cost and may

address different issues. Especially, degraded weather like rain or fog, are major concerns. First, adverse weather directly affect the security of the driving force by reducing his safety margin: low visibility distance or low friction. Second, the reliability of camera-based systems is reduced thanks to altered image quality. For these two reasons, detecting, characterizing, and mitigating the consequences of fog by the camera may be a challenge for a camera-based safety system.

The vehicle will got to have the simplest visibility possible once you want to drive it. If you are doing not have proper visibility, you'll risk the security when driving down the road**.**

## 2. OVERVIEW OF FOG MONITORING SYSTEM

The main objective is to form a light-weight, compact, effective, and reliable fog monitoring system which will increase visibility during fog and supply a safer ride experience. The main target is given on increasing the visibility within the fog without employing a lot of kit and at a cheap price. Wide-angle night-sight camera is employed within the fog monitoring system because it's tons of advantage which incorporates better visibility and cheap price and is simpler than a daily camera, lightweight, more durability, etc.

### 2.1. CAMERA

Active night-sight systems involve a camera and a bright light that emits near-infrared radiation (which happens to be invisible to the naked eye). The camera is sensitive to the present light and picks it up. Passive night-sight systems use a picture intensifier tube to amplify existing light.

Night vision goggles using image enhancement technology collect all the available light, including infrared, and amplify it in order that you'll easily see what is going on within the dark. Hot objects, including human bodies, emit some heat within the sort of infrared.

IR or night-sight cameras use infrared to illuminate images within the dark. We will not see it, but infrared is all around us. The filter sits between the camera's lens and sensor, to permit light to undergo within the daytime while blocking out infrared wavelengths.

The thermal imaging system can add the entire absence of sunshine solely on the warmth signature of objects with an above temperature temperature.

Smaller lenses are referred to as wide-angle security camera lenses, which produce a greater field of view than security cameras with a bigger lens. They capture an outsized area, though objects will appear smaller within the camera image. Ultra wide-angle security cameras are designed for monitoring large areas.

The size of the image sensor and sort of image sensor also plays a task within the field of view of wide-angle security cameras outdoor. Cameras image sensors are available a spread of various chip sizes, for instance , a 1/3″ image sensor produces a wider viewing angle than that of a 1/4″ sensor image sensor. The various sizes also affect the viewing angle – the smaller the chip size the narrower the angle of view.



**Fig 1-** camera used

## 2.2. DIGITAL VIDEO RECORDER(DVR)

A digital video recorder (DVR) is a device that records & plays video in a digital format and then saves it into a disc drive , USB flash drive, SD memory card, SSD or any other local or networked mass storage device. It includes a set-top boxes directed to disk recording, television gateways, portable media players and with recording capability, along with digital camcorders. (wikipedia)It is a device that captures video from up to a single camera to hundreds or more surveillance cameras onto a digital disk. The frame rate are often switched from real time to time lapse so as to save lots of space for storing. Digital recorders are more flexible than earlier analog VHS tape systems, and therefore the video are often easily transmitted over a network.

Car DVRs, also referred to as car black boxes and dashboard cameras, performing on 12V battery power are an aftermarket car accessory designed to affect the unpredictability of other drivers while driving and drivers' misunderstanding of road traffic rules. By recording live streams from the front and rear of the vehicle, car DVRs provide information to insurance companies, the system et al. within the event of an accident.



**Fig 2-** dvr used

## 2.3. LCD DISPLAY

A liquid crystal display (LCD) may be a flat-panel type display or a type of electronic moderated device that practices the light-altering properties of liquid crystals combined with polarizers to provide us an image or video. Liquid crystals don't emit light directly, instead employing a backlight or reflector to supply images in color or monochrome. (wikipedia )

Universal car LCD monitor are car monitors that are designed to figure on 12 volts. Our vehicle monitors are designed to be utilized in a spread of applications that aren't limited to automobile use. We have car LCD monitors which will be mounted on a headrest mount or a flex mount**.**



**Fig 3**- tft ldc used

## 2.4. WIRING HARNESS

CCTV or television is defined because the use of video cameras to transmit signal to a specific place. CCTV is used for typically surveillance purposes bearing crime avoiding, security, monitoring and criminality resolving in mind. For this purpose, CCTV usually requires cables that might enhance the standard of video signals. For wired surveillance, there are many other options that help within the transmission of higher video signals among other functions.

Coaxial Cables:

Having been about for nearly a century now, coaxial cables are quite relevant in today's world primarily thanks to its extraordinary property shielding quality. The shielding helps in avoiding any interference with the signal. The copper plate in such cables helps in speeding up the transmission of data. It's tons easier to put in, coming in two sizes for CCTVs:

RG-6

This particular cable is formed for higher bandwidth, made from copper and aluminum, and for higher frequency. Therefore, it isn't ideal for indoor CCTVs. It's a lot thicker than its other types, thus seamless for CCTVs used by city authorities, police authorities, administrations.

RG-59

Related to RG-6, the RG-59 discusses to 'Radio Guide' while 59 mentions to the radius size, i.e., .059 and a copper plate is used. This type of cable is suggested for a lower bandwidth, therefore, it's ideal for CCTV installations particularly suitable for studios, apartments, societies, hotels and other interior, relatively smaller places. Finolex RG59 coax may be a foaming-based dielectric system. With an excellent gas injected from the froth insulation, the cable thus helps in providing a far better quality signal which eventually helps for better surveillance.



**Fig 4**- rg6 cable used

## 3. INSTALLATION PROCESS

Current flows along one side of the cable from the battery to the component being powered, and back to the battery through the metal body of the car. The body is connected to the terminal of the battery by a thick cable.

Earth-return system

In a negative (-) earth-return system, the present flows from the positive (+) terminal to the component being operated. The equipment is earthed to the car body, which is earthed to the negative terminal of the battery.

This type of circuit is named as an earth-return system any a part of it connected to the car body is claimed to be earthed. (drivetribe.com)

The same way the camera is wired with the negative wire earthed and positive is run to the fuse box where an empty fuse location is searched and a fuse tap is used with 10A fuse in case of safety and the power is given to the dvr and display.
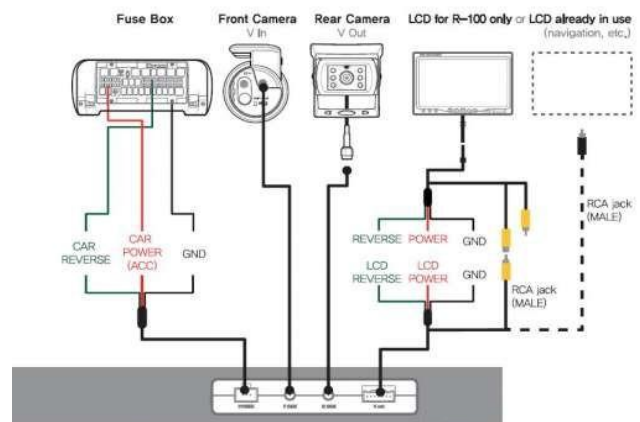


**Fig 5**- wiring process

## 4. OUTCOME

The goal here was to find a method to provide better visibility especially at early morning and at night by fog monitoring using a standard camera with automatic exposure settings.

The project a successful and provided a great visibility during fog the installed fog monitoring system is effective, reliable without any compromise in its safety standards and performance.

As in the figure, the system works and the visibility has been increased by looking onto the screen which can provide a safer driving experience

This system is successful and affordable to be installed in any vehicle.



**Fig 6**-outcome

## 5. CONSLUSIONS

The fog monitoring system was installed in a vehicle and an evident different can be seen between the normal vision and that from the fog monitoring system during the fog.

Hence, this system is completely effective, reliable, affordable without any compromise in safety standards and performance so it is fit to be installed in any vehicle as a safety device.

## 6. FUTURE SCOPE

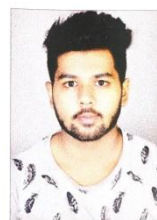The same system can be implemented on a heads up display and will provide even greater results.

Detection of vehicle and objects with the help of AI & ML can be used in future. Working on 2D model, all the images collected and utilized are based on 2 dimensional approaches. The future work will concentrate on modeling the contour parameters from 2D models to 3D models with the help of LIDAR and vehicle detection system.

## 7. REFRENCES

1. Belzner, H., Pavlic, M., Rigoll, G., & Ili'c', S. (2012). Image based fog detection in vehicles. IEEE Intelligent Vehicles Symposium.
2. drivetribe.com. (n.d.). Retrieved from drivetribe(HOW CAR ELECTRICAL SYSTEMS WORK): https://drivetribe.com/p/how-car-electrical-systems-work-GINHuCprQpKZO3RGMsyMNw?iid=Gj9YT88ZRUiDe47O_9409A
3. wikipedia.(n.d.).wikipedia, https://en.wikipedia.org/wiki/Digital_video_recorder.
4. Wikipedia.(n.d.).Retrieved from wikipedia: https://en.wikipedia.org/wiki/Fog
5. wikipedia.(n.d.).Retrieved from wikipedia: https://en.wikipedia.org/wiki/Liquid-crystal_display
6. American Meteorology Glossary. "Glossary of Meteorology",Onlineavailable at http://amsglossary.allenpress.com/glossary
7. S. Bronte, L.M. Bergasa, L., and P.F. Alcantarilla, "Fog Detection System Based on Computer Vision Techniques", IEEE Intelligent transportation Systems, vol. 12, 2009.
8. C. Busch and E. Debes,"Wavelet Transform for Analyzing Fog Visibility", IEEE Intelligent Systems, vol. 13(6), 1998.
9. R. Gallen, A. Cord, N. Hautière and D. Aubert, "Towards Night Fog Detection through use of In-Vehicle Multipurpose Cameras", Intelligent Vehicles Symposium, 2011.
10. N. Hautière, J.P. Tarel, J. Lavenant and D. Aubert, "Automatic fog detection and estimation of visibility distance through use of an on board camera", Machine Vision and Applications, vol. 17, 2006.
11. W. Middleton, "Vision Through the Atmosphere", University of Toronto Press, 1952.
12. World Meteorological Organization. "International Meteorological Vocabulary".
13. T. M. Kwon, "Video camera-based visibility measurement system," Patent 7 016 045, March, 2006.
14. J. Leleve, A. Bensrhair, , and J. Rebut, "Method for detecting night fog and system implementing said method," Patent EP1 715 456, August,2008.
15. N. Kawasaki, T. Miyahara, and Y. Tamatsu, "Visibility condition determining device for vehicle," Patent 20 080 007 429, January, 2008.
16. E. Dumont, "Semi-monte-carlo light tracing for the study of road visibility in fog," in Monte Carlo and Quasi-Monte Carlo Methods1998. Berlin: Springer-Verlag, 1999.

## 8. BIOGRAPHY

SANDARBH AGARWAL is currently pursuing B.E. degree in Automobile Engineering from Dr. DY Patil School Of Engineering &Technology, Pune, Maharashtra, India. He is a member of Society of Automotive Engineers (SAE).