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An Intelligent Night Vision Technology for Automobiles

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Abstract

Safety and security of life are the two most successful and booming words in the field of transport and manufacturing. The world has emerged from being a just simple form of day to day life to being aeon of mean and daring machines. Thus the safety of the people both inside and outside the vehicle is of prime concern in the car manufacturing industry. The term "Automotive Night Vision" refers to a number of systems that helps to increase driver's awareness when it's dark out. Thus system extends partition of driver beyond the limited reach of the headlights through the use of thermo-graphic cameras in front light heads up display and other technologies since automotive night vision can alert drivers to presence of potential hazards before they become visible, thus system can help to prevent accidents.

Keywords: *Automotive Night Vision, Night vision, central information display, etc.*

INTRODUCTION

"Night Vision Technology, by definition, literally allows one to see in the dark". Night vision is the ability to see in low light conditions, whether by biological or technological means. It is originally developed for military use, it has provided the United States with a strategic military advantage, and some agencies now routinely utilize the technology for site security, surveillance as well as search and rescue. Night vision equipment has evolved from bulky optical instruments in lightweight goggles through the

advancement of image intensification technology. The streets of today has turned to be monstrous night mare for the public with demon like vehicle that swift past the roads at very high speeds and the case gets worst in the night with drunken drivers ruling the road with high stake speeds. Thus comes to the use of night vision systems which uses infra-red sensors or thermal sensors to provide a clear view of the road ahead and in the coming sections we shall discuss about the detailed working of the Night Vision Systems in automobiles.

What is Night Vision System in Automobiles?

The Automotive Night Vision System provides the driver with the black and white image of the driving environment ahead of the vehicle in the central information display (CID).Automotive night vision is 100% passive system without active infrared illumination. Objects situated ahead of the vehicle are shown in varying degrees of the brightness depending upon the temperature of these objects. This enables the driver to detect in good time heat emitting objects such as peoples, animal's and the other vehicles. An Automotive Night Vision System uses a thermo-graphic camera to increase a driver's perception and seeing distance in darkness or poor weather beyond the reach of the vehicle's headlights. Such systems are offered as optional equipment on certain premium vehicles."The first introduction was in 2000 on Cadillac Deville."

WORKING

Electromagnetic Spectrum

Before going into the night vision systems it is necessary to understand something about it and the electromagnetic spectrum. Humans are visible only to the rays felling under the visible region of electromagnetic spectrum and are invisible to both the infra-red as well as the ultra violet region of the electromagnetic spectrum .See Figure: 1

But night vision technology makes it possible for the humans to view the rays felling in the infrared region of the electromagnetic spectrum that is generally the night vision systems used in automobiles captures the infrared image of distant obstacles on road as every object emits infrared rays (heat rays) even during night. This image is viewed in a screen and the driver can thus apply the brakes as required.

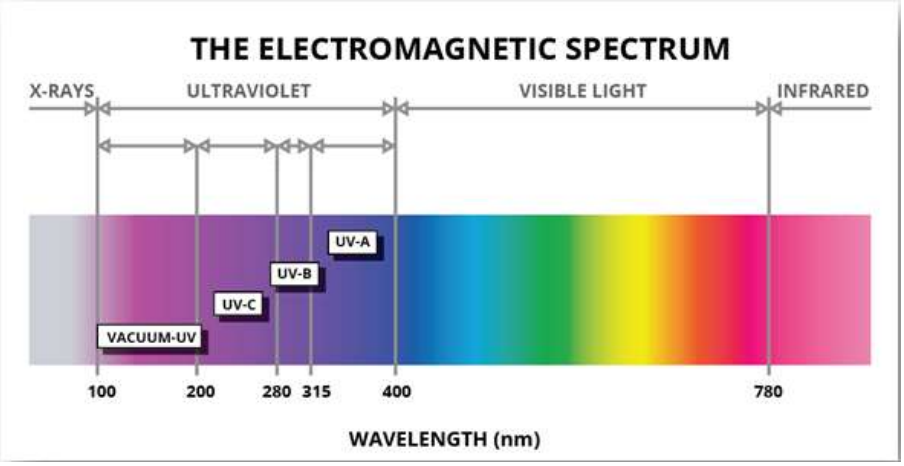

Fig. 1: ElectromagneticSpectrum

How Does Night Vision Technology Works in Automobiles?

Automotive night vision systems are broken into two basic categories, which are referred to as active and passive. Active night vision systems uses infrared light sources to illuminate the darkness and passive systems rely on the thermal radiation that is emitted from cars, animals, and other potential hazards. The systems both rely on infrared data, but each one has its own benefits and drawbacks.

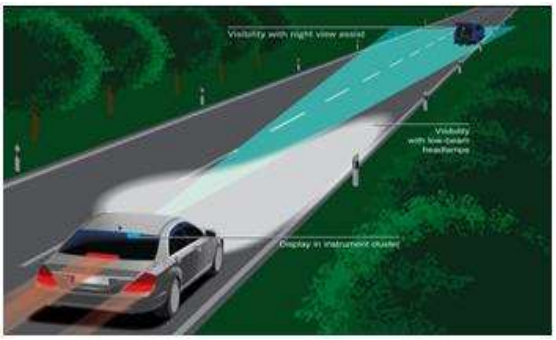

Fig.2: Night Vision System Car

There are two types of Automotive Night Vision Systems-

- Active Automotive Night Vision Systems
- Passive Automotive Night Vision Systems

Active Automotive Night Vision Systems

Active systems use an infrared light source built into the car to illuminate the road ahead with light that is invisible to humans. There are two kinds of active systems: gated and non-gated. The gated system uses a pulsed light source and a synchronized camera that enable long ranges (250m) and high performance in rain and snow.

- **Pros:** Higher resolution image, superior picture of inanimate objects,

works better in warmer conditions; smaller sensor can be mounted to rearview mirror.

- **Cons:** Does not work as well in fog or rain, lower contrast for animals, shorter range of 150–200 meters or 500–650 feet. Also needs own infrared light sources.

Passive Automotive Night Vision Systems

Passive systems do not use an infrared light source, instead they capture thermal radiation already emitted by the objects, using a thermo-graphic camera. Passive systems don't use their own light sources, so they rely on thermo-graphic cameras to detect thermal radiation.

- **Pros:** Greater range of about 300 meters or 1,000 feet, higher contrast for living objects.

- **Cons:** Grainy, lower resolution image, works poorly in warmer weather conditions, larger sensor.

SYSTEM COMPONENTS AND DESCRIPTION

The Intelligent Night Vision System for Automobiles consists of the following components:-

Table 1: Components of Night Vision System (NVS)

No.	Explanation
1	Night Vision Control Unit
2	Controller Display
3	Controller
4	Instrument Cluster
5	Button in Light Switch Centre
6	Night Vision Camera

Fig. 3: ComponentsofNightVisionSystem(NVS)

How Does Infrared or Thermo-graphic Information Help Me to See in Dark?

Fig. 4: Views from save position[Left-Day Time,Centre-Night,Right-Night Vision System Image(IR)]

Fig.5 : View of Roads at night (a)General View,(b) Thermal View

APPLICATIONS

Active System

- Mercedes-Benz--Mercedes-Benz S-Class (W221),Mercedes-Benz F500, Mercedes-Benz E-Class (W212), Mercedes-Benz CL-Class (C216),W222 S-Class.

- Toyota--Landcruiser Cygnus or Lexus LX470,

Passive System

- Audi—Audi A8 W12L.
- BMW—BMW 7Series (E65), BMW 7Series (F01).
- Caddilac--Cadillac Deville, Cadillac CT6
- Honda--Honda Legend.

CONCLUSION

The innovation and implementation of night vision system has a great impact on automotive session such as saving many lives from death reducing accidents at night.

To put it in a nut shell it has become the need of the hour to have these kinds of hybrid safety systems on the latest automobiles that could save the lives of many. All the automobile giants should divert their R&D work towards such innovative technologies and make this world a safer world to live in. Many such ideas are yet to come and it is the duty of young budding engineers to think innovatively and work upon developing such techniques one of which being the night vision sensors used in cars and other automobiles that are proving to be a great success in the west and this should be implemented immediately on the Indian terrain and reduce the catastrophic incidents that occur on the roads especially during the night times. In the recent past small scale developments have come into play and the world is looking forward for such creations to come into play.

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