

NIGHT VISION IMAGING

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INTRODUCTION

- **What is a Digital Image ?**

- A **digital image** is a representation of a two-dimensional image using ones and zeros (binary).

- **What is Digital Imaging ?**

- Digital imaging or digital image acquisition is the creation of digital images, typically from a physical scene.

- **What is Night Vision ?**

- **Night vision** is the ability to see in a dark environment. Whether by biological or technological means, night vision is made possible by a combination of two approaches: sufficient spectral range, and sufficient intensity range.



HOW NIGHT VISION WORKS

- Night vision technologies can be broadly divided into three main categories:
 - Image intensification
 - Active illumination
 - Thermal imaging





Image intensification technologies work on the principle of magnifying the amount of received photons from various natural sources such as starlight or moonlight.

Examples of such technologies include night glasses and low light cameras.



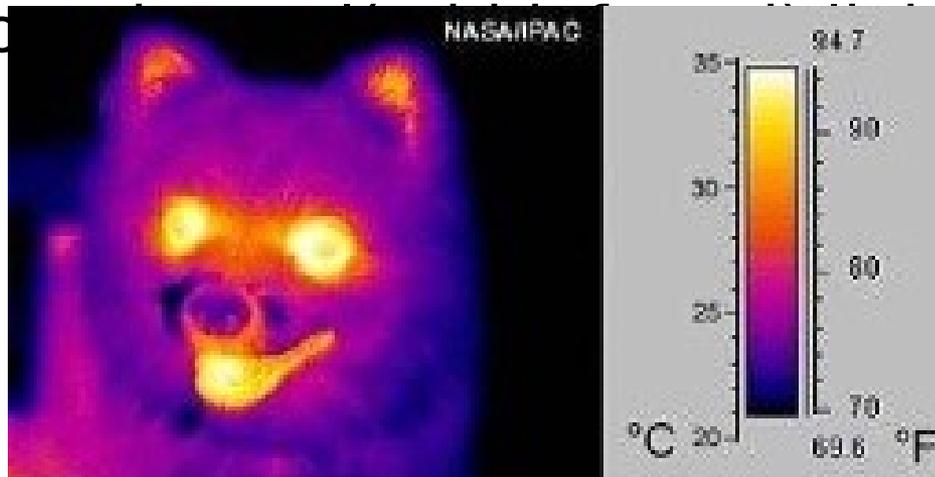
ACTIVE ILLUMINATION

- Active illumination technologies work on the principle of coupling imaging intensification technology with an active source of illumination in the near infrared (NIR) or shortwave infrared (SWIR) band.
- Examples of such technologies include low light cameras.



THERMAL IMAGING

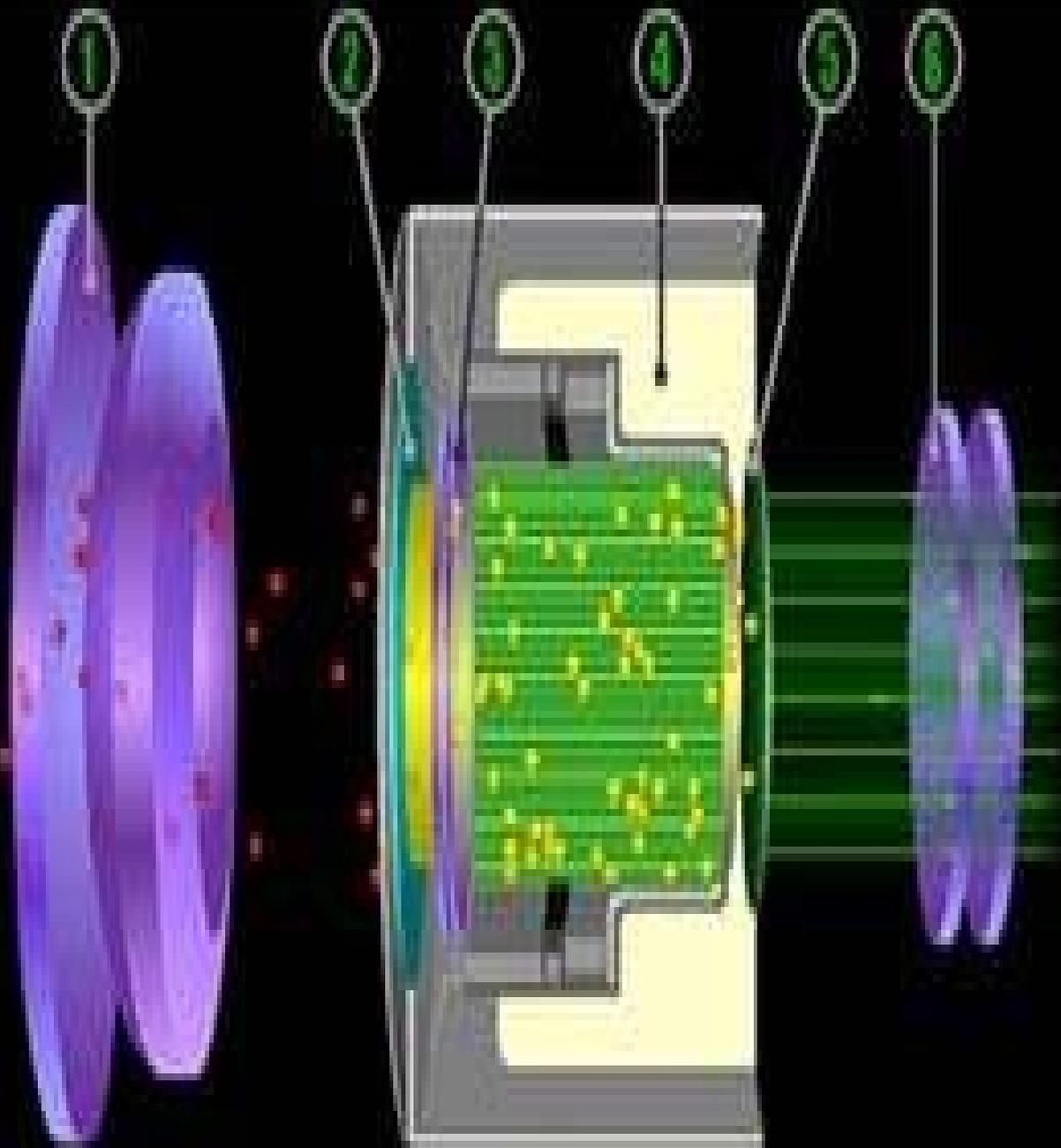
- Thermal imaging technologies work by detecting the temperature difference between the background and the foreground objects.
- The figure below shows an image of a dog taken from a thermal camera.



HOW IMAGES ARE ACQUIRE THROUGH NVD'S

- Night vision devices gather existing ambient (starlight, moonlight or infrared light) through the front lens.
- The light, which is made up of photons goes into a photocathode tube that changes the photons to electrons.
- The electrons are then amplified to a much greater number through an electrical and chemical process.
- The electrons are then hurled against a phosphorus screen that changes the amplified electrons back into visible light that you see through the eyepiece.
- The image will now be clear green-hued amplified re-creation of the scene you were observing.





NIGHT VISION DEVICE

1. Front Lens
2. Photocathode
3. Micro-channel
4. High Voltage Power Supply
5. Phosphorus Screen
6. Eyepiece



NIGHT VISION EQUIPMENTS

○ **Scopes**

- Normally they are handheld or mounted on a weapon, scopes are monocular scopes.
- Since they are handheld and hence good as when we want to get a better look at a specific object and then return to normal viewing condition.

○ **Goggles**

- While goggles can be handheld, they are most often worn on the head.
- Goggles are binocular (two eye-piece) and may have a single lens or stereo lens, depending on the model.
- Goggles are excellent for constant viewing, such as moving around in a dark building.



○ Cameras

- Cameras with night-vision technology can send image to a monitor for display or to VC for recoding.
- When night-vision capability is desired in a permanent location, such as part of the equipment in a helicopter, cameras are used.
- Many of the newer camcorders have night-vision built right in.



MISSION

- Night Vision's mission is to:
 - Acquire and Target enemy force in battlefield environment.
 - Detect and neutralize mines, minefields and unexploded ordnance; Develop Humanitarian demining technology.
 - Deny enemy surveillance & acquisition through electro-optic, camouflage, concealment and deception techniques.
 - For night driving and autopilot.



APPLICATION OF NIGHT VISION SYSTEM

- Wildlife Observation
- Surveillance
- Security
- Navigation
- Hidden-object detection
- Entertainment





Night Vision System in Cars



NIGHT VISION SYSTEM IN CARS

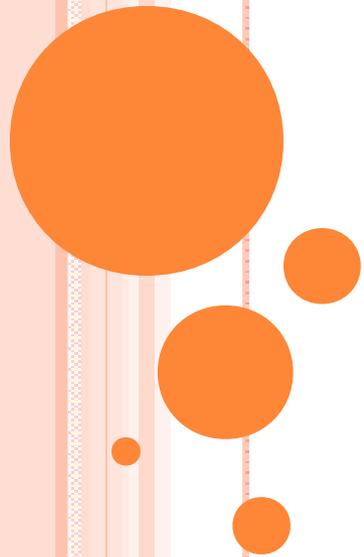
- Night Vision makes a vehicle's darkened surrounding visible out to a distance of 150 meters.
- Night Vision generates an electronically processed video image that can be displayed in real time in the head-up display.
- The pedestrian marking in the video image has been realized by Siemens VDO as a prototype with image processing electronics.
- This analyzes all the image data according to the temperature differences and typical shapes and marks pedestrians on the monitor with a warning.



CONCLUSION

- It's a critical study, which plays a vital role in modern world as it is involved with advance use of science and technology.
- The advances in technology have created the tremendous opportunities for Vision System and Image Processing.
- The technology has evolved greatly since their introduction, leading to several “generation” of night vision equipment with performance increasing and price decreasing.
- From the above discussion we can conclude that this field has relatively more advantages and disadvantages and hence is very useful in varied branches.





THANK YOU

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