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Night Vision Technologies

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Night Vision Technology, as the name suggests, is the expertise that makes us capable to see in the night without using any external light source such as a torch or a lamp [1]. Highly advanced light sensitive cameras are used in this technology for producing clear visible images at night which can't be done by the naked eye. Low-light imaging, thermal imaging and near-infrared illuminations are the three most commonly used night vision technologies.

The most common method of low-light imaging is based on a device called an image intensifier to amplify available light. Available light is focused through the objective lens (the lens closest to the object being viewed) onto the photocathode of the image intensifier. Then the electrons released by the cathode and accelerated by an electric field enter holes in a microchannel plate and bounce off specially-coated internal walls thus creating a denser "cloud" of electrons representing an intensified version of the original image. The electrons next hit a phosphor screen, making the phosphor glow. And finally the light displays the desired view to the user or to an attached camera or video device [2]. Since the human eye is quite sensitive to green colour which falls in the middle of the spectrum, these cameras have green phosphor which gives the green colour to the night vision cameras.

Whenever a night vision device is used, some facts are to be kept in mind. Surface colours and patterns directly influence the produced image. A darker image will be formed for the

objects that are dull in texture and vice versa for bright textured objects. Presence of rain, fog, smog and various other forms of water precipitation can have an adverse effect on the performance of the device. This is because the devices are quite responsive to even a slight amount of light and presence of water can give rise to various light phenomena which may not give the exact output that one desires to get from a night vision device [1].

Thermal imaging is a method of improving visibility of objects in a dark environment by detecting the objects' infrared radiation and creating an image based on that information [2]. All objects emit infrared energy (heat) as a function of their temperature. In general, the hotter an object is, the more radiation is emitted. A thermal imager/camera is essentially a heat sensor capable of detecting even tiny temperature differences. The device collects the infrared radiation from objects in the scene and creates an electronic image based on information about the temperature differences. Because objects are rarely precisely the same temperature as other objects around them, a thermal camera can detect them and they will appear as distinct in a thermal image. Thermal images are normally grayscale in nature: black objects are cold, white objects are hot and the depth of gray indicates variations between the two. Some thermal cameras, however, add color to images to help users identify objects at different temperatures.

Near-infrared illumination is a method of night vision based on the employment of a device that is sensitive to invisible near infrared radiation in conjunction with an infrared illuminator. This popular and inexpensive method of night vision is used in a variety of applications including perimeter protection where it can be integrated with video motion detection and intelligent scene analysis devices for a reliable low-light video security system. Near-infrared illumination can also be used to perform high-speed video capture, such as

reading license plates of moving vehicles in an automatic license plate recognition system. Like thermal imaging, near-infrared illumination may provide visibility in fog, mist, rain and snow [2].

The original purpose of night vision technology was to locate enemy targets at night. It is still used extensively by the military for that purpose, as well as for navigation, surveillance and targeting. The police and security often use both thermal-imaging and low-light imaging technology, particularly for surveillance. Hunters and nature enthusiasts use night vision devices for maneuvering through the woods and for wildlife observing at night. A really amazing ability of thermal imaging is that it reveals whether an area has been disturbed – it can show that the ground has been dug up to bury something, even if there is no obvious sign to the naked eye. Law enforcement has used this to discover items that have been hidden by criminals, including money, drugs and bodies.

Many people are beginning to discover the unique world that can be found after darkness falls. If you're out camping or hunting a lot, chances that night-vision devices can be useful to you are very high – just be sure to choose the right type for your particular needs [3].

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