

# THERMOGRAM IMAGE FOR IMAGE ENHANCEMENT

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## ABSTRACT

Today there is no area where images are not used, taking an example of Medical images, to study a variety of medical imaging techniques to diagnose and treat human diseases. In these years the digitalizing process of medical images starts from gathering, scanning, display to reconstruction, diagnosis, transmission, storage, etc is closely confined up to the development of computer science. Thermogram means a photographic record made by thermography. In this paper a Analysis is made about the Thermogram Image and the enhancement using the Thermography instrument

**Keywords:** Gray Image, Images, Infrared Technology, Pixels, Temperature, Thermogram,

## I INTRODUCTION TO THERMOGRAPHY

A regional temperature map of the surface of a part of the body made by a thermograph or A graphic record of temperature variations or The visual record obtained by THERMOGRAPHY; called also thermograph

A technique for sensing and recording on film hot and cold area of the body by means of an infrared detector that reacts to blood flow diseases states that manifest increased or decreased blood flow present thermographic patterns that can distinguish from those of normal areas.

All objects when heated emit electromagnetic energy. The amount of energy is related to the temperature. The higher the temperature, the more electromagnetic energy it emits.

The electromagnetic spectrum contains various forms of radiated energy including gamma rays, X-rays, Ultraviolet, infrared and radio. Infrared energy covers the spectrum of 0.7 to 100  $\mu\text{m}$ .

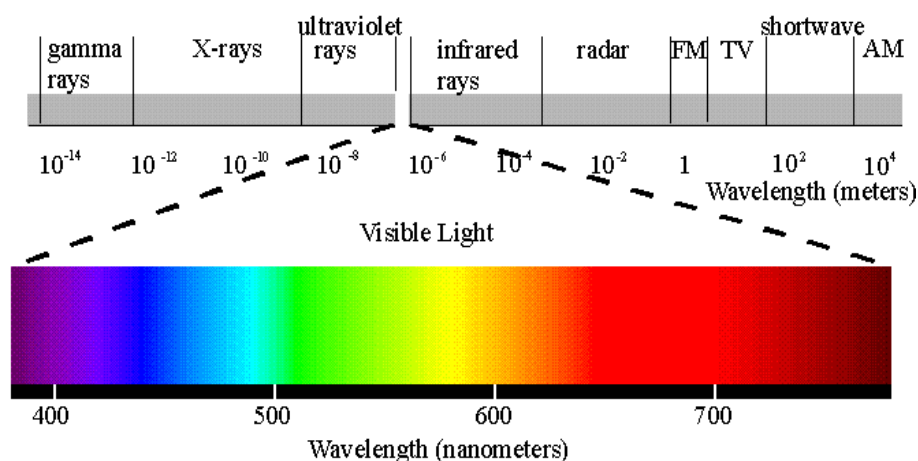


Figure 1.1 Electromagnetic spectrum

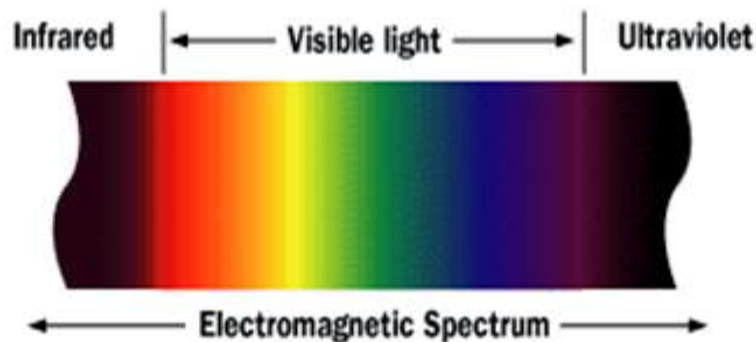
## 1.1 Infrared

All matter (examples planets, gases) produces some amount of electromagnetic radiation across a range of wavelengths or energies

All materials, which are above 0 degrees Kelvin (-273 degrees C), emit infrared energy.

Thermal, or infrared energy, is light that is not visible because its wavelength is too long to be recognized by the human eye;

- NEAR INFRARED
- MID INFRARED
- THERMAL INFRARED



**Figure 1.2 Classification of Spectrum**

“Infrared” denotes to the portion of the electromagnetic range where natural life-forms emit the most light, at wavelengths somewhat longer than what we perceive as the color.

Why Don't We See It.

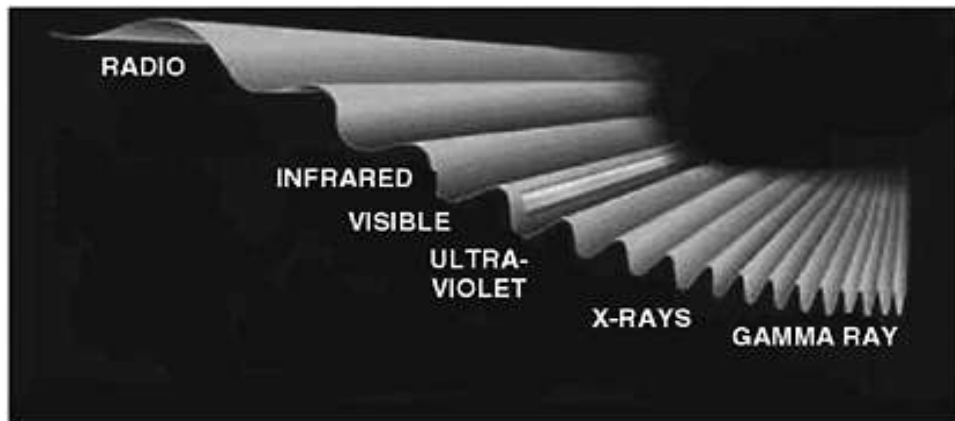
Put simply, Human eyes do not have the basics necessary features for detecting infrared. Although there are practical evolutionary details for this, infrared is a reality that exists behind the scenes.

## 1.2 Normal Infrared

Human beings are not able to see infrared, where as we can still *sense* it through what is frequently called heat. Physical touch is the straightest way of observing it. We feel it on a hot day under the sun, or when we walk on the campfire.

The electromagnetic band is a range of all electromagnetic waves arranged according to wavelength and frequency. A wave has several characteristics the diagram 1.5 shows the highest point in the wave is called the *crest* and the lowest point in the wave is referred to as the *trough*. The distance between one wavecrest to another wavecrest is called a *wavelength*. *Frequency* is the number of wavecrests passing a given point per second. As the wave frequency increases, the wavelength decreases. The shorter the wavelength the more energy contained; the longer the wavelength, the less energy. For example: a steel slab exiting the furnace at the hot strip will have short wavelengths. we can sense the heat and realise the red glow of the slab. The wavelengths have become smaller crest to crest and the energy being emitted has increased, entering the visible band on the electromagnetic spectrum. By contrast, (infrared energy) when the coil comes off of the coilers it

has been cooled. There is a loss of energy. The wavelength have increased crest to crest and decreased in frequency.



*Figure 1.3 Wavelengths.*

### **1.3 Basic Infrared Theory**

Infrared is light that works outside the dynamic range of the human eye. The heat is measured & viewed by the developer of the infrared images. Later this information is transformed into digital data & processed into video images that are called Thermograms. Individual pixel of a thermogram images has a temperature value and the image's contrast is derived from the differences in surface temperature. An infrared examination is a harmless technique for detecting thermal differences that indicate problems with equipment. Infrared surveys are conducted with the plant equipment in operation, so production need not be interrupted. The comprehensive information can then be used to prepare repair time/cost estimates; evaluate the scope of the problem; plan to have repair materials available, and perform repairs effectively.

## **II HEAT TRANSFER CONCEPTS**

Heat is a form of thermal energy. The first law of thermodynamics is that heat given up by one object must equal that taken up by another. The second law is that the transfer of heat takes place from the hotter system to the colder system. If the object is cold, it absorbs rather than emits energy. All objects emit thermal energy or infrared energy through three different types or modes. The three modes are conduction, convection, and radiation. It is important to understand the difference of these three forms.

### **2.1 Conduction**

Conduction is the transfer of energy through or between solid objects. A metal bar heated at one end will, in time, become hot at the other end. When a motor bearing is defective, the heat generated by the bearing is transferred to the motor casing. This is a form of conduction.

### **2.2 Convection**

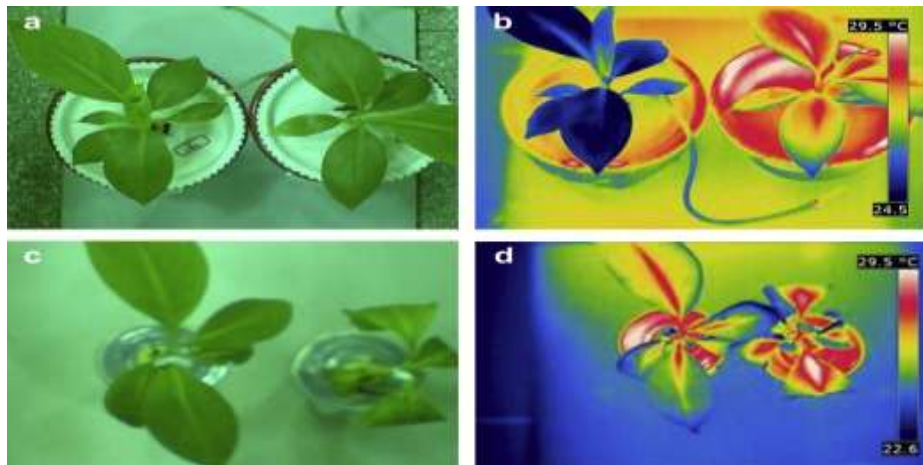
Convection is the transfer of energy through or between fluids or gases. If you took the same motor mentioned above and placed a fan blowing directly on the hot bearing, the surface temperature would be different. This is convection cooling. It occurs on the surface of an object. An operator must be careful to identify the true cause

and effect. In this case, the difference between good and bad source heating and the surface cooling due to convection.

### 2.3 Radiation

Radiation is the transfer heat by wavelengths of electromagnetic energy. The most common cause of radiation is solar energy. Only radiated energy is detected by an infrared imager. If our motor were sitting outside in the slab storage yard with slabs stacked around it, the electromagnetic energy from the sun and from the slabs would increase the temperature.

The infrared energy emitted from the measured object is converted into an electrical signal by the imaging sensor (microbolometer) in the camera and displayed on a monitor as a colour or monochrome thermal image.



**Figure 1.4 Color thermal image**



**Figure 1.5 Thermal Imaging Camera**

The spectrum and amount of thermal radiation depend strongly on an object's surface temperature. This makes it possible for a thermal imaging camera to display an object's temperature.

### III INFRARED THERMOGRAPHY SECURITY

Equipment included in an infrared thermography inspection is almost always energized. For this reason, a lot of attention must be given to safety. The following are basic rules for safety while performing an infrared inspection:

Plant safety rules must be followed at all time.

Notify area personnel before entering the area for scanning.

Qualified electrician from the area should be assigned to open and close all panels.

Where safe and possible, all equipment to be scanned will be on line and under normal load with a clear line of sight to the item.

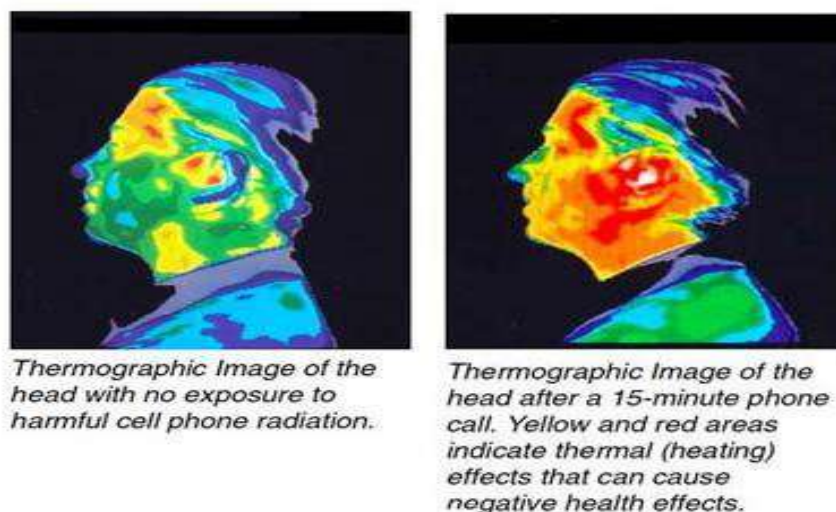
Equipment whose covers are interlocked without an interlock defect mechanism should be shut down when allowable. If safe, their control covers opened and equipment restarted.

Examples: The very first thermal image in 1948 took 40 minutes to scan



**Figure 1.6 First Thermal image in 1948**

Thermal Image of the Immediate Effects of Cell Phone Radiation



**Figure 1.7 Thermographic image for Cell phone radiation**

Treatment Progress



Figure 1.8 Backbone treatment

Various Conditions

“red glove” in hands related to pancreatic issues,

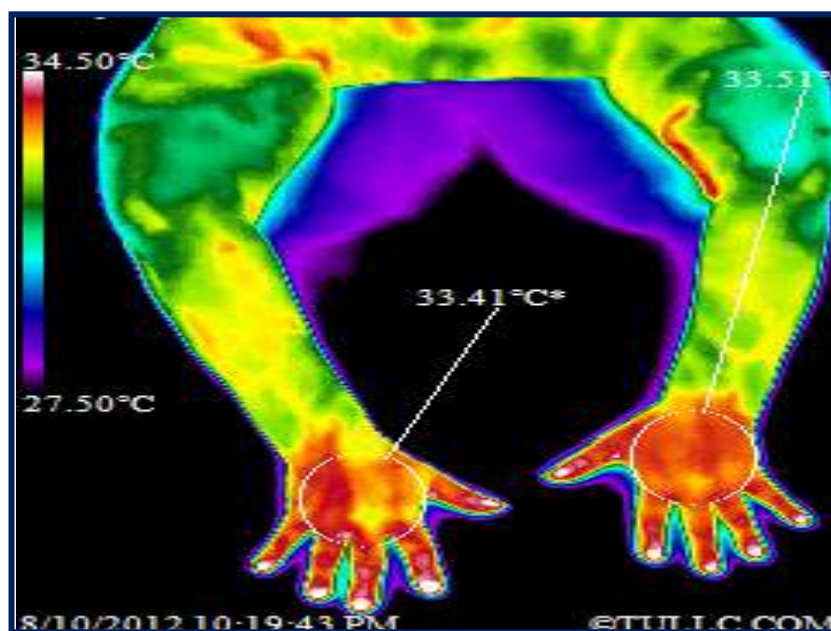
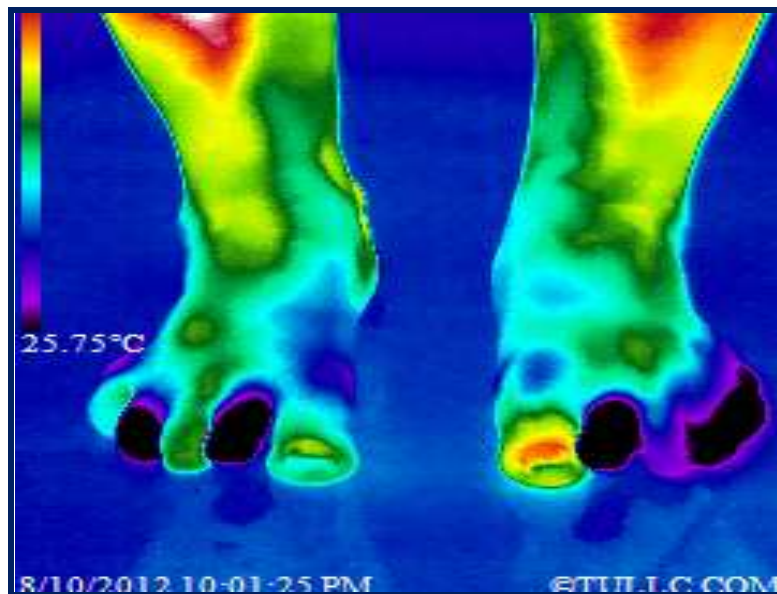


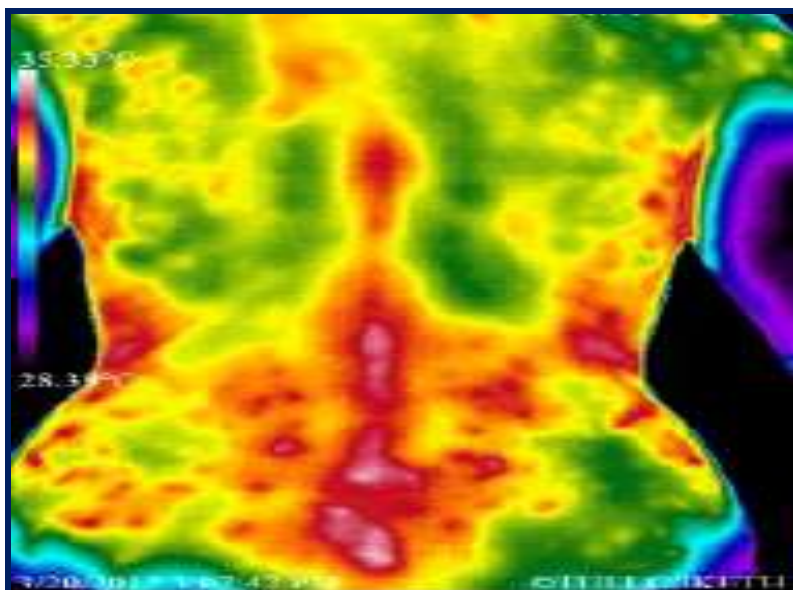
Figure 1.9 Hands related to Pancreatic

digital neuropathy in toes,



**Figure 2.0 neuropathy in toes**

kidney inflammation and back pain



**Figure 2.1 Kidney inflammation and back pain**

#### IV CONCLUSION

By this survey we can conclude that thermogram Imaging is a completely non-invasive, non-contact, medical imaging procedure for detecting and monitoring various diseases and physical injuries. It helps the doctor to diagnose the problem early stage of the diseases

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**Proceeding Paper**

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