THERMAL IMAGE ANALYSIS

Project submitted to the
SRM University – AP, Andhra Pradesh

for the partial fulfillment of the requirements to award the degree of

Bachelor of Technology/Master of Technology

In

Computer Science and Engineering
School of Engineering and Sciences

Submitted by
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(DECEMBER, 2022)

Certificate

Date: 14/12/2022

This is to certify that the work present in this Project entitled "THERMAL IMAGE ANALYSIS" has been carried out by [T.CHIDROOP] under my/our supervision. The work is genuine, original, and suitable for submission to the SRM University – AP for the award of Bachelor of Technology/Master of Technology in School of Engineering and Sciences.

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Abstract

The work we have portrayed the is Thermal Image Analysis, which is a remote sensing technique which is used for several reasons in this particular research we have done thermal analysis on automobiles/cars by using an FLIR thermal camera which was provided to us by our mentor in this research we have collected and recorded the temperature of several automobiles at different timings and different climate atmospheres. The temperature measurement technology of infrared thermal imaging has become a hotspot because of its fast outcomes and non-contact temperature measurement. This type of technology is used in electric power, manufacturing of automobiles, climatology, constructions etc, In this undergraduate research we have worked on automobiles and the temperature they attain with respect to the climate and by the condition of specific automobile so we have recorded the temperatures of several automobiles and gathered about thousand images and mapped graphs using the images we have taken. In this project we have concluded the increment in temperature of automobiles with respect to the average current temperature atmosphere they are present in and finally distinguished the increment in temperature of automobiles based on the color of the automobiles.

Abbreviations

FLIR - Forward Looking InfraRed InfraRed

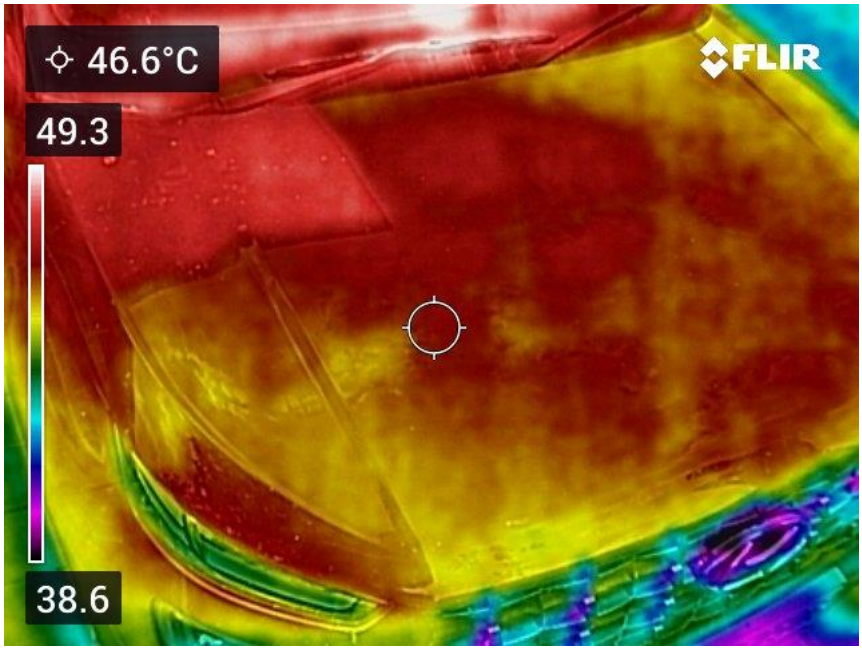
1. Introduction

In recent days thermal imaging or temperature analysis is mostly used to detect the temperature changes or increment or decrement in temperature of a particular object. With the high increase in smart technologies and other effective features temperature measurement for industrial purposes and for other automobile purposes we have used an FLIR thermal camera to measure the temperature of required automobiles and we have distinguished the increment/decrement in temperature in different climate atmospheres and also distinguished the difference in temperature of various colors.

This project's major goal is to represent the analysis that we have done on several automobiles in different climatic conditions and map a graph on the basis of automobiles/cars color and make a report on the variations of temperature. We have used an FLIR thermal camera as an instrument to measure the temperature in several modes using thermal mode/thermal MSX mode using several filters such as Black hot/White hot/Greyscale by using them we can differentiate the temperature scale of different colors under different climatic conditions so we can record the movement of temperature for different colors.

2. Methodology

Thermal image capturing: The goal of thermal image capturing is a technology that allows people to capture images using the infrared radiation emitted by objects. This technology is often used in security and surveillance applications, as well as in the field of thermography, where it is used to detect and diagnose problems in a variety of systems and structures. Thermal imaging cameras are able to detect very small differences in temperature, which makes them useful for a wide range of applications, including detecting leaks in buildings, identifying overheated electrical components, and locating people in low visibility conditions.



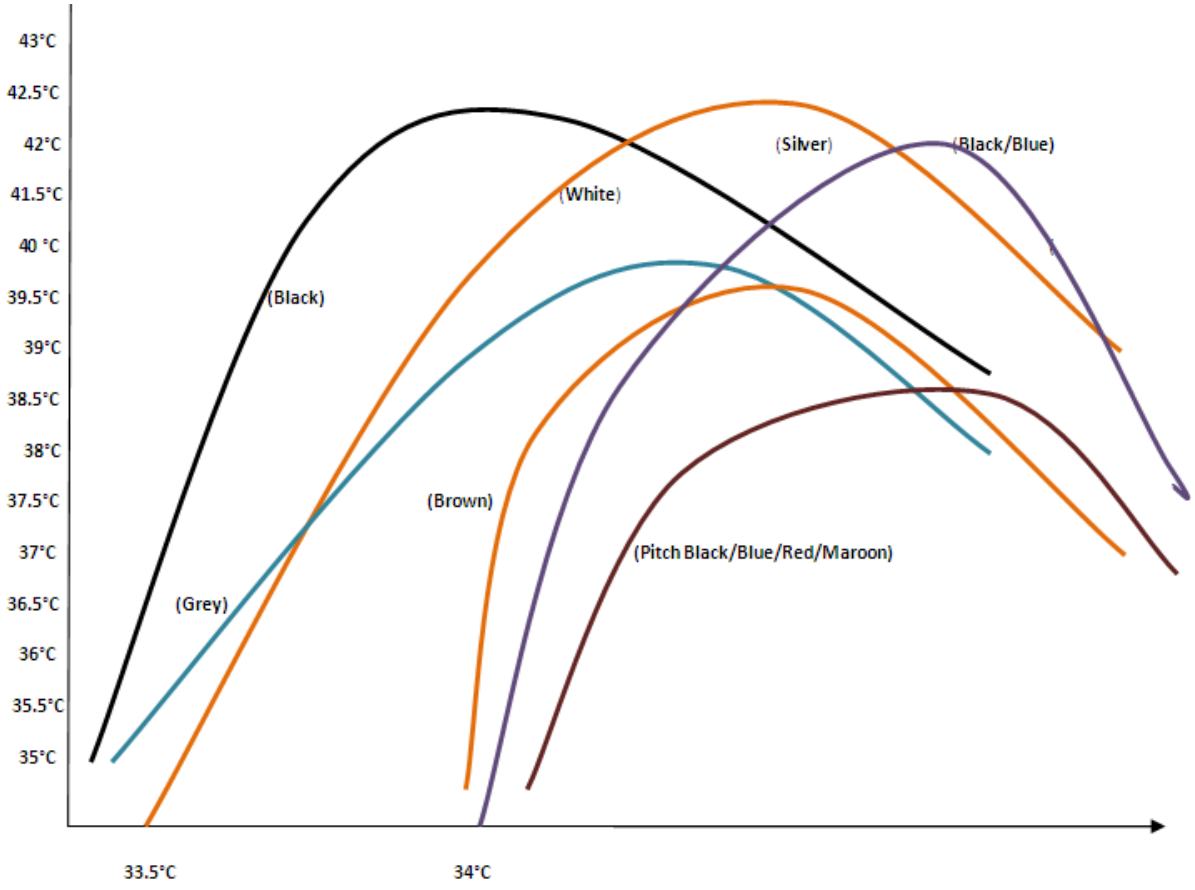
Utilization of FLIR thermal camera: FLIR thermal cameras are a type of specialized camera that is designed to capture thermal images, which are images that show the heat being emitted by objects. These cameras use infrared technology to detect and measure the thermal radiation emitted by objects, and can be used to visualize and record the temperature of a car's engine and other components. Using a FLIR thermal camera for recording the temperature of a car's systems can be an effective way of monitoring the health of the vehicle and detecting potential problems, such as overheating or other issues. These cameras can be used in a variety of applications, including automotive repair and maintenance, and are often used by mechanics and other professionals who need to diagnose and fix problems with vehicles.

Recording temperature of automobiles using FLIR thermal camera: Recording the temperature of an automobile using a FLIR thermal camera is a way of using infrared technology to monitor the temperature of a car's engine and other components. FLIR thermal cameras are specialized cameras that are designed to capture thermal images, which are images that show the heat being emitted by objects. By using a FLIR thermal camera to record the temperature of a car's systems, it is possible to monitor the health of the vehicle and detect potential problems, such as overheating or other issues. These cameras can be used in a variety of automotive applications, and can be an important tool for mechanics and other professionals who need to diagnose and fix problems with vehicles.

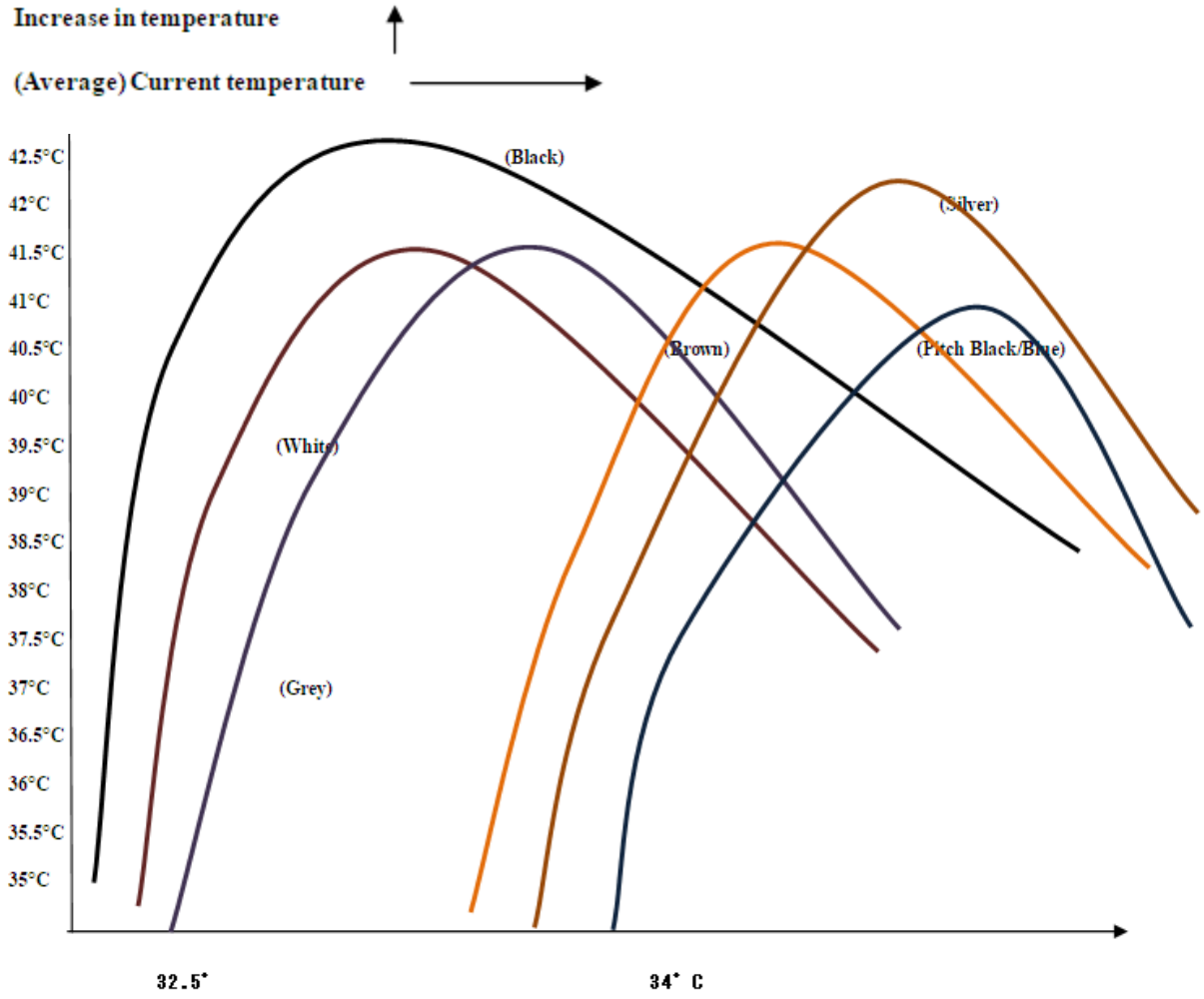
Temperature Graphing for automobiles: Temperature graphing for automobiles is a way of visualizing the temperature changes that occur in a vehicle's engine and other components over time. This can be useful for identifying potential problems, such as overheating, and for monitoring the overall health of the vehicle. Temperature graphing can be accomplished using a variety of technologies, including sensors, thermal imaging cameras, and specialized software. Some vehicles may have temperature graphing capabilities built in, while others may require the use of aftermarket systems. By monitoring temperature changes in a vehicle, it is possible to detect potential problems early and take action to prevent them from becoming more serious. These graphs are typically generated using sensors and other temperature-sensing technology, and can be used to monitor the health of a vehicle's engine and other systems. Thermal graphs can help identify potential problems, such as overheating, and can be useful for detecting trends and patterns.

3. Discussion:

Thermal graphs on cars can be used to show how the temperature of a car's surface varies based on its color. Thermal graphs on cars can be used to show how the temperature of a car's surface varies based on its color. Dark-colored cars tend to absorb more sunlight and heat up faster than light-colored cars, so they will have higher temperatures on their thermal graph. Light-colored cars, on the other hand, will reflect more sunlight and heat away from their surface, so they will have lower temperatures on their thermal graph. This is because darker colors are better at absorbing light and heat than lighter colors, which are more effective at reflecting them. The difference in temperature between cars of different colors is primarily due to the fact that darker colors are better at absorbing light and heat than lighter colors, which are more effective at reflecting them. As a result, dark-colored cars will tend to absorb more sunlight and heat up faster than light-colored cars. This means that dark-colored cars will have higher surface temperatures than light-colored cars in direct sunlight. However, the difference in temperature between the two types of cars will depend on various factors, such as the intensity of the sunlight, the ambient temperature, and the type of material used for the car's body. (Graphs are mentioned below)



(Graph based on Sunny atmosphere without any climate interference)



(Graph based on cloudy atmosphere)

Benefits of thermal imaging: Thermal imaging is a valuable technology that offers a number of benefits. Some of the key advantages of thermal imaging include: Detecting problems or issues that are not visible to the naked eye: Thermal imaging allows us to see and measure the temperature of objects and surfaces, which can help us identify problems or issues that may not be apparent from visual inspection alone. For example, thermal imaging can be used to detect leaks or overheating in buildings, electrical systems, or mechanical equipment, allowing for early detection and repair. Improving safety and security: Thermal imaging can be used in a variety of safety and security applications, such as detecting the presence of people or objects in low light or obscured environments. It can also be used to identify potential hazards, such as hot spots in a building or malfunctioning electrical equipment, helping to prevent accidents or injuries. Reducing costs and improving efficiency: Thermal imaging can help improve efficiency and reduce costs by allowing for early detection and repair of problems or issues. For example, it can be used to identify energy loss in buildings, allowing for better insulation or improved heating and cooling systems. It can also be used to diagnose mechanical problems in vehicles or other equipment, reducing downtime and saving on repair costs. Non-invasive and non-destructive: Thermal imaging is a non-invasive and non-destructive method of inspection, which means it does not require physical contact with the object or surface being inspected. This makes it ideal for use in sensitive or delicate situations, where traditional inspection methods may not be appropriate.

Concluding Remarks on thermal imaging: Thermal imaging is a useful technology that allows us to see and measure the temperature of objects and surfaces. It is commonly used in a variety of fields, including engineering, construction, and medicine, to detect and diagnose problems or issues that may not be visible to the naked eye. Thermal imaging is also used in some law enforcement and military applications, as it can help detect the presence of people or objects in low light or obscured environments. Overall, thermal imaging is a valuable tool that helps us better understand the world around us and make informed decisions based on the information it provides Thermal imaging has a number of industrial applications, including: Detecting leaks or overheating in buildings, electrical systems, or mechanical equipment and can be used for monitoring the temperature of processes or equipment in manufacturing or industrial facilities and identifying energy loss in buildings, allowing for improved insulation or heating and cooling systems.

References:

[1].https://www.infratec.in/thermography/industries-applications/automotive-industry/