IOT BASED SURVEILLANCE SYSTEM USING THERMAL CAMERA

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ABSTRACT: Thermography, or thermal visualization using thermal camera is a type of infrared visualization. Physiological and affective computing which is based on thermal imaging is an emerging research area thereby enabling technologies to monitor our bodily functions and understand psychological and affective needs in a contactless manner. However, up to recently, research is being carried out in very controlled lab settings. Thermographic cameras/ thermal sensors are utilized in many automated heavy factories for monitoring the temperature conditions of the machines and thereby monitoring any malfunctioning of the machines. Besides, thermographic camera overcomes the disadvantage of traditional digital camera by being able to detect trespassers in environment with poor lighting condition. This surveillance system is mainly used in sensing any human activities during the hours where no human presence is expected.

Keywords- Thermal imaging system, Arduino, human temperature, thermography.

INTRODUCTION

Security is a most important issue of our daily life. Everyone around would want to be as much safe and secure as possible. Security is necessary even if we have excellent agencies for public (police, fire, highway patrol, etc). Person detection and localization is an important part of many camera-based safety and security applications such as search and rescue, surveillance, reconnaissance, or driver assistance. There are increasing cases of humans and children being stuck inside an elevator or a storage space like a freezer, etc. The cameras that examine the space for the entire time and reacts accordingly to the conditions are in great demand. There are varieties of security systems available in the market for all the kinds of applications. However many of these units have the limitations of high installation cost, immense consumption of electricity, high memory space utilization of the recording system and complexity of the hardware circuits, etc. Various techniques have been implemented in this regard to ensure safe human safety. Installation of all time working CCTV Cameras are major amongst these. But these approaches have come up with the limitation of being ineffective and inefficient too. A major obstacle encountered in most surveillance systems is the change in ambient light, specifically in an outdoor environment where the lighting condition varies naturally. This makes the conventional digital colour images analysis process in smart surveillance system very difficult. The most important action in cases like humans being trapped in a particular area is to instantly alert the owner and alarm him about the situation. And this process is required to be low on price scales and highly effective and efficient so that it is affordable by all. The thermal camera uses infra-red (IR) sensors that captures IR radiation coming from different objects in the surrounding and forms IR image. Since infra-red radiation from any object is purely due to the thermal radiation, and not the light reflected from the object, such camera can be conveniently used for trespasser detection in night vision too. This surveillance system can be used for detecting the trespassers in poor lighting conditions too.

PROPOSED SYSTEM

This project is a surveillance system using Thermal camera. Each and every object that we deal in our daily lives produces thermal energy. The energy emitted from these objects is also known as heat signature, that is each objects may have different thermal energies. The thermal camera senses the variation in temperature by recognizing and capturing different levels of Infrared light. We detect the trespassers as well as fire in certain environments even in poor lighting conditions. Global Positioning System (GPS) is used to track the location where the presence is detected. Once the presence is detected, an alert message along with the GPS location is send to the respective authority. IoT, a network of internet connected objects that can collect and exchange information is also used. The collected data is send to an open source IoT platform Cayenne Mydevices through the Wi-Fi module. This information can be accessed by the user anywhere in the world.
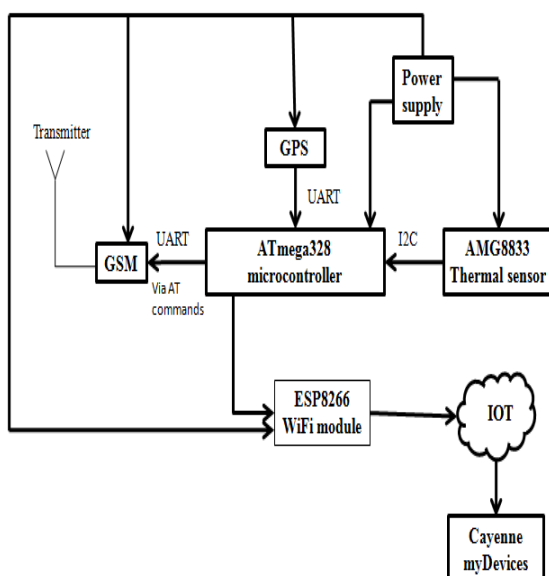
BLOCK DIAGRAM

Fig: block diagram of proposed system

This proposed surveillance system detects any human activities during the hours when no human presence is expected. This system can also detect fire.

i. CONTROLLER SECTION

AMG8833 Thermal sensor senses variations in temperature. If any variations found, it sends the data to the ATmega328p microcontroller. The microcontroller detects the temperature variations and identifies whether it is human or fire. If human or fire detected, the GPS module tracks the location of the region. The controller sends this information to IOT and authority.

ii. TRANSMITTER SECTION

The transmitter section consists of GSM module and ESP8266 WiFi module. Once human or fire is detected by the microcontroller, the data s stored in IOT with the help of WiFi module. The alert message s send to the corrsponding authority. The GSM module transmits alert message and location link to the mobile phone of corresponding person.

iii. RECEIVER SECTION

Te receiver section mainly consists of mobile phone of the authority. The alert message along with the location link is received in the mobile phone. Upon clicking the link, location details are shown within the Google map.

WORKING

Basic principle behind this project is Thermal Imaging. It is a non-invasive technique used to observe the distribution of heat on the surface of any of the objects. The thermal camera produces images also known as thermograms by sensing the infrared radiations on the surface of objects. Thermal imaging helps to view the objects in dark environment. Each and every object emits different heat energy and the thermal camera can detect these tiny differences in temperature. An object whose temperature is high would emit more infrared radiations as blackbody radiations and thermal camera detects this.
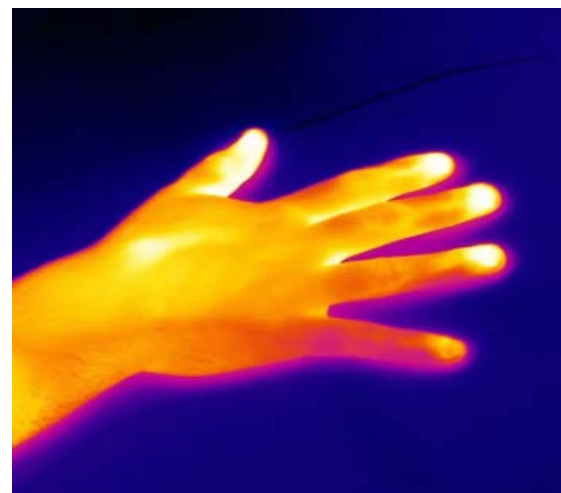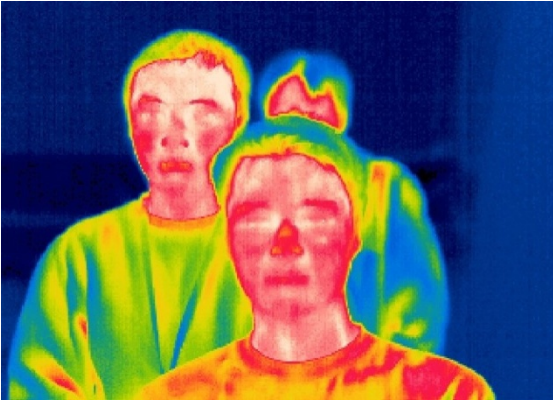
AMG8833 is an 8x8 array of IR thermal sensors that offers high performance .It uses only I2C protocol. An interrupt pin is present which can be configured by the user, it gives indication when the pixel value exceeds above or below the threshold value set by the user. By connecting the sensor with microcontroller, we get 64 individual infrared readings over I2C.We get the image by considering the temperature of each pixel. In order to compare each pixel, run the program for some time and store it. Immediately after storing, it compares and identifies the signal whether it is a human or fire.

FLOW CHART
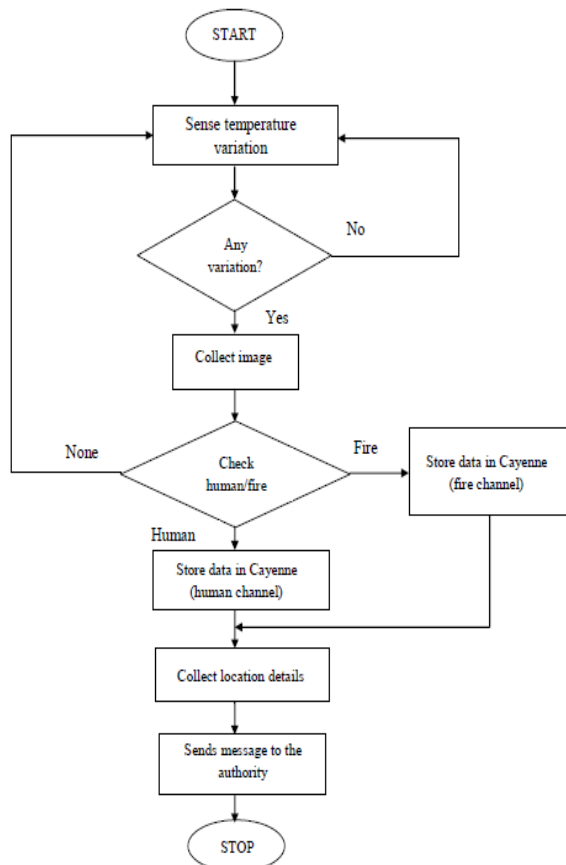
Thermal camera senses the temperature variation by recognizing and capturing different levels of infrared light. If there is amy variation the image is collected by the system. Here we detect trespassers as well as fire in certain environment even in poor lighting conditions. Once the human or fire presence is detected a message along with the location is is send to the respective authority. GPS is used to track the location where the presence is detected. Here we also use IoT, a network of Internet connected objects able to collect and exchange data. The information regarding human presence or fire is send to the open source IoT platform Cayenne Mydevices through the WiFi module. Thus the information can be accessed by the user anywhere in the world. The details of the location is then sent to the user's mobile phone in the form of text message.

RESULT

In this project we have introduced the application of proposed thermal imaging surveillance system for human and fire detection. We have used the thermal sensor AMG8833 in our project. The sensor measures temperature ranging from 0°C to 80°C (32ºF to 176ºF) with an accuracy of ± 2.5ºC (4.5ºF). Temperature range of human is calibrated as 33ºC - 50ºC, fire calibrated as 20ºC and insert calibrated as above 50ºC. This can detect a human from a distance of up to 7 meters (23) feet, with a maximum frame rate of 10Hz. Unlike digital cameras, thermal sensors are applicable in environments with poor lighting conditions. Here digital cameras do not fit. Thermal sensors can be used in chillers room, secret rooms etc for the safety purpose. It can also be used in bathrooms for ensuring the safety of aged as well as physically disabled people where digital cameras cannot be placed due to privacy issue.

CONCLUSION

In this project we set up a surveillance system with thermal sensor which mainly aims to detect human activities and fire during the hours when no activity is expected and also we can separate the different temperature levels of human, fire etc. The system sends an alert message along with the GPS location and updates the server. Thermal cameras are applicable in environments with poor lighting conditions, where digital cameras do not fit. We

can use this device in chillers room, secret rooms etc for the safety purpose, the data acquisition from sensor and processing is implemented in software and the system work can be utilized to reduce electricity and power consumption.

FUTURE SCOPES

1. More sensors can be employed to cover the whole 360 degrees of area so that entire circular area around the system becomes intrusion proof.
2. Video can be captured and stored for future reference and can also be sent to the owner and nearby police immediately.
3. Servo motor can be added to provide 180 degree rotation.
4. Can implement a robotic system so that it can move to places and detect the presence.

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