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AUTOMATIC CENTRALIZED AIR CONDITIONER USING MATLAB

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Abstract - Nowadays the normal air conditioning system works on the room temperature (28 degrees Celsius). Initially it detects the room temperature and varies with the manual set point (22 degrees Celsius) and maintains the set point with the help of thermostat. Thermostat is a device used to control the temperature and maintains a constant temperature in the fixed range throughout the room. It automatically switches the compressor ON/OFF as the temperature rises or falls. The existing centralized air conditioning system is going to be fully automated with the help of automation. we are trying to do this automation into two different systems. They are Open system and closed system.Automatic on/off centralized air conditioning is implemented with thermal image detector which senses the body temperature, and position of the person so that the inlet air supply is reduced or increased automatically. Hence the life span of centralized air conditioning system increases due to minimal utilization of load.

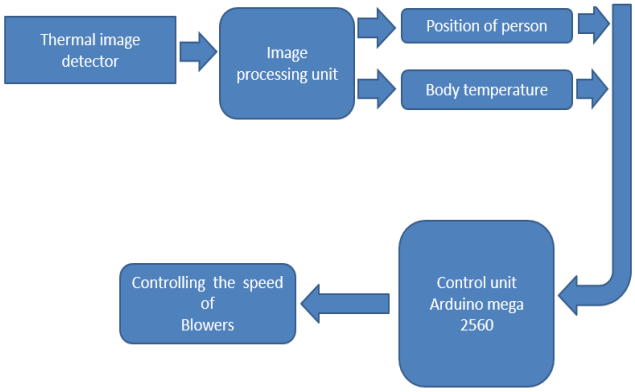
Key Words: (Size 10 & Bold) Key word1, Key word2, Key word3, etc (Minimum 5 to 8 key words)…

1.INTRODUCTION

Central air conditioning (or central A/C) is a system in which air is cooled at a central location and distributed to and from rooms by one or more fans and ductwork. The work of the air conditioner compressor is what makes the whole process of air-conditioning possible. The compression of the refrigerant gas enables it to discharge heat out of the house, which is how the cool air is created. There are two types of central air conditioners: a split system or a packaged unit. In a split-system central air conditioner, an outdoor metal cabinet contains the condenser and compressor, and an indoor cabinet contains the evaporator. In many split-system air conditioners, this indoor cabinet also contains a furnace or an air handler. The air conditioner's evaporator coil is installed in the cabinet or main supply duct of this furnace or heat pump. If your home already has a furnace but no air conditioner, a split system is the most economical central air conditioner to install. In a packaged central air conditioner, the evaporator, condenser, and compressor are all located in one cabinet, which usually is placed on a roof or on a concrete slab next to the house's foundation. Air supply and return ducts come from indoors through the home's exterior wall or roof to connect with the packaged air conditioner, which is usually located outdoors. Packaged air conditioners often include electric heating coils or a natural gas furnace. This combination of air conditioner and central heater eliminates the need for a separate furnace indoors. Nowadays the normal air conditioning system works on the room temperature (28 degrees Celsius). Initially it detects the room temperature and varies with the manual set point (22 degrees Celsius) and maintains the set point with the help of thermostat. It automatically switches the compressor ON/OFF as the temperature rises or falls. The existing centralized air conditioning system is going to be fully automated with the help of automation. we are trying to do this automation into two different systems. They are Open system and closed system.

In proposed system Automatic on/off centralized air conditioning is implemented with thermal image detector which senses the body temperature, and position of the person so that the inlet air supply is reduced or increased automatically. Hence the life span of centralized air conditioning system increases due to minimal utilization of load.

2.WORKING METHADOLOGY



It has working in three main areas

- OPEN AREA
- CLOSED AREA
- COMBINED AREA

A. OPEN AREA:

Consider an auditorium as an example for the open system.
In this system, it has been separated into different segments. Each segment contains individual damper (Inlet air supply and Return air duct).
Using Thermal image detector, it captures the thermal image of each person present in the auditorium. It automatically calculates the total temperature of the particular segment in the auditorium. Based on the temperature, the inlet supply gets varied accordingly.
If there is no one in the segment, then the inlet supply in moderately maintained. So that the utilization of power is reduced comparatively.(Inlet air supply is controlled, by controlling the speed of the blower inside the air duct).

B. CLOSED AREA:

In this system, it consists of individual closed cabins i.e. (IT companies, Hospitals etc.).
Using Thermal image detector, it captures the thermal image of the person entering inside the cabin. Using entry level sensor i.e. (Passive infrared sensor), detects the particular cabin, in which he enters. Therefore, the input supply gets varied according with the temperature of the person.
After attaining the comfort level, the input maintains with the body temperature of the person with the help of temperature sensor inside the cabin.
If there is no one inside the cabin, then the supply is automatically cutoff.

C. COMBINED AREA

Both of these systems can also be combined together for any proposed system like Hospitals, Malls etc. So that the overall efficiency can be increased.

For e.g. Consider a Hospital in which it is consist of out-patient ward, doctor's cabin, causality, ICU, neurology, radiology, general ward, cardiology, operation theatre, orthopedic, reception, pharmacy etc.
Among these, general ward is considered as a individual closed area where separate thermal detector can be used and inlet air supply is controlled accordingly. Around the general ward, the path is a open area, where thermal detectors can be arranged accordingly.
The remaining cabin are considered as individual cabin where the temperature is controlled using temperature sensor. If there is no one in the cabin, then the supply is automatically cutoff.
So that the overall power efficiency of the hospital can be increased.Conclusion content comes here Conclusion content comes here Conclusion content comes here Conclusion content comes here Conclusion content comes here Conclusion content comes here Conclusion content comes here . Conclusion content comes here

III. COMPONENTS REQUIRED

3.1.Thermal Image Detector

The image camera provide the main solution that is used that is used for countering the existing system disadvantage .as thermal camera uses interfere rays to provide images, it acts as a much better way for providing vision during fire accidents as IR penetrates through the smoke thus providing some useful information on process happening during the fire accident . The thermal camera also provides information's on the temperature of the surrounding and objects and human trapped inside the fire . The camera applies and color pallet on top of the image providing information of temperature.
If the temperature of the surrounding is cooler then the objects appears the brighter red signifying higher temperature why the blue color sigfies the lower temperatures and green indicating medium temperature

3.3 Arduino

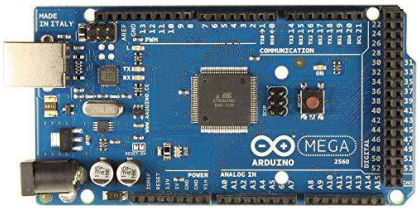
Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone.

An Arduino board consists of an Atmel 8-, 16- or 32-bit AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560), but other makers' microcontrollers have been used since 2015. The boards use single-row pins or female headers that facilitate connections for programming and incorporation into other circuits. These may connect with add-on modules termed shields. Multiple, and possibly stacked shields may be individually addressable via an I^2C serial bus. Most boards include a 5 V linear regulator and a 16 MHz crystal oscillator or ceramic resonator. Some designs, such as the LilyPad, run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions.
Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default bootloader of the Aduino UNO is the optiboot bootloader

3.4 Motor Driver

A motor driver IC is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor driver ICs act as an interface between microprocessors in robots and the motors in the robot. The most commonly used motor driver IC's are from the L293 series such as L293D, L293NE, etc. These ICs are designed to control 2 DC motors simultaneously. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor. For this tutorial we will be referring the motor driver IC as L293D only. L293D has 16 pins, they are comprised as follows:
Ground Pins - 4
Input Pins - 4
Output Pins - 4
Enable pins - 2
Voltage Pins - 2

3.5 Mega 2560



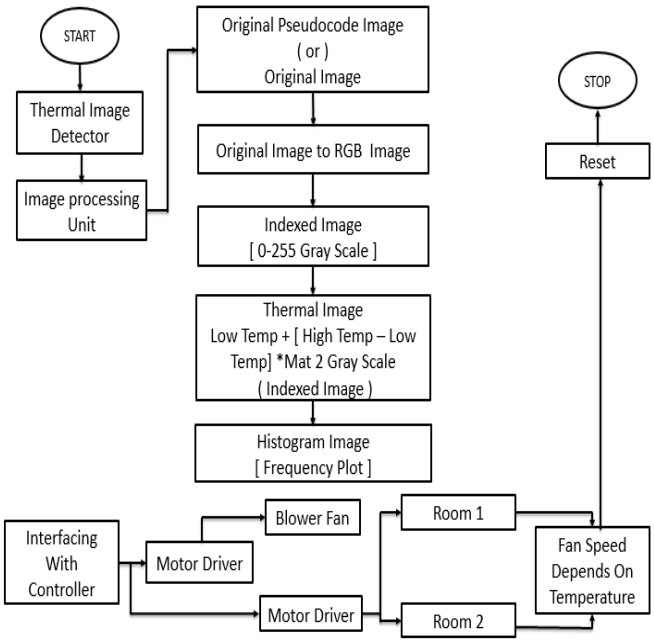
Arduino Mega 2560 is a Microcontroller board based on Atmega2560. It comes with more memory space and I/O pins as compared to other boards available in the market.
There are 54 digital I/O pins and 16 analog pins incorporated on the board that make this device unique and stand out from others.
Out of 54 digital I/O, 15 are used for PWM (pulse width modulation).
A crystal oscillator of 16MHz frequency is added on the board.
This board comes with USB cable port that is used to connect and transfer code from computer to the board.
DC power jack is coupled with the board that is used to power the board. Some version of Arduino board lacks this feature like Arduino Pro Mini doesn't come with DC power jack.
ICSP header is a remarkable addition to Arduino Mega which is used for programming the Arduino and uploading the code from the computer.

This board comes with two voltage regulator i.e. 5V and 3.3V which provides the flexibility to regulate the voltage as per requirements as compared to Arduino Pro Mini which comes with only one voltage regulator.
There is no much difference between Arduino Uno and Arduino Mega except later comes with more memory space, bigger size and more I/O pins.
Arduino software called Arduino IDE is used to program the board which is a common software used for all boards belonged to Arduino family.
Availability of Atmega16 on the board makes it different than Arduino Pro Mini which uses USB to serial converter to program the board.

IV.BACKGROUND AND RELATED WORK

In this Proposed system , Thermal Image captures the image which is given to the image processing unit .Image Processing unit is mainly used in Matlab.In image processing unit, the original image will be received to the image processor and gets converted to RGB image .Then RGB image

is converted Indexed image Indexed Image is also known Grayscale (Gray Scale Value - 0 -255).



The Indexed image is converted to the thermal image .Now the thermal image is converted to Histogram from which get temperature and frequency.Then the Arduino is interfaced with Matlab , the motor driver is connected to the controller and the blower fan is connected to the motor driver and another motor driver which is connected to the the room 1,2. Room 1,2 Fan speed always varies with temperature of the room changes.

THERMAL IMAGE DETECTOR

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. .Thermal imaging, near-infrared illumination, low-light imaging and are the three most commonly used night vision technologies. Unlike the other two methods, thermal imaging works in environments without any ambient light. Like near-infrared illumination, thermal imaging can penetrate obscurants such as smoke, fog and haze.

Here's a brief explanation of how thermal imaging works: All objects emit infrared energy (heat) as a function of their temperature. The infrared energy emitted by an object is known as its heat signature. In general, the hotter an object is, the more radiation it emits. A thermal imager (also known as a thermal camera) is essentially a heat sensor that is capable of detecting tiny differences in temperature. 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 imagers allow users to measure temperature in applications where conventional sensors cannot be employed. Specifically, in cases dealing with moving objects (i.e., rollers, moving machinery, or a conveyor belt), or where non-contact measurements are required because of contamination or hazardous reasons (such as high voltage), where distances are too great, or where the temperatures to be measured are too high for thermocouples or other contact sensors. The thermal imagers provide an image which shows the temperature difference of the object being measured. Hot spots can be seen immediately versus traditional infrared guns which average the area being measured.

Ergonomic Features
A lighter thermal camera will decrease strain on your shoulder and back during long inspections. Some models have lens systems that tilt along a 120 degree axis allowing users to keep the viewing screen comfortably in front of them. An extra button or two can actually make the camera easier to use as opposed to using one button to step through a maze of menu options. Buttons should be intuitively positioned and comfortable to use. Some cameras offer integrated touch screens.

Picture-in-Picture (P-i-P) and/or image fusion
Allows you to combine thermal and visible-light images for generating reports that are easier to understand.

Reporting Software
Can you create instant reports right from the camera, or on your mobile device with Wi-Fi enabled cameras? Can it perform a wide range of tasks from simple spot measurements to custom radiometric calibrations, or create specialized data analysis using third party software like MatLab™ or Excel?

Temperature Range
A camera's temperature range and sensitivity are important considerations, too. The range tells you what the minimum and maximum temperatures are that the camera can measure (-4°F to 2,192°F is a typical example).

Protect your Investment
Look for cameras with a comprehensive, extended warranty program to protect your investment for the long haul.

Technical Support and Training
The quality of customer service and the depth of technical support available should be integral to your decision on which infrared camera to purchase.

MATLAB

MATLAB provided a method for counting people from image provided by the camera .the image from the camera from the camera are fed into the computer remotely using a common point or hotspot .The images are then loaded in the computer and to the MATLAB for execution. The Head count is established by using color detection process that produces a particular color from the overall images .As environment during the fire will have a higher temperature than human beings that appears cooler or blue in color .Thus color detection code is used to detect the blue color from the image and thus can be used to publish the total count .Appropriate cropping is also done provided to clear images to program for effective detection .Since the camera are to be fixed at an angle and at a particular position the cropping action to be prefixed so as to feed constant dimension images to the program for successful detection .This Detection Become crucial as the extinguisher depends on the count produced by the program

ALGORITHM USED

Image Segmentation

Segmentation is performed by demarcating an object on an image using pixel-level or object-level properties of the object.

These properties can be edges, texture, pixel intensity variation inside the object, shape, size and orientation.

The segmentation has two goals.
The first is to decompose an image into regions for further analysis
The second is to perform a change of the representation of an image for faster analysis.

Based on the application, a single or a combination of segmentation techniques can be applied to solve the problem effectively.
There are three types of segmentation techniques, namely Thresholding segmentation, and Region-based segmentation, which are described as follows.

Thresholding Segmentation:

Thresholding segmentation algorithms define the boundaries of the images that contain solid objects on a contrast background. This technique gives a binary output from a grey scale image.

This method of segmentation applies a single fixed criterion to all pixels in the image simultaneously. The method consists of the selection of an adequate threshold value T, which is a converted binary image from a grey level image.

Advantage:

Getting a binary image is that it simplifies both the complexity of the data and the process of recognition.

Region-based Segmentation

Region-based segmentation treats an image as the composition of a finite number of regions and performs regional statistics that are used for segmentation.

The watershed transform is a broadly used region-based technique for image segmentation.

The intuitive idea underlying this method comes from geography. The topographic surface will slowly be flooded, from the lowest regions to the top of what lies in the image.

When the "waters" merge they built "dams". These dividing lines resulting from these multiple floods are the watersheds.

The watershed is applied to the image gradient and the watershed lines separate homogeneous regions, giving the desired segmentation result .

V. ADVANTAGES

- Control Cold Air
- More Energy Will be Saved and also increases the efficiency of the Centralised Air conditioner
- Affordable system
- This system can be used in many places like Clean environmental , white house , machinery rooms IT industries, hospitals

VI.CONCLUSION

In this Centralised Ac , the cold air will be controlled effectively and also automate the on / off control and further we use thermal image detector for the appropriate temperatures.

Hence we Conclude that our project will be helpful in hospitals and it parks , machine rooms ,micro organisms. and mostly it will save the energy and increases the efficiency.

VII. WAY TO OVERCOME ISSUES

1.CONTROL OF COOL AIR

In Existing system ,there is no control of cold air .But In our Proposed System We had overcome this issue.

2.USAGE OF THERMAL DETECTOR

In Existing System thermal detector is not used.But in our project we use thermal detector for sensing the body temperature which automatically controls the air conditioning .

3.PROVIDE MULTIPLE USER ACCESS

In Exisitng system there is no automatic On / Off Control.But in Our Proposed sytem we automate the centralized air conditioner.

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