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Intelligent eye: An anti-theft and fire detection system

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Abstract
By reviewing the old technology of Fire security system by smoke detectors and facial recognization by AI is quite interesting but is there any solution to get AI (Artificial Intelligence) in domestic survilliance CCTV camera.
Developing the old and merging the New Technology of AI. Here presented a Embeded system consisting of a regular CCTV camera and a supporting Software that can help to detect fire by its smoke (work like a smoke detector) & flames moreover its can detect suspicious faces by AI to secure your home and shops.

Keywords: interlocking, edge filteration

1. Introduction
Now a days the Demand of AI (Artificial Engineering) is the biggest wanted. As the technology is increasing just as the threats to the society is increasing we can see by electrical equipments there is sometimes a fire on house or anywhere else but a threat to fire is always there every where.
So if noticed we can see CCTV cameras all over the world according to the study the sale of CCTV Camera is on vast scale from 2002 and t0 2005 commercial year the sale of CCTV is just 45% of its market but from the year 2007 to 2012 its growth increased to 60 % and now it is 85%.
People are now very concerning about there particular things and the fire and the thieveries is the biggest threat to the people.
Artificial Intelligence helping the people to minimize their problems as seeing AI in Medical you can see its revolutionary concepts.
What is Artificial intelligence? If we go not so deep we can clearly justify it as 'making machines intelligent itself by giving it directions via programming'. So it's a emerging field in which there is so many sectors rely on.AI in games, AI in criminalism and AI in aerospace Tech.
Can AI be used as security system by inserting it to a regular CCTV camera [1]? Why not we developed a embedded system which can able to detect fire by its smoke and flames with the help of AI [2].
Moreover it can detect wanted criminal and thieves' faces and other faces expect the user and several pre-uploaded faces.
Now how does it work? This idea consist how to detect fire or smoke by using developed AI software [1, 2].
This develop AI software will be helpful for recognizing the fire with the help of regular differentiation of Pixels per Area with respect of Time (t). Then in the next step there will be interrogation of the whole area how many pixels is increased in a particular time manner. If the increment crosses the particular limit then the system software developed for the camera will give a security warning on the first step then if the limit exceeds to emergency level then the buzzer will be buzz of and automatically the water spray and will be on full throttle and in case of security the doors will be automatically locked.
In the case of the smoke [2]. The concept is if there is smoke in a particular area there will be blurred pixels in that particular area and where the pixels are not blurred there will be no smoke. So now again by the method written above of interrogation and differentiation we can get an emergency and security parameter to buzz off. Using AI in our system is our main priority. Figure shows working of above explained method.

Fig 1: Smoke detects the fire warning alert

In Fig 1 the smoke has been detected and the there is a fire warning alert to the user's phone or laptop.

Fig 2: Emergency Alert

In Fig. 2 The water sprayer system will be on automatically

and by auto locking interlocking system the doors will be automatically be locked.

Fig 3: Fire warning alert by little fire

Fig 4: fire Emergency Alert Big Flames

2. Edge Filteration

If we see the photo editing scenario there is a common method to edit the major parts on the face like nose eyes and eyebrows.

There are many photos editing software that use edge filtration technique to enhance the nose and eyebrows parts.

i.e for changing the iris color of our eye the Edge filtering technique is used.

What is the concept of edge filtration or edge detection process?

Now a photo is a combined array of pixels and if we get the perfect algorithm to reach the pixels in every major parts so we can use the editing system as well as facial recognition.

Now what is the process of edge filtration a basic software consist of edge filtration technique finds the pixels at the edges and once we get the pixels then we can perform many task like Facial recognition and editing as described i.e iris colors changer.

3. RGB color model

A fire image can be described by using its color properties. There are three different element of color pixel: R,G and B. The color pixel can be extracted into these three individual elements R,G and B, which is used for color detection.

RGB color model is used to detect red color information in image. In terms of RGB values, the corresponding inter-relation between R, G and B color channels: R>G and G>B. The combined condition for the captured image can be written as: R>G>B. In fire color detection R should be more stressed then the other component, and hence R becomes the domination color channel in an RGB image for fire.

This imposes the condition for R as to be over some pre-determined threshold value RTH.

All of these conditions for fire color in image are summarized as following:

Condition 1: R > RTH
Condition 2: R > G > B.

Where RTH is the Red color threshold value for fire. International Journal of Computer Applications (0975 – 8887) Volume 58– No.18, November 2012 14 are the blue-difference and red-difference chrominance components, will be chosen intentionally because of its ability to separate illumination information from chrominance more effectively than the other color spaces. In YCbCr color space and analysis can be performed. For a fire pixel Y(x, y) >= Cr(x, y) >= Cb (x, y), where a non-fire pixels don't satisfy this condition, where (x, y) is spatial location of a fire pixel. Such system can be useful for detecting forest fires where we can't put sensors at each location.

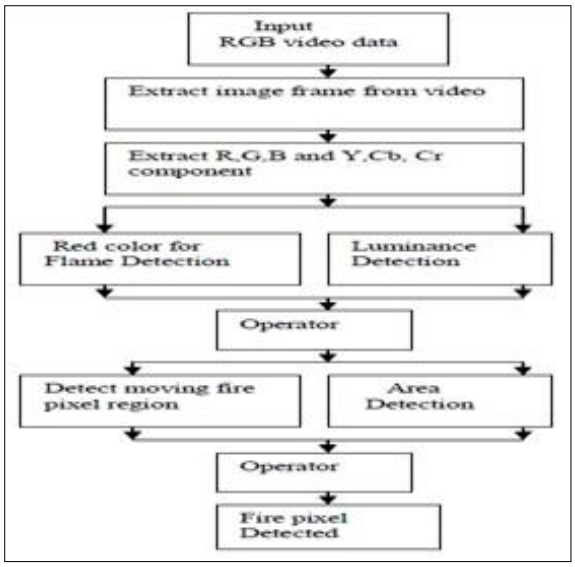

Fig 5: Flow chart of proposed algorithm for fire detection.

4. YCbCr Color Model

YCbCr color space is used in our model rather than other color spaces because of its ability to distinguish luminance information from chrominance information more effectively then other color model. In order to create Y, Cb, Cr components from obtained RGB Image. We will use color space transformation equation to transform each RGB pixel in corresponding Y Channel, Cb Channel, Cr Channel pixel to form a corresponding Y, Cb, Cr image.

When the image is converted from RGB to YCbCr color space, intensity and chrominance is easily discriminated.

YCbCr color space can be easily model as following for the fire:

Y = 16 + R * 65.481+ G * 128.553 + B * 24.996;
Cb= 128 + R * -37.797 - G * 74.203 + B * 112.0;
Cr = 128 +R * 112.00 + G * -93.7864 + B * -18.214;

In YCbCr color space, Y′ is the luma component (the "black and white" or achromatic portion of the image) and Cb and Cr are the blue-difference and red-difference chrominance components, will be chosen intentionally because of its ability

to separate illumination information from chrominance more effectively than the other color spaces. In YCbCr color space and analysis can be performed. For a fire pixel Y(x, y) >= Cr(x, y) >= Cb(x, y), where a non-fire pixels don't satisfy this condition, where (x,y) is spatial location of a fire pixel. Such system can be useful for detecting forest fires where we can't put sensors at each location.

So we can summarize overall relation between Y(x, y), Cb(x, y) and Cr(x, y) as follows:

Y(x, y) >= Cr(x, y) >= Cb(x, y)

Now, we can have some rules for fire detection:

Rule1: R1(x,y) = 1, if ((R(x,y) > G(x,y)) &&(G(x,y) > B(x,y)))
0, otherwise

Rule2: R2(x,y) = 1, if (R(x,y) > 190) && (G(x,y) >100) && (B(x,y) < 140)
0, otherwise

Rule3: R3(x,y) = 1, if Y(x,y) >= Cb(x,y)
0, otherwise

Rule4: R4(x,y) = 1, if (Cr(x,y) >= Cb(x,y)
0, otherwise

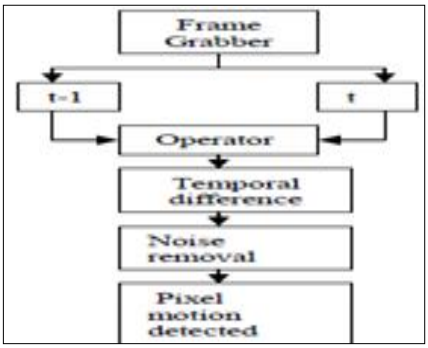

Fig 6: YCbCr Flowchart

5. Facial Recognization

This process is very useful for detecting and matching criminals or any suspect's face by using of AI.

In this process their will be detection of imp. Recoginizing points of a particular face, many the points many the probability of matching the face accurately. This process is 94.67% accurate and Efficient.

Fig 7: Facial Recognition

Fig 7: The matching process of figure 05 will be take place first ad after that for the second confirmations by a special extracting technique the important areas will be searched and then matched to the original image of any criminal or suspect or the previously uploaded family member or the shopkeeper's face if the face is mismatched then the software will automatically take a zoom snap of the suspect face and in case of any blunder in shop or in home the captured face can be helpful for investigating.

The snap which is captured will be uploaded to a cloud security server of police or any investigating department that will be automatically matched with the criminal records of central or state criminal.

6. Future Proposed Works

This concept will be working on the AI software that will be developed for the CCTV cameras but the major drawback of it is this there are many of the CCTV in-built software that may not be compatible with the AI, Intelligent Eye Software or the application. To remove it the solution is for of Embedded system means the proposed work is to build a device and a camera that will be part of the intelligent Eye software.

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