R-Lorgnon to Locate Humans Got in Fire Accident

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Abstract: *Nowadays, many fire accidents may cause major impact throughout the world. It is found that, cooking fire is common in all those building types that contain kitchens which cause serious death. If it happens, many humans may be trapped. The major drawback is the fireman takes prolong time to search the humans. There is a solution that robot can overcome this, it is economical and also creates indirect jobs. An idea is proposed here to overcome this problem in which a R-lorgnon has been invented which is specially designed for firefighters. In normal, lorgnons are forms of protective eyewear that usually enclose or protect the area surrounding the eye in order to prevent particulates, heat or chemicals from striking the eyes. R-lorgnon is known as Rescue-Lorgnon which is made up of using IR-DETECTOR (Infrared detector). If the firefighters wear the R-Lorgnon during the rescue time they can easily find human beings at risk. It is made up of device using infrared radiation, which is used to identify thermogrphic image.*

Introduction:

There is a huge problem due to the fire accidents. The fire accident at residence, factories, industries and forest fire because a major impact to the earthly bodies. There are many technologies to prevent the fire accidents but still many human beings have become victim due to this mishap.

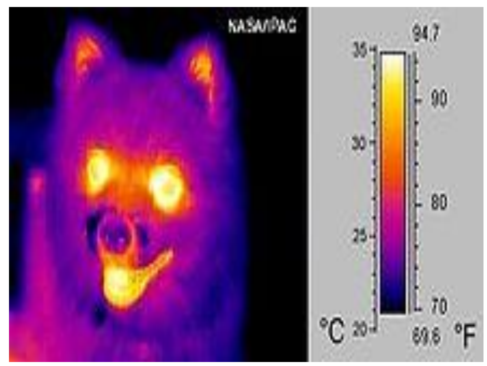
Firefighters protect the humans who are in danger, but for many reasons it takes a long time for them to search where those people get trapped. This may be a major drawback. The R-Lorgnon are very helpful to fireman to search the terrestrial bodies. These lorgnon are specially invented for firefighters to search the sufferers and where they trapped over a building. It has a special feature such as visual perception by which the lorgnon can detect all living things. This lorgnon consist of Infrared sensor which can help fireman to detect earthly bodies. Finally the most economical design is recommended here.

Working:

The working principle of our project is the thermographic lens that contains the IR-Sensor which detects and differentiates the human temperature and environment temperature. This thermographic lens is connected with R-Lorgnon which gives the thermographical image.

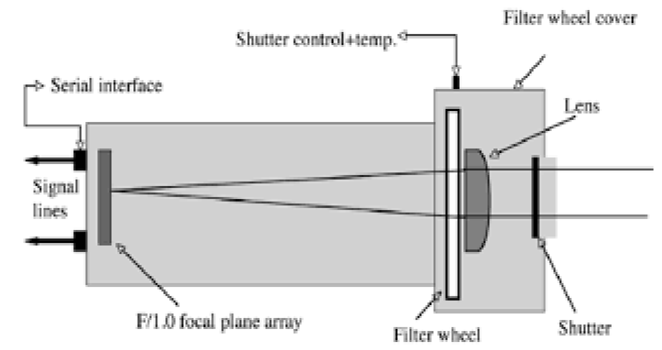
Thermographic Image:

A thermographic camera is a device that forms an image using infrared radiation and used to detect living things in the accidental place. On the other hand the common camera forms an image using visible light. Instead of the 400-700 nanometer range of the visible light camera, infrared camera can be operated in wavelength up to 14000 nanometer.

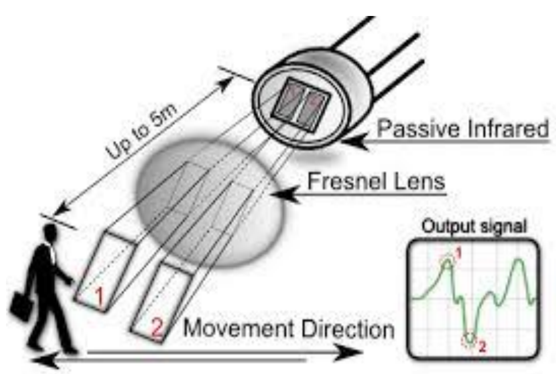


Theory of Operation:

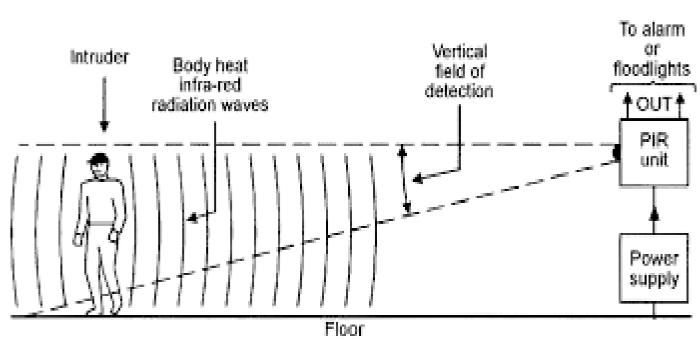
Infrared energy is just one part of the electromagnetic spectrum, which encompasses radiation from different types of rays. All radioactive waves are different from the length of their wave (wavelength). All objects emit a certain amount of black body radiation as a function of their temperatures. We use these radiations in our lorgnon for detecting the humans in the room.



In that situation, the humans have high temperature and it is very easy for the IR-DETECTOR to find humans, and moreover the IR shows the temperature of human body and the area. The IR detectors have got different type of camera to detect the objects in the visible light. It works even in total darkness because ambient light level does not matter. This also makes it useful for rescue operations in smoke-filled buildings and underground.



A major difference with optical cameras is that the focusing lenses cannot be made of glass, as glass blocks long-wave infrared light. Special materials such as Germanium or Sapphire crystals must be used. Germanium lenses are also quite fragile, so often have a hard coating to protect against accidental contact. The higher cost of these special lenses is one reason why thermographic cameras are more costly.



Algorithm:

A.ILCM Calculation:

A sub block may contain the whole small target or totally the background, which can be denoted by TB and BB, respectively. Since real IR small targets are usually brighter than back-ground, the simplest way to obtain TB is to apply a threshold operation on M directly however, the results may be easily influenced by bright background. HVS contrast mechanism means that it is the contrast but not the brightness, which occupies the most important part in the streams of our visual systems. This fact is true in the whole detection process, which will benefit finding the target from the whole IR image with a high detection rate. In this letter, based on contrast mechanism and derived from LCM, the ILCM is proposed. The calculation of ILCM is as follows. If sblk(q,t) is a sub block and its gray average is m0 in M, ln is the maximum of the gray value in sblk(q, t),i.e.,

$L_n = \max (I(pix(ij)))\ ,\ pix(i,j) \in sblk(q\ ,\ t)$ -----(1)

Apply an image patch whose side length is three times to the sub block's side length on the image and take sblk(q,t) as the central sub block, and find the eight adjacent sub blocks of sblk(q,t) in this patch, as well as their gray average m1~m8 in M. The ILCM of sblk(q, t) will be defined Similar to LCM, if sblk (q, t) is TB, usually max (mi) < Ln; thus, ILCM (TB) >m 0, then target can be enhanced. If sblk(q, t) is BB, there may be max (mi) ≥ Ln; thus, ILCM (BB) ≤ m0, then the background can be suppressed. It can be seen that after the ILCM calculation, target enhancement and background suppression can be achieved simultaneously, which is robust to resist bright background and will help to achieve a high detection rate. It is necessary to point that it is hard to decide whether enhancement or suppression is applied on PB, but since PB only emerges around TB, and obviously for a same target ILCM(PB) < ILCM(TB), it will not disturb the detection of TB. PB will be eliminated using the inhibition-of-return mechanism. There are two main differences between ILCM and LCM. First, ILCM is calculated for each sub block, whereas LCM is calculated pixel by pixel; thus, ILCM will have a faster speed than LCM. Second, both the maximum brightness (Ln) and the size information of the central sub block are used in ILCM, whereas LCM only uses the maximum brightness of the central cell. When a PNHB exists in a PB/BB (denoted by NPB/NBB), its influence on the mean estimation of the central sub block is weak; thus, it can be easily deduced that

$ILCM_{NBB} < ILCM_{BN},\quad ILCM_{PBG} < ILCM_{BN}$ ------ (2)

It means that ILCM is robust to resist the PNHB and can achieve lower false alarm rate than LCM), here, the small target is labeled in a rectangle and the PNHB with similar brightness to the target is labeled in a circle.

B. Traversal Mechanism and the Threshold Operation:

For each element of M, calculate its ILCM according to above equation, and form them as the saliency map SM. The ILCM of TB can be found by applying a simple threshold operation on SM, here, threshold this is defined as

$$Th = \mu_{vt} + k\sigma_{vt} \quad \text{------ (3)}$$

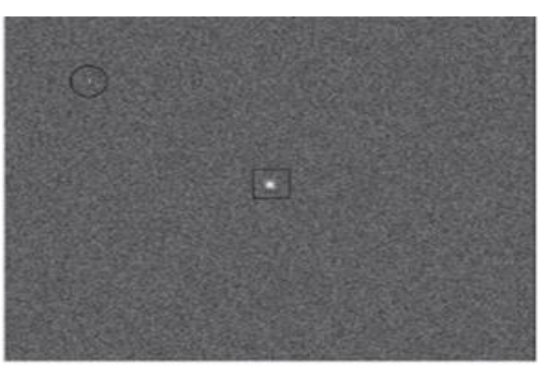
Where μ and σ is the mean and standard deviation of SM, respectively, k is a parameter; experimental results show that 10 to 20 is quite suitable in our work. The subblocks with larger ILCM than There taken as TB, the target center (ti, tj), if needed, can be calculated as

$$ti = \frac{\sum_{i,j} i \times I(\text{pix}(i,j))}{\sum_{i,j} I(\text{pix}(i,j))}, \quad tj = \frac{\sum_{i,j} j \times I(\text{pix}(i,j))}{\sum_{i,j} I(\text{pix}(i,j))} \quad \text{-----(4)}$$

where pix(i,j) is a pixel that belongs to TB, and I(pix(i,j)) is the gray value of pix(i,j). HVS attention shift mechanism means that the region with the most saliency will gain the highest priority (also called pop- out phenomena), and regions been processed will not be processed repetitively (also called inhibition-of-return mechanism), which is helpful to reduce the calculation redundancy, thereby further improving detection speed. Similarly, a winner-take-all mechanism is adopted to the traversal of all SM elements: the largest element will be processed first, then other elements will be processed from large to small until it is smaller than. Meanwhile, in order to avoid repetitive detection, once a TB is detected, the TB and its adjacent overlapped PBs will be all inhibited

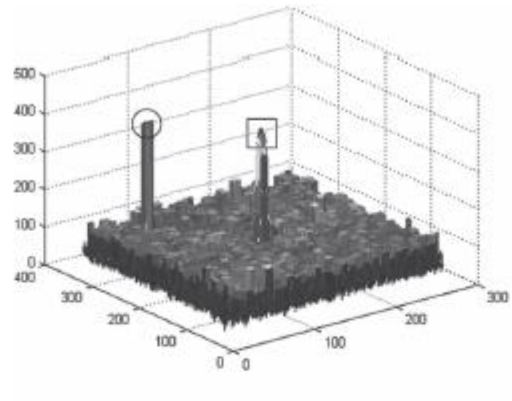
Resistance to PNHB of ILCM versus LCM.

a. A simulation image that contains a small target and a PNHB.



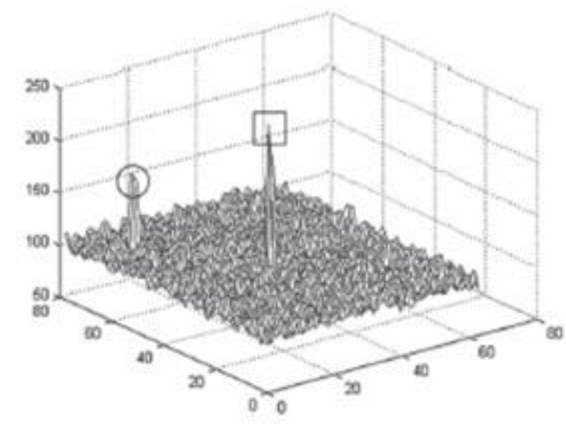
(a)

b. The saliency map obtained by LCM.



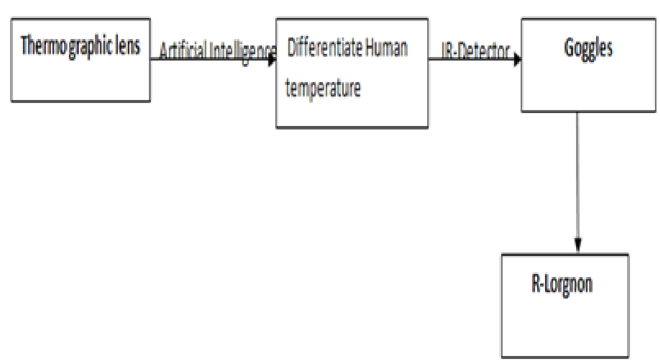
(b)

c. The saliency map obtained by ILCM



(c)

Block diagram of the proposed target detection method



Conclusion:

By using this project a fireman can easily find victims and rescue them on time to save their lives. It would be the effort of the team which came to know the difficulties of a fireman during his rescue operation. It will be useful device and suitable for the Indian economy.

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