

HUMAN EYE PUPIL DETECTION TECHNIQUE USING CENTER OF GRAVITY METHOD

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ABSTRACT: The performance of pupil recognition systems is considerably laid low with the segmentation accuracy, particularly in non-ideal iris pictures. This work proposes a quick and correct methodology to section the pupil notwithstanding the form employing a combination of morphological operations, double threshold and center of gravity methodology. In existing, Associate in Nursing edge-map generation technique for pupil detection in close to infrared (NIR) relies on generating 2 completely different edge-maps of same eye image victimisation mathematician filtering, image binarization and Sobel edge detection operations then combining them to one edge-map victimisation intersection operation on binary pictures. Center of gravity has planned a stimulating and computationally economical procedure for detection pupil region in iris pictures. Experimental results on the CASIA version four.0 iris databases have indicated a high level of accuracy victimisation the planned drastically within the edge-map of eye image, that is fascinating for correct and quick pupil detection. Field programmable logic array (FPGA) primarily based hardware implementation of the planned technique is bestowed, which may be employed in iris localization system on FPGA primarily based platforms for iris recognition application.

I. Introduction

Eyes movement state recognition is to analysis the way to sight the visual method of gazing accurately and non-intrusively. With the analysis of gazing direction, we will get the placement info of saccade choice and observation method in people's variable observation, and take it as a channel of There area unit four types of eyes movement state, Vergence movement, VOR, saccades and swish pursuit, that manifest because the movement of pupil centre. The attention detection or eye hunter is that the sensing element technology that allows a tool to induce to grasp clearly wherever our eyes area unit cantered and it regulates our presence, attention, drowsiness, consciousness and alternative fatigue states. This intelligence shall be used for feat the deep correct and understanding in to client behaviour or to model the new interfaces across various devices. By connected the attention trailing with alternative input modules, as an example keyboard, mouse, and voice. using the eyes as a pointer at a screen the ways of eye trailing facilitates

interoperation with nodes and alternative gadgets once the user unable to Iris localization could be a prime associated initial stage in an iris recognition formula, that involves detection of iris boundaries.

II. Literature review

Eye tracking is a technique used in perceptive science, iris recognition [6], human-computer Interaction[7], advertising, medical research, and other areas. One simple method [8] is a camera focused on eye and recording their movements as the observer looks at some kind of stimulus and then these records are processed by imageprocessing software. Most of the modern [9],[10] systems use infrared beams to create acorneal reflection, from which the angle of measure can be calculated. Most of them use a frequency of at least 30Hz to capture the details of the very rapid eye movements. In [11] zhu and Q. Ji proposed different eye detectionmethods like template, appearance, and feature based methods. The eyes were exactly detecting in these methods and also it is expensive in computational part. In [12], author given details a couple of quick eye detection theme to be used in video streams. In [13], author developed a face detection formula victimisation MCT and enzyme Boost. In [14], author developed an eye fixed detection methodology victimisation AdaBoost coaching with MCT-based eye options. Morphological techniques verify the image with a tiny low templet referred to as structuring part.

III. PUPIL DETECTION ALGORITHM

In this proposed system, morphology erosion ,dilation, double threshold and center of gravity is used for pupil detection.

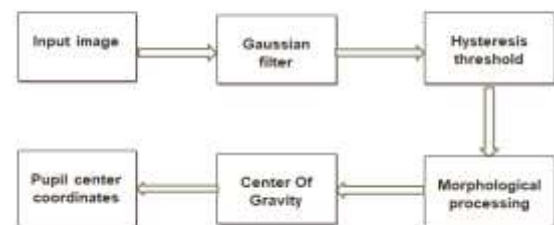


Fig : 1 Proposed Block Diagram

3.1 Gaussian Filter

The smoothing of the first image removes the random noise and therefore the uneven intensities which will end in supernumerary false edges within the edge-detected image. It conjointly helps within the image binarization (image thresholding) step by reducing the false black pixels within the binary image. The Gaussian filter design is shown in Fig the first image is ironed employing a Gaussian filter.

$$k = \frac{1}{16} \begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ 1 & 2 & 1 \end{bmatrix}$$

$$I_G = k * I$$

$$P5' = (P1 + 2 * P2 + P3 + 2 * P4 + 4 * P5 + 2 * P6 + P7 + 2 * P8 + P9) / 16$$

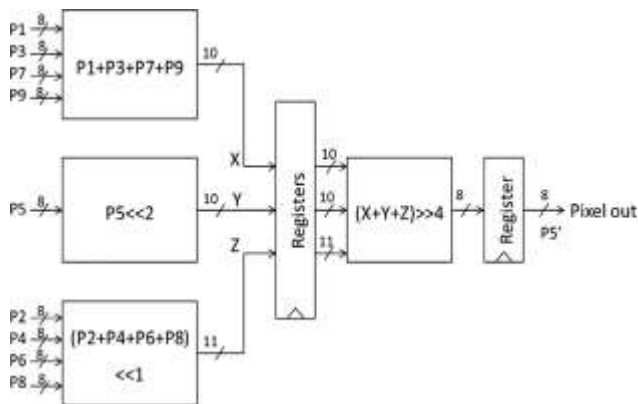


Fig 2: Gaussian filter hardware architecture

The 3x3 filter mask or kernel (k) for Gaussian image performs convolution of k with the input image (I), which supplies the ironed image (IG). the weather of k area unit increased with corresponding pixels of image window to induce the weighted add as per atomic weight. The hardware design of Gaussian filter module implements the atomic weight. except for the adders, the design uses the shifters to hold out multiplication and division operations and shifting by over one bit is obtained in a very single clock cycle. The pipelined registers area unit introduced within the design to induce the output of 1 output pel per clock cycle.

3.2 Double Threshold

Image binarization may be a vital reprocessing technology for the recognition of written literal amounts of checks, document image method, recognition of fingerprint footage, etc. Currently, many binarization ways are given, which could be classified primarily into two classes: world thresholding ways and accommodative thresholding ways. the globe thresholding ways are effective for footage with Associate in Nursing clearly bimodal bar chart. attributable to its poor robustness, however, world thresholding ways are not acceptable for footage with low distinction or non-uniform illumination. Otsu's formula, a classical world thresholding methodology, reflects the intensity distribution of an image, but its property of 1 threshold ends up in poor robustness. although accommodative thresholding ways can pay attention of some advanced footage, they sometimes ignore the sting property and cause a fake shadow. throughout this work, we tend to tend to gift a different double-threshold image binarization methodology, that separates the pupil region from eye image. two thresholds are required to threshold the result. to reduce the resources used and so the latency, just like the quick methodology, two fixed thresholds are accustomed filter the result. The high threshold is prepared as a 1/6 of the largest magnitude through empirical observation.

3.3 Morphology closing

Opening and motility unit 2 necessary operators from mathematical morphology. they're each derived from the essential operations of abrasion and dilation. Like those operators they're sometimes applied to binary footage, though there are grey level versions. The structuring 0.5, SE, got to be one structuring 0.5 object, as hostile academic degree array of objects. The morphological shut operation is additionally a dilation followed by academic degree erosion, exploitation identical structuring 0.5 for each Operations. A picture can endure a series of dilations and erosions exploitation identical, or generally absolutely utterly completely different structuring components. There unit 3 commonest mixtures of dilation and erosion: gap, closing and random transformation

3.4 Center of Gravity

Morphology image have solely pupil region ab initio count the amount of black pixels within the image that provides density of black region. within the same manner calculate the accumulative total of x, y coordinates for corresponding the black pel positions. Divide the total values with count numbers which ends the common values of the region. This Values show the middle of the pupil region. If we tend to draw the circle in octave with this Centre values precisely match the pupil region.

$$X_{cog} = \frac{\sum_{i=1}^n x_i}{n}$$

$$Y_{cog} = \frac{\sum_{i=1}^n y_i}{n}$$

Fig 3: X, Y center coordinates

IV. ADVANTAGES OF PROPOSED PUPIL DETECTION METHOD

Pupil detection technique Pupil detection forms a pre-processing stage to get rid of the redundant data from the input image, so dramatically reducing the quantity {of data of knowledge of data} to be processed whereas at a similar time conserving helpful information regarding the boundaries. So the pupil detection provides center coordinates of the pupil as x-coordinate and y-coordinate.

V. RESULTS

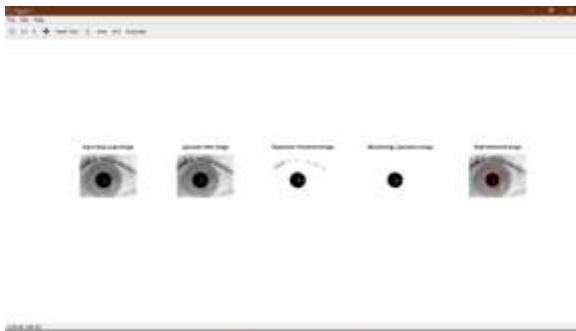


fig 4: Output Image with pupil detection

Simulation of proposed technique is done by Modelsim and output is viewed through octave

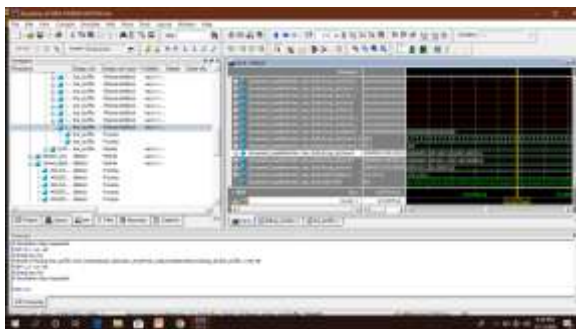


Fig 5: simulation waveform of pupil region

VI. CONCLUSION

Pupil detection may be a necessary step in several of medicine diagnostic applications and ought to be performed quickly. In most studies, pupil detection is handled with simple ways that lack accuracy and fail in high illumination cases. during this analysis article, dedicated hardware design and octave simulation for pupil detection is planned and enforced with success. so as to find eyes with totally different sizes, while not a lot of process work and numerous databases of various sizes for every image, AN economical design is developed. economical utilization of the offered hardware is noted within the discovered result.

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