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A PORTABLE LOW VISION AID

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Abstract. This work proposes a customizable and portable aid system for low vision impaired. The system aims to transform images taken from the patient's environment and tries to convey the best information possible through his visual rest, applying various transformations to the input image and projecting the processed image on a head-mounted-display, HMD. The main transformations are contrast and edge enhancement and tone-mapping. To achieve real time performance (over 25 frames per second) on a light–weight platform we use portable devices based on a GPU NVIDIA ION 2 and on a XILINX SPARTAN III FPGA

Motivation

→Low Vision (LV) is the term commonly used to describe partial sight, or sight which is not fully correctable with conventional methods such as glasses or refractive surgery[1].

→285 million of people have impaired vision worldwide[2].

Low vision pathologies can be divided mainly into two categories

→Loss of visual acuity in a central Region of the visual field (VF) due to macular degenerations

→ Reduction in the overall visual field such as Retinitis Pigmentosa, with good visual acuity in the central region of the VF.

→Most of the LV pathologies are characterized by a slow progression with residual vision deteriorating gradually with time.

→Most of the LV handicapped experience night blindness, and difficulties to manage themselves in environments with non- uniform lighting conditions such as glares.

State of the art

There are several LV aids which try to improve the visual capabilities taking advantage of residual vision. [1,3,4]

These devices performs transformations of the input image, amplifying it in size, intensity or contrast.

These kind of transformations are useful in static and illumination controlled environments such as reading, but they present less utility in mobile environments like walking.

Our goal is to improve and extend the previous aid system developing a new system which aims to easily implement and test different types of visual correctors tailored to the needs of each affected, and his visual field. The system must be useful bot only in static n

The system

Main features **[5]**:

✓**Customizable system** →Totally adapted to the VF and the pathology and its evolution

✓**Portability** → Small size, long life battery, embedded devices

✓**Real time processing**→ minimum delay

✓**Flexibility** →Useful for several kinds of impairments

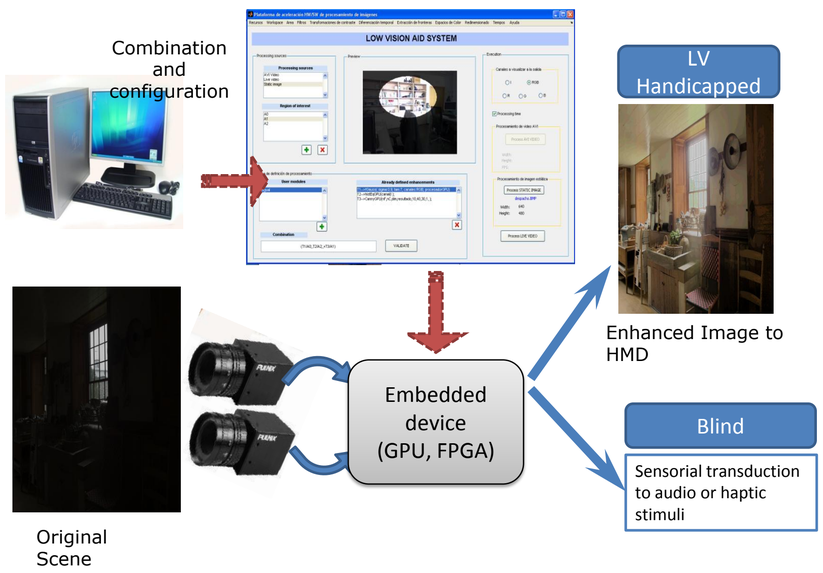

Figure 1: System architecture

The system can combine several types of visual enhancements including digital zooming, spatial filtering, edge extraction and tone-mapping and works properly in non uniform illumination environments.

Example

The system working in a low illumination environment, performing a new contrast enhancement operator[6].

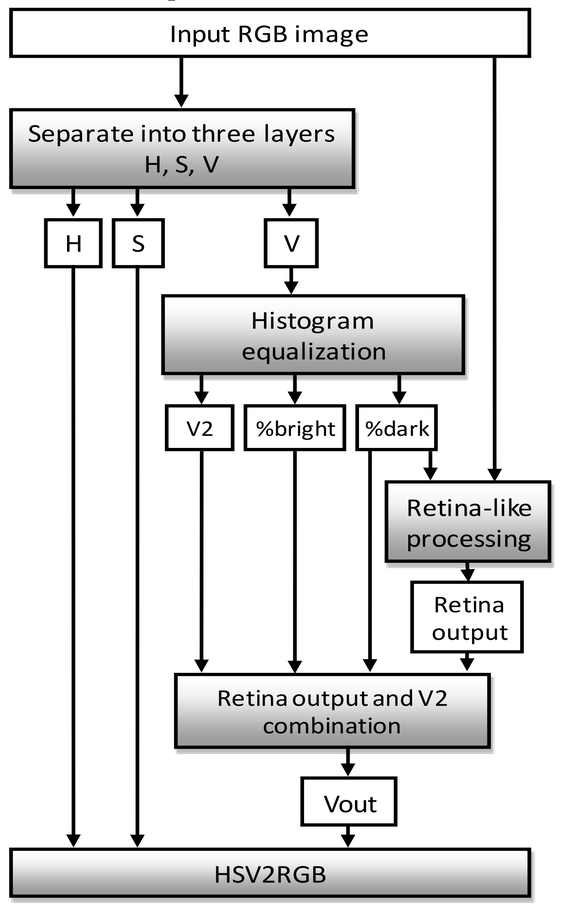

Figure 2: Block diagram of the proposed operator

Figure 3: Output from the proposed operator

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Acknowledgements

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