Chapter 5
The Padding of Vein Image Features and Hardware Designs in M-Health Environments

ABSTRACT

This chapter describes the timing diagrams of padding features and hardware designs of segmentation, controllers, and filters. Further, the authors have described that the hardware design concept of segmentation task can be performed online in a distributed cloud computing m-health environment. The segmentation phase uses two Gaussian filter functions with different sizes of filter masks and standard deviation with a threshold value to make a distinction between veins image patterns and the corresponding backgrounds in the cloud IoT-based m-health environment. In order to design the hardware architecture of the median filter, the superior moving window architecture is used by researchers to accommodate a larger size median filter in the cloud IoT-based m-health environment.

INTRODUCTION

The segmentation phase in the cloud IoT-based m-health environment starts the processing tasks in $mode_0$, where it receives suitable control signals and data from the re-sampling phase. If once the controller receives the authentic

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control signal and veins image data from the resample, the Controller instructs the *GF3 Controller* and *GF31 Controller* to initiate the 3x3 Vertical Gaussian and 31x31 Vertical Gaussian processes concomitantly. The first data ($data_0$) received from the re-sampling is stored in the first shift register for the 3x3 Vertical Gaussian filter in mode zero. In the next clock rotation, the second data obtained from the re-sampling is stored in the first shift register. Here, the preceding data stored in the first shift register is shifted to the second shift register ($data_1$). In the next clock cycle, the third data received from the re-sampling is stored in the first shift register. The preceding data stored in the first shift register is shifted to the second shift register and the preceding data stored in the second shift register is shifted to the third shift register i.e. $data_2$. If all the data stored in shift registers are valid, then the one-dimensional Gaussian filter operation is to be performed in the cloud IoT-based m-health environment. The result of the one-dimensional Gaussian filter is stored in memory (MEM3) through the help of port 1 by GF3 Controller. The procedure continues until the task completion of 3x3 Vertical Gaussian processing. If once the 3x3 Vertical Gaussian process finishes, then the *GF3 controller* informs the Controller in them-health environment that the 3x3 Vertical Gaussian $mode_0$ is over (Hashimoto, 2010; Hashimoto, 2006; Xie, 2017).

Similar explanations are applicable to the31x31 Vertical Gaussian filter in $mode_0$.The only difference between the GF31 and GF3 is that the GF31 consists of 31 shift registers, which are used as a temporary buffer to perform 31x31 as a one-dimensional Gaussian filter. Hence, it consumes more amounts of clock cycles to produce the first 31x31 vertical Gaussian outputs. The result of one-dimensional Gaussian is stored in MEM31 with the help of port 1 by using GF31 Controller for 31x31 vertical Gaussian in mode zero in distributed and cloud computing environment. Here, the resultant pixels for both Gaussians are fewer than the input pixels because pixel-padding concepts are not used. Hence, the chosen input pixels from re-sampling are kept in a random access memory called MEM_PAD which can further be used for padding purposes in the cloud IoT-based distributed environment (Lu Y., 2013) (Khmag A., 2014) (Saad, 2012).