International Journal of Information Science and Computing 2(1): June, 2015: pp. 41-48

Simulink Model Based Fish Disease Analysis

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Abstract

To identify diseased fishes are at early stage to prevent and spreading diseases. This study deals with histogram of the images of diseased fish. Taken four Epizootic Ulcerative Syndrome (EUS) diseased fish images as a case study to evaluated the proposed approach. The technique are implemented using Matlab and Simulink. This design is analysed and tested in Matlab Simulink R2011a.The model is generated using Matlab software.

Keywords: Matlab simulink model, histogram equalization, matlab/simulink

Introduction

The fresh water fish disease is a serious problem. It has been increased since 1988 due to dreadful disease Epizootic Ulcerative Syndrome (EUS), symptom tiny red spot on the body surface initially. This spot later develop ulcer. After few days losing its scales and muscles exposes body. Infected fish dies within a short period.

The present study is to compare disease effected area and unaffected area diseased fish effected with Epizootic Ulcerative Syndrome (EUS) using histogram[1][2].

Material and Methods

Fish effected with Epizootic Ulcerative Syndrome (EUS) these are *Puntius chola*, *Labeo bata*, *Clarias batrachus* and *Channa punctata* collected from the different part of the Barak Valley, Assam and identified by human expert. Pictures of diseased fish were taken by the SLR camera. Images were diseased effected areas and un-effected areas of 200 by 200 pixels stored in a file[3][4].

Matlab (matrix laboratory) is a numerical computing environment and fourth-generation programming language. Matlab allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, and Fortran. Although Matlab is intended primarily for numerical computing, an optional toolbox. Simulink, adds graphical multi domain simulation and Model-Based Design for dynamic and embedded systems.

Simulink Model Design

Designing a Simulink model requires system components and its design flow. The components of any system can either be designed using only inbuilt blocks of Simulink or by integrating some user-defined functions into the design.

Parameters

Histogram

The histogram block computes the frequency distribution of the elements in the input. To find the histogram over parameter to specify whether the block computes the histogram for each column of the input or of the entire input. The running histogram check box allows to select between basic operation and running operation.The block distributes the elements of the input into the number of discrete bins specified by the number of bins parameter, n.

$$y = hist(u,n)$$

The Histogram block sorts all complex input values into bins according to their magnitude. The histogram value for a given bin represents the frequency of occurrence of the input values bracketed by that bin. The upper boundary of the highest-valued bin in the upper limit of histogram parameter, B_M, and the lower boundary of the lowest-valued bin in the Lower limit of histogram parameter, B_m. The bins have equal width of:

$$\Delta = \frac{B_M - B_m}{n}$$

and centers located at

$$B_M + \left(k + \frac{1}{2}\right) \qquad k = 0,1,2,\ldots.., n-1$$

Input values that fall on the border between two bins are placed into the lower valued bin; that is, each bin includes its upper boundary. Input values greater than the upper limit of histogram parameter or less than lower limit of histogram parameter are placed into the highest valued or lowest valued bin, respectively. The values for the upper limit of histogram and lower limit of histogram parameters must be real-valued scalars. NaN and inf are not valid values for the upper limit of histogram and lower limit of histogram parameters.

Concatenate Block

The Simulink concatenate block. All signals must have the same frame rate and frame size. In this example, a single-channel frame-based signal is combined with a two-channel frame-based signal to produce a three-channel frame-based signal.

The concatenate block concatenates the signals at its inputs to create an output signal whose elements reside in contiguous locations in memory.

Vector Mode

In vector mode, all input signals must be either vectors or row vectors [1xM matrices] or column vectors [Mx1 matrices] or a combination of vectors and either row or column vectors. The output is a vector if all inputs are vectors.

The output is a row or column vector if any of the inputs are row or column vectors, respectively. The Vector Scope block is a comprehensive display tool similar to a digital oscilloscope. The block can display time-domain, frequency-domain, or user-defined signals. The Vector Scope block to plot consecutive time samples from a vector, or to plot vectors containing data such as filter coefficients or spectral magnitudes. To compute and plot the period gram of a signal with a single block, use the Spectrum Scope block.

The input to the Vector Scope block can be any real-valued matrix or vector. The block treats each column of an M-by-N matrix input as an independent channel of data with M consecutive samples.The block plots each sample of each input channel sequentially across the horizontal axis of the plot.

Create a new Simulink model, and click-and-drag the following blocks into it. The unconnected blocks are arranged as shown in the Figure1.

The model for histogram analysis of image presents an efficient architecture for image histogram. This architecture offers an alternative through a Graphical User Interface tool Matlab. Image of histogram can be obtained by using various methods, but the drawback of most of the methods is that they use a high level language for coding. The tool with a high-level graphical interface under the Matlab Simulink based blocks which makes it very easy to handle with respect to other software. This is the difference between coding technique and model developed using Simulink. There are many techniques based on coding for image histogram but all that techniques require a high level language. This model uses various blocks given in Table 1.

Table 1

Block	Library	Quantity
Image From File	Computer Vision System Toolbox > Sources	1
Video Viewer	Computer Vision System Toolbox > Sinks	1
Matrix Concatenate	Simulink > Math Operations	1
Vector Scope	DSP System Toolbox > Signal Processing Sinks	1
Histogram	DSP System Toolbox > Statistics	3

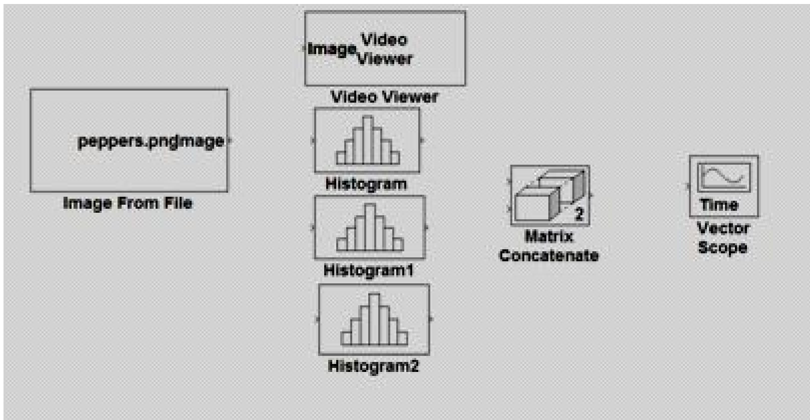

Fig. 1 : Unconnected Blocks

Experimental Findings

Simulink model for Histogram Analysis

The Simulink model shown in Figure 2 is prepared in Matlab with the help of Simulink library browser which contains the image from file. The software model for histogram analysis consists of Image from file, Video Viewer, Histogram, Matrix Concatenate, Vector Scope. Both input images from file and output images are displayed using the video viewer block and histogram in Vector Scope. While running the Simulink model each time different image dataset has to be selected from fish diseased image file.

Diseased effected area of fish and normal unaffected area of fish image is imported from fish diseased image file. Then histogram equalization blocks, the features are extracted from the image. The fish image (200 × 200) used as an input for Simulink models.

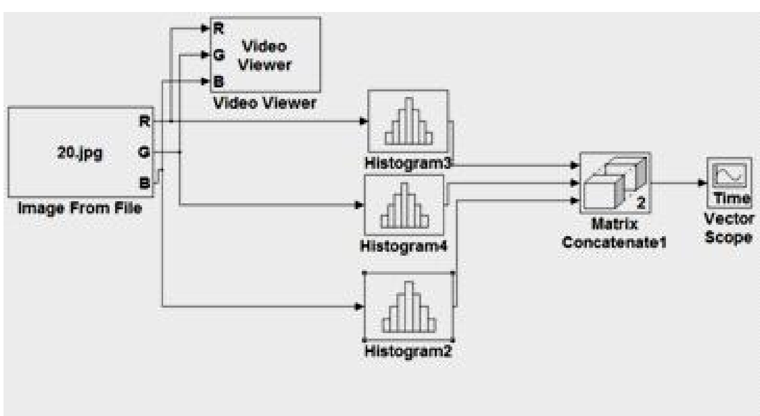

Fig. 2: Connected Blocks

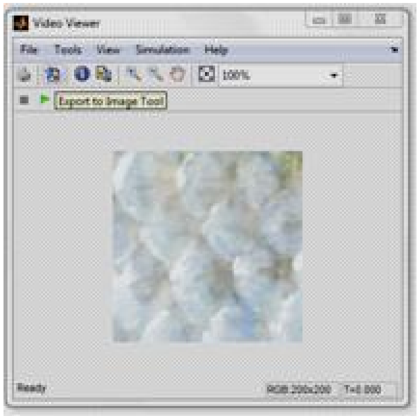

Fig. 3 (a) **Puntius chola(normal)**

Fig. 3 (b) **Puntius chola(effected)**

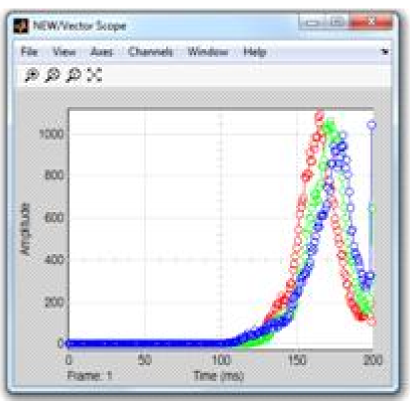

Fig. 3 (c) Histogram **Puntius chola*(nomal)***

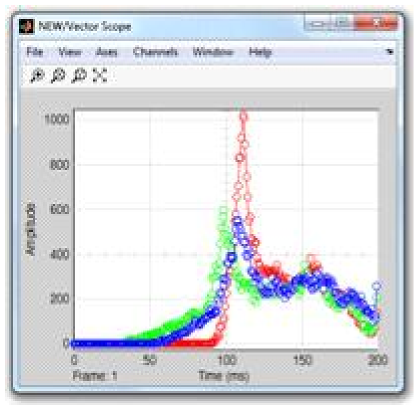

Fig. 3 (d) Histogram **Puntius chola*(effected)***

Fig. 4 (a) **Labeo bata (normal)**

Fig. 4 (b) **Labeo bata (effected)**

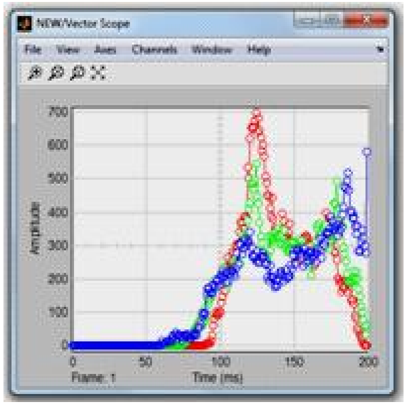

Fig. 4 (c) Histogram Labeo bata (normal)

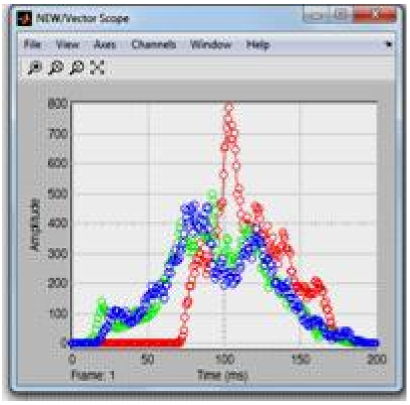

Fig. 4 (c) Histogram Labeo bata (effected)

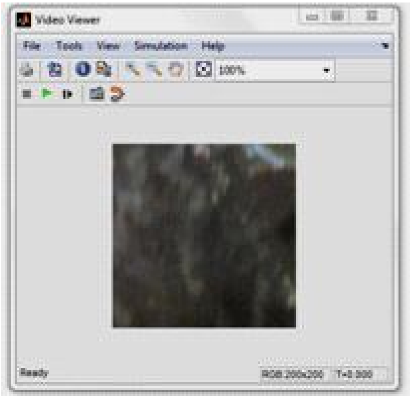

Fig. 5 (a) Clarias batrachus, (normal)

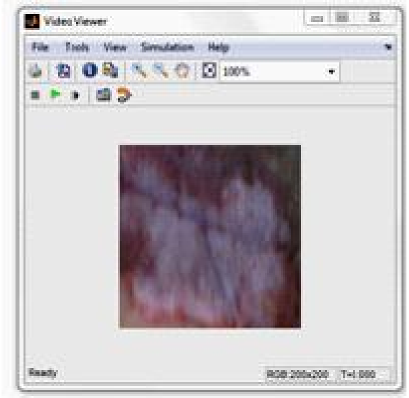

Fig. 5 (b) Clarias batrachus, (effected)

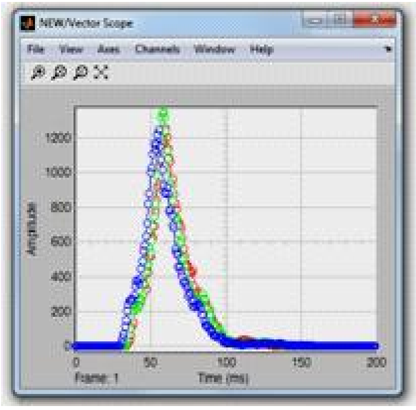

Fig. 5 (c) Histogram Clarias batrachus, (normal)

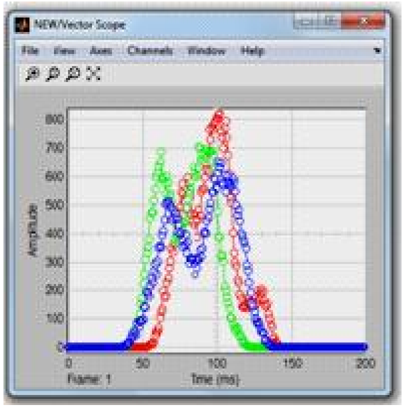

Fig. 5 (d) Histogram Clarias batrachus, (effected)

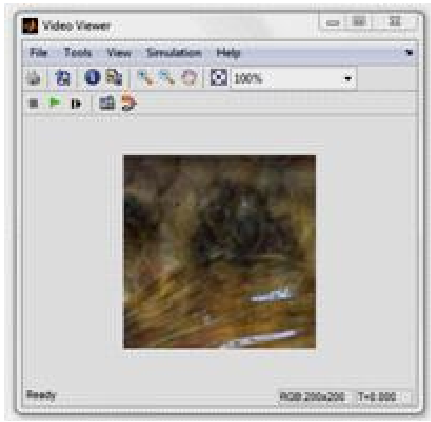

Fig. 6 (a) Channa punctata, (normal)

Fig. 6 (b) Channa punctata, (effected)

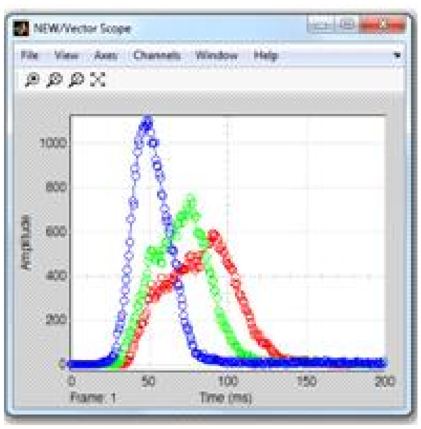

Fig. 6(c) Histogram
Channa punctata, (normal)

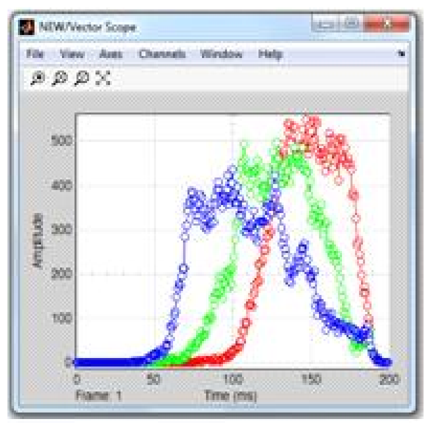

Fig. 6 (c) Histogram
Channa punctata, (effected)

Results and Discussion

Histogram gives the detail of the colour component of the image. The histogram of the R, G,and B values unaffected part of the diseased fish *Puntius chola*, *Labeo bata*, *Clarias batrachus*, *Channa punctata* shown in Fig. 3(c), Fig. 4(c), Fig. 5(c) and Fig. 6(c). The histogram of the R, G, and B values effected part of the diseased fish *Puntius chola*, *Labeo bata*, *Clarias batrachus*, *Channa punctata* shown in Fig. 3(d), Fig. 4(d), Fig. 5(d) and Fig. 6(d). The effected parts value different from the unaffected parts.

Conclusion

The software reference model of the chosen architecture is developed in Matlab Simulink R2012b. The Simulink Model based image histogram analysis is new in image processing. The histogram are designed by blocks and it even support Matlab codes. It also offers an ease of designing with GUI environment. This tool supports software simulation which is important to avoid high level language for coding. These features are essential in real time image processing. The design architecture used in this paper successfully compare the effected disease area and unaffected area of the fish effected with Epizootic Ulcerative Syndrome (EUS).

References

1. D. Kar, S.C. Dey and A. Roy, 2000, "Epizootic Ulcerative Syndrome In Fish at Barak Valley, Assam, India", Section-8 Sustainable Water Resource Management, Policies And Protocols.
2. H. Chakravorty, R. Paul and P. Das, 2015, "Image Processing Technique to Detect Fish Disease", International Journal of Computer Science and Security (IJCSS), Volume (9) : Issue (2) : 2015, pp 121-131.
3. A. Kamboj and A.Gupta, 2012. "Simulink Model Based Image Segmentation", Vol. 2, Issue 6, June 2012, ISSN: 2277 128X.
4. D. Nagpal and L. Bhambhu, 2013, "Implementation of Simulink Based Model Using Sobel Edge Detector for Dental Problems", International Journal of Innovations in Engineering and Technology (IJIET), Vol. 3, Issue-1, October 2013, ISSN: 2319 – 1058