

LBYEC4A – EK3

Signals, Spectra and Signal Processing Laboratory



Final Project Proposal

Letter image identification to FSL

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PROJECT DESCRIPTION (Describe what your project is all about and its intended application. Include your research showing how your intended application can be achieved by your project. Also, provide theoretical concepts that will be utilized.)

An image of a letter or a Filipino Sign Language (FSL) hand gesture will be shown and the application will output its equivalent in FSL or Filipino alphabet letter. The application will initially apply a Gaussian filter to the image in a process called Gaussian smoothing using the command “B = imgaussfilt()” to remove any unnecessary noise. It then converts the image into grayscale using “rgb2gray()” for image detection [1] and [2]. The converted image has its background removed to only have the shape of the hand retained via “graythresh()” [3]. It is then compared with the reference image found in the database via “r = xcorr(x,y)”. Xcorr is a command where the similarities between two images/signals is compared and the highest similarity among all the set images is considered as the equivalent letter [4],[5] and [6]. It then outputs the equivalent image to the user.

METHODOLOGY (How are you going to do it? Included an overall system flowchart of how your project should work as well as initial draft of schematic diagram. Include description of digital signal processing concepts that will be used to develop the project.)

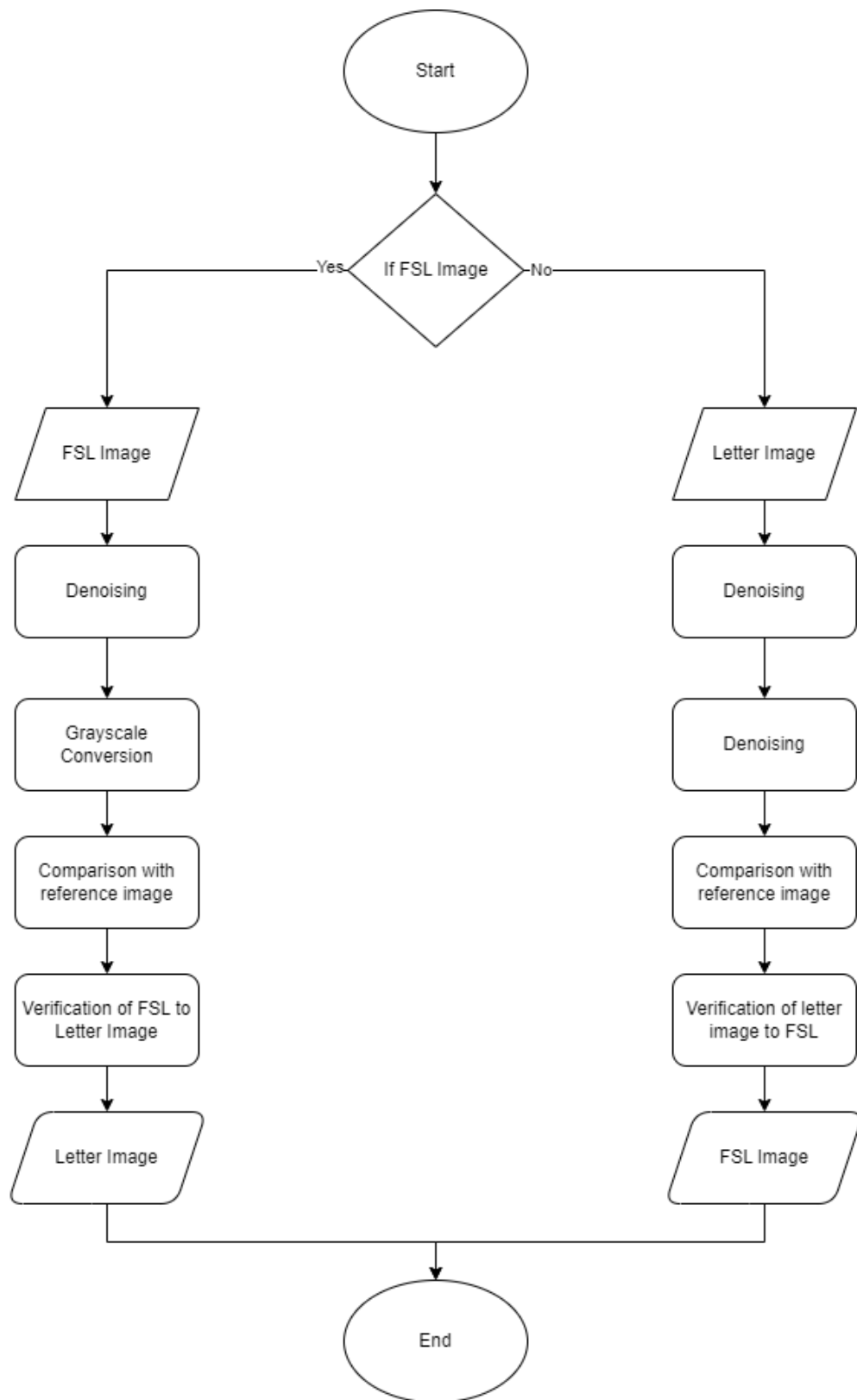


Figure 1. Flowchart for FSL to letter image and latter to image to FSL

The flowchart in Figure 1 describes the general flow of how the images provided will be processed. In the app there will be two options that the end-user can pick which is to process FSL to letter image, and letter image to FSL. This will decide which series of code is to be used. When the image is uploaded, the image is first denoised and then converted into a grayscale color scheme. The image denoising removes gaussian noise and isolates important features such as the FSL hand gesture or the letter image input [1]. Then, the isolated input image is compared to a reference image catalog to output the appropriate letter image or FSL sign [4] and [5]. The similarity between the isolated input image and reference image is compared using cross-correlation [4]. Once the isolated input image is compared, the output FSL or letter image will be based on which reference image had the highest correlation.

The specific MATLAB command to be used for the grayscale conversion is the “`rgb2gray()`” command [2]. Then, the command to denoise the image is the “`graythresh()`” command which makes the whites whiter and the darks darker in a grayscale image [3]. Finally, the comparison of the input and reference images uses the “`xcorr2()`” command which will compare two images and find how similar the two images are [6].

SCHEDULE OF ACTIVITIES (Provide a timetable or Gantt chart of your deliverables. Indicate also whom and when the specific deliverables will be accomplished.)

Date	Person Assigned	Deliverables
Week 9	Chrismon Elijah Q. Mansilungan	Code for Denoising
	Justine Christian H. Carrasca	Code for grayscale conversion
	Reinald Jan M. Subong	Code for Denoising
Week 10	Chrismon Elijah Q. Mansilungan	Code for FSL and Letter image database
	Justine Christian H. Carrasca	Code for Comparison with reference image
	Reinald Jan M. Subong	Code for Comparison with reference image
Week 11	Chrismon Elijah Q. Mansilungan	MATLAB App Making
	Justine Christian H. Carrasca	
	Reinald Jan M. Subong	
Week 12	Chrismon Elijah Q. Mansilungan	Final Paper and App Testing
	Justine Christian H. Carrasca	
	Reinald Jan M. Subong	
Week 13	Chrismon Elijah Q. Mansilungan	Submission of Paper
	Justine Christian H. Carrasca	
	Reinald Jan M. Subong	

REFERENCES (Cite the resources that will be used as well as your research regarding your project.)

[1] A. S. Konwar, B. S. Borah, and C. T. Tuithung, "An American Sign Language Detection System Using HSV Color Model and Edge Detection," *IEEE Xplore*, Apr. 01, 2014.

<https://ieeexplore.ieee.org/document/6949942> (accessed Mar. 13, 2023).

[2] The Mathworks, Inc, "Convert RGB image or colormap to grayscale - MATLAB rgb2gray,"

www.mathworks.com, 2023. <https://www.mathworks.com/help/matlab/ref/rgb2gray.html>

[3] The Mathworks, Inc, "Global image threshold using Otsu's method - MATLAB graythresh,"

www.mathworks.com, 2023. <https://www.mathworks.com/help/images/ref/graythresh.html>

[4] A. Joshi, H. Sierra, and E. Arzuaga, "American Sign Language Translation Using Edge Detection and Cross Correlation," *IEEE Xplore*, Aug. 01, 2017. <https://ieeexplore.ieee.org/abstract/document/8088212>

(accessed Mar. 13, 2023).

[5] C. M. Jin, Z. Omar, and M. H. Jaward, "A Mobile Application of American Sign Language Translation via Image Processing Algorithms," *IEEE Xplore*, May 01, 2016.

<https://ieeexplore.ieee.org/abstract/document/7519386> (accessed Mar. 13, 2023).

[6] The Mathworks, Inc, "2-D cross-correlation - MATLAB xcorr2," *www.mathworks.com*, 2023.

<https://www.mathworks.com/help/signal/ref/xcorr2.html#buwe7f3> (accessed Mar. 13, 2023).