LBYEC4A – EK1

Signals, Spectra and Signal Processing Laboratory

Final Project Proposal

Paper Bill Color Detector

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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.)

The researchers of this project will utilize MATLAB and its capability in image processing to create a project that is able to determine the color of a Philippine paper bill and dictate to the user its monetary value. The program can be considered as a prototype of a future application since it will utilize external devices, namely a camera and audio speakers. The process of the project can be defined with the following components a.) Input: webcam-captured image of the paper bill b.) Process: Image processing wherein the image undergoes color segmentation to be quantified into HSV values and compared to set threshold HSV values to appropriate its monetary value c.) Output: audible dictation of the scanned bill's monetary value through the device speakers. As such, this program has the potential to become a fully realized application in the future for advocacy for optically-handicapped people such as those with color-blindness as a tool or as a fraud deterrent. This advocacy was chosen since there are numerous accounts of blind people getting manipulated financially such as a case in 2021 where a blind man has been harassed daily wherein his disability was exploited. His statement was, "I depend on people telling me how much I have because this money can't tell me how much it is. You know how much I get scammed?" [1].

This project will utilize three principal theoretical concepts under signal processin: image processing, color segmentation, and the HSV color scale whic all go hand-in-hand in the program.

1. Color Segmentation

   Color segmentation is a process of dividing an image into multiple segments based on color information. This technique is commonly used in computer vision and image processing applications, where identifying objects based on their color is important. Color segmentation can be performed using various algorithms, such as thresholding, and clustering [2].

2. Image Processing

   Image processing is the manipulation of digital images using computer algorithms and techniques to extract information or enhance image quality. This field includes tasks such as image restoration, segmentation, feature extraction, and recognition. Image processing has applications in various fields, such as medical imaging, remote sensing, and computer vision. For this project, color segmentation will be the image processing technique used [3].

3. HSV color scale

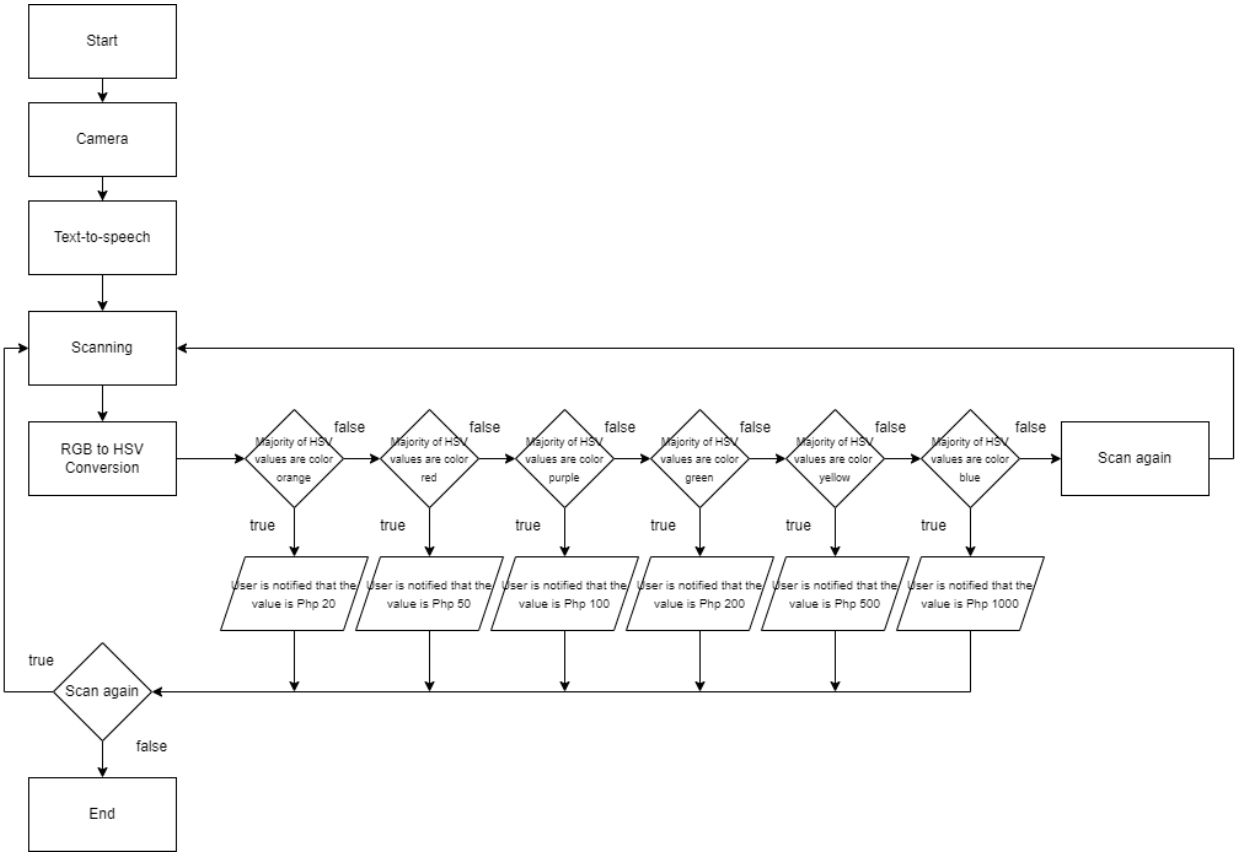
The HSV (Hue, Saturation, Value) color model is a cylindrical-coordinate representation of colors that describes how humans perceive color. Hue is the color's shade or its location on the color wheel, saturation refers to the color's intensity, and value is the color's brightness. The researchers will utilize the built-in color thresholder in MATLAB to set the HSV value threshold per each color paper bill. [4]

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.)

The project will make use of different MATLAB toolbox add-ons such as (fill in later) to take pictures of different Philippine peso bills and process the images.

The initialization process for the project will include the scanning of 10 of each Philippine peso bill in order to get the average HSV value to set the HSV threshold for a specific bill. Next is to set the different webcam or camera settings for a high quality image of the bill to be processed. After that the text to speech parameters would be set to confirm that the image was scanned and the output to inform the user what the scanned bill is.

First a Philippine peso bill will be scanned, to ensure that the bill was scanned properly the imshow function will be used to display the scanned image for the researchers use to ensure that the image captured is optimal. The next step would be to convert the RGB of the scanned image to their respective HSV value for easier image processing. The HSV color scale provides the researchers with numerical values for the scanned images for easier image processing. Then the HSV array of the scanned images will be compared to each of the prior set threshold to determine which bill was scanned. After MATLAB determines what bill was scanned a speaker will play telling the user what bill was scanned.



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

{Schedule of Activities}

SCHEDULE OF ACTIVITIES	
02/27/23	Project Proposal
03/13/23	Submission of Project Proposal
03/14/23 - 03/26/23	Project Creation and Implementation
03/27/23	Project/Document Review
03/28/23 - 04/09/23	Tweaking and Completion of Project
04/10/23	Demonstration of Project

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

[1] C. A. Powell, “Internet rages over blind man who claims people steal his stuff, scam him out of money,” Newsweek, 17-Nov-2021. [Online]. Available: https://www.newsweek.com/internet-rages-over-blind-man-who-claims-people-steal-his-stuff-scam-him-out-money-1650504. [Accessed: 13-Mar-2022].

[2] M. Hanif, A. Ali, M. Arshad, and A. A. Minhas, "Color Image Segmentation: A Survey," in IEEE Access, vol. 9, pp. 93125-93149, 2021, . [Online]. Available: doi: 10.1109/ACCESS.2021.3093879. [Accessed: 13-Mar-2022].

[3] S. A. Kumar, A. S. Kumar, and S. S. Iyengar, "A review of image processing techniques and algorithms," in IEEE Access, vol. 5, pp. 12070-12099, 2017, [Online]. Available: doi: 10.1109/ACCESS.2017.2708990. [Accessed: 13-Mar-2022].

[4] P. Garg and R. S. Kankar, "An Introduction to the HSV Color Model," in IEEE Potentials, vol. 35, no. 6, pp. 24-26, Nov.-Dec. 2016, [Online]. Available: doi: 10.1109/MPOT.2016.2591161. [Accessed: 13-Mar-2022].