

LBYEC4A – EK2

Signals, Spectra and Signal Processing Laboratory



Final Project Proposal

Recreating an Automatic Plate Number Registration System
(ANPR) through MATLAB

Carl R. Chua

Nathan H.. Devera

Michael Angelo M. Obciana

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.)

{Project Description}

In this project, the proponents plan on using the programming language known as MATLAB that will read and detect a plate number of a given car or motor vehicle, that consists of a combination of letters and numbers and will store it in its own personal database; thus creating an Automatic Number Plate Recognition System (ANPR). This program will consist of the following features: Plate Number Detection and Removal of Background Images for clarity.

As stated previously, this project is intended for number plate detection to be applied to traffic security cameras (expressways, busy streets, etc.). Compared to existing ANPR systems, this project aims to apply key features which are not easily available in current applied systems. One such feature is vehicle type & color. This would be vital to vehicle detection due to being applied in conjunction with plate number detection. The output of the program would be a plate number of a detected vehicle along with its vehicle type and color, so that users of the program would be able to easily identify the object vehicle they intend to distinguish.

MATLAB has already built-in functions which help perform the said project. One such function is “edge()”. The said function determines an image’s edge/border [1]. This function is vital for the said project due to the nature of the project is image processing, specifically image recognition. By detecting the edges or border of the image, the program would be able to determine which part of the image is the actual number plate. The said function in MATLAB utilizes different image processing techniques for edge detection. The technique used in this project is the Prewitt Operator. The difference between the respective pixel intensities in a picture is used to calculate edges. Derivative masks refer to any mask that is utilized for edge detection. Because an image is also a signal, changes in a signal can only be calculated via differentiation. These operators are also known as derivative operators or derivative masks for this reason. Basically, the Prewitt operator works by creating vertical and/or horizontal masks which are able to detect vertical and/or horizontal edges of the object/s in the image respectively. Other techniques such as Roberts and Sobel can be used in conjunction with the “edge()” function. By using the Prewitt operator, the “edge()” function will be able to extract the license plate object from the image. Conveniently, a license plate is often rectangular in shape which will be advantageous for vertical and horizontal masks of the Prewitt operator.

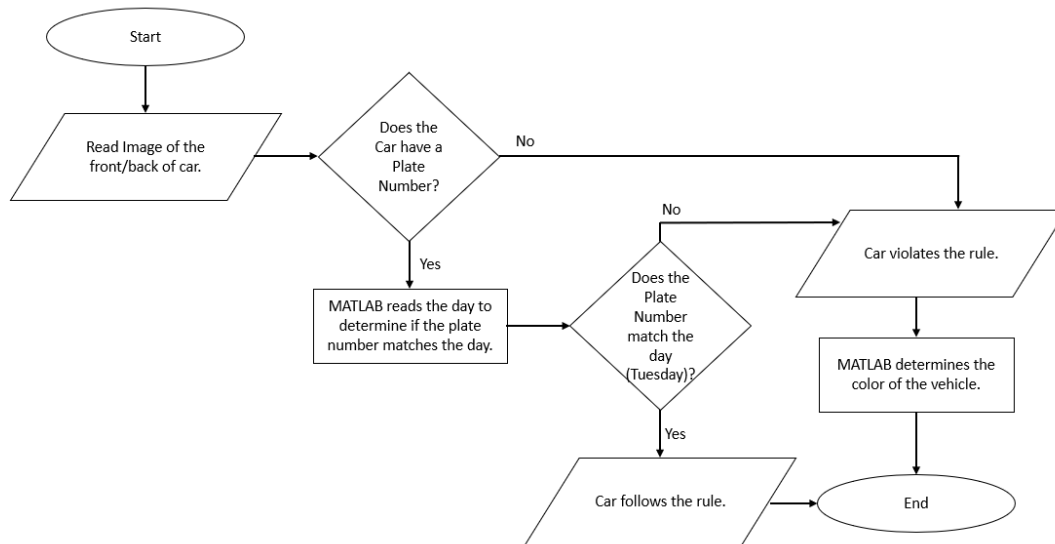
METHODOLOGY (How are you going to do it? Included an overall system flowchart of how

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.)

{Project Methodology}

This project aims to take an input of an image of a license plate or a vehicle with its license plate visible/readable and provide an output of plate number (in text form). The license plate portion of the program would be done by opening the image in MATLAB using the function “imread()” which opens an image file in MATLAB and converts it to numerical data. After this, the function “rgb2gray()” is used to convert the RGB color values to grayscale for easier numerical analysis. After using the previous two functions, the function “imbinarize()” is used to convert the grayscale image to black and white (binary 1 or 0). Since the image is already in numerical data form, the function “edge()” is used to identify the edges or the boundary between the license plate and its background. Once the license plate is identified, it is cropped from the background using the function “imcrop()”. This describes the working process of identifying the license plate and filtering out the background of the said license plate.

Once the license plate is isolated from the whole image, it is read by a custom function which identifies the letters and numbers in a license plate through the process of 2-D correlation. This is implemented in MATLAB through the function “corr2()” which returns the correlation coefficient between two arrays (in this application, the two arrays are the image data and the reference data which contains the reference images). The reference images are individual images which each contain a single letter or number. These reference images are used as comparison for the image data. Through the 2-D correlation, a correlation coefficient is calculated based on the presence of a high statistical relationship between the two arrays. A high correlation coefficient indicates that the two arrays (images) are similar. Another array is used to store the correlation coefficients wherein the index of the array corresponds to a certain letter or number (ex: index 1 corresponds to letter “A”. Index 27 corresponds to number “0”). To decide which letter or number is seen in the detected license plate, the highest correlation coefficient is searched inside the array containing the list of correlation coefficients. Once the highest correlation coefficient is found, the index of the said coefficient corresponds to the letter or number. This is the working process for letter or number detection.



In the flowchart, the MATLAB will read the image of the car's plate number. There are two ways a vehicle can be violated: When the vehicle has no plate number, or when the vehicle has a plate number that does not match the day. The assumption is that the image is taken within the day and the day is Tuesday. When the vehicle has a plate number, the MATLAB program tries to match the plate number and the day. If the plate number matches the day, then the vehicle follows the rules. However, if the plate number does not match the day, the vehicle violates the rule. Finding the plate number alone of the vehicle may be difficult to determine the violator. Hence, there will be additional measures in which the MATLAB will determine the color of the vehicle coming from the given image.

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

With the remaining weeks, from week 9 (March 12 - March 18) until week 13 (April 9 - April 10), the proponents from Team Flash have currently mapped out the following deliverables that the group must complete during the project process. The list of deliverables can be seen throughout the Gantt chart below in Table 1.

Deliverables	Week 9	Week 10	Week 11	Week 12	Week 13
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Final Project Proposal					
Coding: Implementing Plate Number Detection					
Testing: AI Training of Plate Number & Simulation					
Coding: Vehicle Type & Color Detection					
Testing: AI Training of Vehicle Type & Color & Simulation					
Coding: Removing of Background Image					
Testing: Overall Simulation					
Creation of Final Paper					
Creation of Final Presentation					

In creating the overall code of the MATLAB program, all members plan on working on the project on each and every factor. While it will lead to the possibility of lacking it time, it would be made up for allowing each member of the group to thoroughly understand and explain each part of the code, there would also be a possibility that with cooperation, the group would be able to finish a portion of the Coding and Testing, in which they can proceed to the following deliverable as earlier than expected. The hope is that the overall program would be finished and is successfully simulated a week before the deadline, in order to have an ample amount of time for the remaining days to be focused on the project's final paper and its 10-minute presentation.

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

{References}

[1] Khatri, P. (2018, November 26). Car Number Plate Detection Using MATLAB and Image Processing. Circuit Digest. Retrieved March 14, 2023, from <https://circuitdigest.com/tutorial/vehicle-number-plate-detection-using-matlab-and-image-processing>