PLATE MOTORCYCLE DETECTION USING RASPBERRY PI 3

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Abstract

A motorized vehicle, whether it's a motorbike or a car, is a means of trans- portation that is very important for humans today. , Amans is a mini IoT that regulates the limits for motorized vehicles Amans is a technology based on Raspberry pi 3 that can support a city to become a smart city. Amans uses the Deep Neural Network (DNN) system as its algorithm so that Amans can detect and copy letters and numbers on a motorized vehicle plate Amans can detect motorized vehicle plates accurately using either the camera in real time or image media. The level of accuracy of Amans is quite good at 76.6% of the trial success rate.

Keywords: Raspberry pi, DNN, Vehicle, Pedestrian, IoT, Safely, sidewalk.

1. Introduction

The importance of transportation in the development of a country's is we need to give attention about transportation problems need special attention by this country (Indonesia). Regarding on (PUPR Minister RI, 2014) declaration that Pedestrian Network is a pedestrian section, both integrated and separate from the road, which is intended for pedestrian infrastructure and facilities and connects activity centers and / or modal change facilities. One of the motor vehicle violations that occurred in Indonesia, The motorbike is a means of transportation that has a slim body so it can pass through small streets. therefore many motorists often commit violations by passing sidewalks that pedestrians should pass. This is a violation that always occurs every day in Indonesia and needs to be fixed.

Amans is a name of a tool or technology that can solve this problem. Amans is one of the technologies of IoT precisely in the aspect of "Smart City" which has the main goal of minimizing the occurrence of motor vehicle violations that occur in front of traffic lights and also Amans can help fight pedestrian rights to cross a zebra crossing safely. With the creation of motorized driving in an orderly manner, it will have an advantage for all parties involved in Indonesian highways. The local security officer or police will not always be on guard at a traffic light because it requires a technology that can minimize the violation.

1.2 Problem Formulation

The sidewalk is a place for pedestrians to carry out mobility activities to move a place to another place therefore the need for a technology that can work to overcome this problem. as a mini computer Raspberry PI 3 can be used to detect the motor plate that passes through the sidewalk.

2. Basic Concept

2.1 Raspberry Pi 3

The Raspberry Pi is a small computer that has the size of a small box that is used to create programs and also as a microprocessor. Raspberry device is a capable small computer, can be used for electronic projects and can do many things like a desktop PC or your computer. Like running office programs to make reports, create documents, browse the internet and even make programs for the IoT field.

Raspberry Pi model B has not good enough specifications to make a technology product that can be useful in the field of IoT. as for the specifications of the Rasp- berry Pi model B, namely

1. Quad Core 1.2GHz Broadcom BCM2837 64bit CPU.
2. 1GB RAM.
3. BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board.
4. 100 Base Ethernet.
5. 40-pin extended GPIO.
6. 4 USB 2 ports.
7. CSI camera port for connecting a Raspberry Pi camera
8. DSI display port for connecting a Raspberry Pi touchscreen display

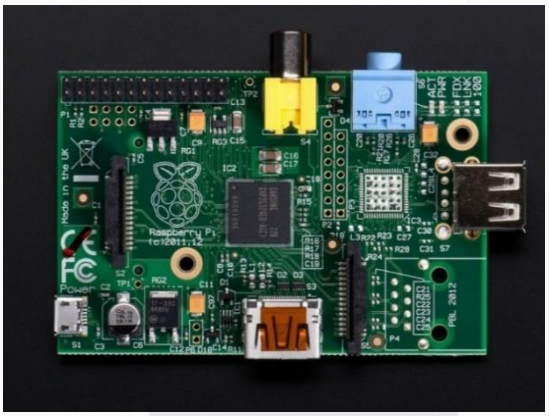

Figure 2.1 Raspberry Pi 3 model B

2.2 Deep Neural Network

Deep neural network is the main process in this tool. This process is where Amans can calcify and reconstruct the image object into an output in the form of text. The detected image is of course a full vehicle plate where the function of the Deep neural network will search for letters and numbers from the plate. The accuracy of the output that comes out will depend on the proximity of the object and the training dataset located in Raspeberry pi.

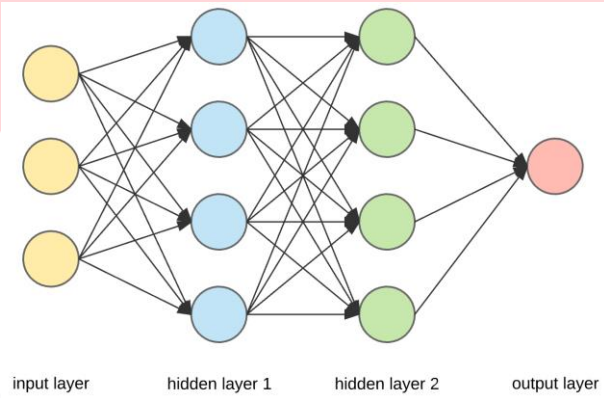

Figure 2.2 Deep Neural Network Architecture

As explained in Figure 2.2 Deep Neural Network architecture is a multilayers process. The above architecture is commonly referred to as Multilayer Perceptron (MLP) or Fully-Connected Layer[7]. The first architecture has 3 neurons in the Input Layer and 1 Output Layer nodes. Between Input and Output, there is 1 Hidden Layer with 4 neurons. The number of layers depends on the input data. The more input data, the more hidden layers.

2.3 YOLO Algorithm

YOLO (You Look at Once) is a program that works to detect objects either in image processing or in real time. YOLO detects objects or images by making frames arranged in the specified matrirks. YOLO architecture processes images in real-time at 45 frames per second and processes 155 frames per second [6]. YOLO can make more localization errors but is far less likely to predict false detections where no objects are listed.

YOLO is a program that has a basic system or algorithm from the Deep Neural Network (DNN). YOLO can only be studied after getting training from input data that has been entered in the neurons in DNN. YOLO will study each neurons that have been inputted and will produce output from the neurons that have been learned from the program.

3. Work System

In the design of the Amans tool system, it is divided into two process parts namely the process of practicing the program and the process of testing the program. The design of this vehicle license plate detection system uses Raspberry Pi 3 which uses the Deep Neural Network (DNN) for learning and YOLO for execute method.

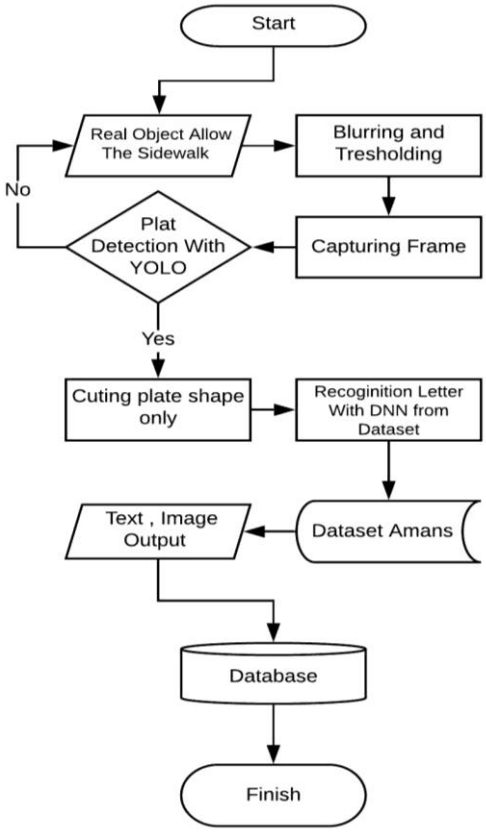

Figure 3.1 Work System Flow Chart.

3.1 Training Dataset Process

The dataset training process is a process that is carried out after the accumulation of pieces of images combined with numbers and numbers with pixel size must be 20 X 20 Pixels that have been entered into their respective folders according to their categories. If this is not done there will be an error process during the program data training period.

To train the program with the prepared dataset material, the first thing to do is to open the Raspberry pi termina command section and type ;

```
pi@raspberrypi:~ $ cd  AMANS
pi@raspberrypi:~/AMANS $ : cd Licence_plate_recognition
pi@raspberrypi:~/AMANS/Licence_plate_recognition $ : python3 main.py --
mode train --d dataset
```

The program will immediately study the materials that have been prepared in the dataset. The dataset that I prepared consists of 10 types of numbers (0,1,2,3,4,5,6,7,8,9) and 24 letters (a, b, c, d, e, f, ... z) . the entire dataset has been changed in the form of a transaction to make it easier for the program to learn it.

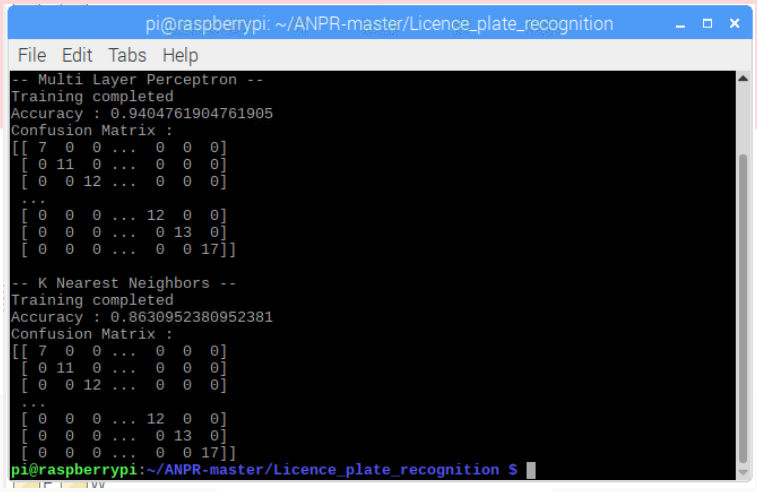

Figure 3.1 Dataset Training Results

Figure 3.1 shows the results obtained by the program in reading the dataset that has been prepared in the multi-layer perceptron training process, with a high accuracy of 0.94 (Scale 0-1). Whereas with the K Nearet Neigbors program, the accuracy level is 0.86 (Scale 0-1) .

3.2 Object Detection Features in the program

Amans has two systems for identifying and reconciling detected vehicle plates. Not onlycan detect in live time, but Amans can also detect a vehicle's license plate through an image. The procedures for running the program are used for this real time mode is ;

```
pi@raspberrypi:~$ cd AMANS
pi@raspberrypi:~/AMANS $ : cd Licence_plate_detection
pi@raspberrypi:~/AMANS/detection $ : python3 mydemox.py
```

Then the raspberry will process the command, but with the small specifications possessed by the raspberry pi, this mode will require a long time depending on how the placement and lighting around the device. Elapsed needed starts from 30-32 seconds on each frame taken and for the experiment it takes 2.5 minutes to detect the vehicle plate. And the results obtained using object detection mode with real time namely ;

Figure 3.2 Real time Object detection result.

3.3 Object Recognition

In the process of recognizing letters contained in objects, Amans has two events to be able to reconcile letters and numbers contained in images, that are in real time and manually using images.

The program code to run the process of image recognition on raspberries, is ;

```
pi@raspberrypi:~ $ cd  AMANS
pi@raspberrypi:~/AMANS $ : cd Licence_plate_recoginition
pi@raspberrypi:~/AMANS/recogniton $ : python main.py –mode predict --a mlp --i
test.jph --model mlp.pkl
```

After that we get the result are ;

Figure 3.3 Real time Object detection result.

Figure 3.3 is the result of image recognition through images but has poor results. For the recognition of letters on the plate is still bad, as for the factors that affect these results, are ;

1. There are still very few sample datasets.
2. Poor image capture.
3. Noise factor in images.

3.4 Success Rate System

For the success rate of the system is measured by the number of successful experiments, in accordance with what has been discussed in Chapter 3. There is also a Success rate system for vehicle plate detection that is ;

$$Successes\ In\ day\ light = \frac{26\ Trials}{30\ Total\ Trials}\ X\ 100\% = 83.3\% \qquad (4.1)$$

$$Successes\ In\ low\ light = \frac{11\ Trials}{30\ Total\ Trials}\ X\ 100\% = 36.6\ \% \qquad (4.2)$$

The success rate was measured with 30 trials bright light conditions resulting in a success rate of 83.3% and for low light the success rate is 36.6 %.

4. Conclusion

Conclusions regarding the amans program reviewed in various aspects are;

- The Amans technology program requires specifications greater than the Raspberry pi 3 B specifications
- The Amans program has good plate shape detection.
- The Amans program is not good in terms of recording letters and numbers on a vehicle license plate.
- Many or less datasets affect the learning of the Amans system.

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