

Designing Object Detection Prototype for People Counter Using Computer Vision

Samuel Mahatma Putra, Renan Prasta Jenie, I Made Vidyasthana, Harry Yanto, Agustinus Wijaya

Abstract—Information is a valuable asset in every aspect of human life. Including for a shop owner, especially the information about the shop traffic. This data is valuable for the store owner to make a decision based on how well the shop progress. And the information is also valuable to the building owner, especially to make the right price when about to sale that shop. So we need a special system that can count the traffic in front of the shop. But the system must be simple, cheap, and efficient. So in this research we study the way to make such system, using a *computer vision* base algorithm.

Index Terms—computer vision.

I. INTRODUCTION

With development of the era, it also increased one's needs for information. Application of information technology to improve efficiency and effectiveness than if the manual or the technology used is not quite right. It is also felt by the managers of shopping centers, and the owners of kiosks in the shopping centers.

One of the difficulties faced by managers in the shopping center is due to lack of data and information to find out the number of visitors kiosk and the density of visitors in a stall. This is important because the data then the managers of shopping malls to show with certainty to the owners of kiosks and stalls the number of visitors to show the density of visitors in a stall. Given that data owners can make a better analyze and accurate data of the market, and also for the manager of the shopping center can use it as a basis in managing the store or stall.

So data like this becomes an important part in making good decisions. For that we plan to conduct research to create applications that can help the manager of shopping centers in getting data. The system that we wanted to create a plan will be based on computer vision, which will use the camera (can be a normal webcam) at each kiosk to obtain video and process it in the form of images. The images obtained will process on the computer and calculated the number of people who have been entered in each stall. From the data expected to show quite accurately the number of people who have been entered in each stall.

Computer vision is chosen because of the fact that it can

provide with more information than if we are using sensors. Such as, the picture of the event that we want to count, and the direction of each object that we want to count. From the data we can get the information on how many people exactly that enter and exit the store.

II. RESEARCH METHODOLOGY

This study aimed to develop a method for detecting the number of movements found in a store. In the process of this research can be divided into several stages.

The study began with the approval of this thesis by Bina Nusantara University. The first step is by starting the application design phase. At this stage we design all the needs that may be used, and look for theories that can be used to get the results. In the process we use the process diagram, described in Figure 1.

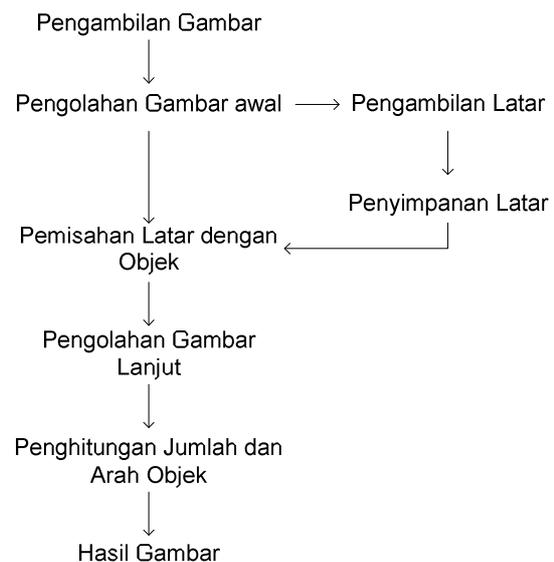


Figure 1 System diagram

The application will be build using Visual C++, using OpenCV 2.1.0 library. The process of the application will be shown in Figure 2.

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I Made Vidyasthana is with the Nina Nusantara University, Indonesia, Jakarta. E-mail : i_made_vidyasthana@hotmail.com

Harry Yanto is with is with the Nina Nusantara University, Indonesia, Jakarta. E-mail : gahas_evo@yahoo.com

Agustinus Wijaya is with the Nina Nusantara University, Indonesia, Jakarta. E-mail : agustinus1989@yahoo.com

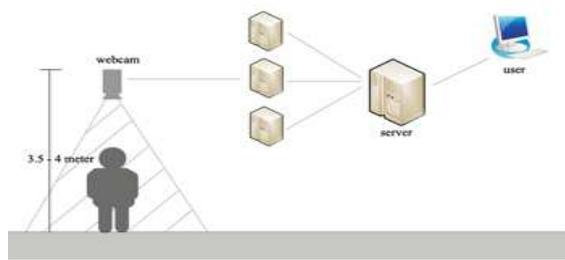


Figure 2 Modular structure

At first a webcam will take the video of the area that we want to scan. This process will be done with the camera looking straight downward and with the resolution of 320 x 240 pixels, at 3-4 meter high. The video will then sent to the client CPU, where it will be compute and process. Next the data will be sent to the server, where the user(s) can see the data.

The height of the camera is chosen because of the average height of a ceiling in a mall. And the resolution is chosen because, at that resolution the picture is quite small, but contains enough feature to be processed in the next step.

In the client the process begin when each frame of the video, sent by the webcam, are being turn into a gray scale image. This process will make the image into a single bit image that is easier to process (1), then the image will be smooth to clear of the small noises (2).

The first frame of the video will be used as the as the background. In the proses each frame of the video will be compared with the background to determine which part of the picture is an object. This process will separate the background from the object (3). To minimize the error rate of the program it is wise to choose the first frame carefully. So that there is a clear background image with no object in it.

The image than will be threshold to make the object colored in white. This is done to simplify the next step of erosion and dilatation. This process is used to clear the noise and split the object if there are two objects that close one to another (4). In the end of the process the image will be smooth and threshold. This is done to enhance the quality of the final image.

The object is then distinguished using contour finding method (5). This is used to determine one object with the other. And finally the object will be counted base on the movement of that object, weather it is going inside or outside. This is done using a single line as the trigger. Once the object touch the line than the program will calculate the potition of the object. Is it on the upper part or in the lower part of the picture. And when the object seperate from the line then the programe will calculate where the object. An object will be flagged as going inside if the object move from the upper field to the lower field, and via versa.

III. RESEARCH RESULTS

From the research we get the conclusion that the application can be build, and already complete its main purpose of calculating the object that move under the camera.

This application is consist of the following module :

- Module to get the video

- Module to change the image into grayscale
- Module to capture a frame as background
- Module to reduce noise
- Module to separate the object from background
- Module to separate on object from another
- Module to count object, and their movement
- Module to sent data to server

IV. DISCUSSION

The background can be taken from the first frame of the video that is captured in the system.

Object detection can be performed at more accuracy in a static environment. Where there is only a minor change in the intensity of the light. This is because of the fact that background subtraction is sensitive to change in light.

The only direction of the object that is counted is upward or downward. Where the two directions are used as the pointers of an object going in or out off the door.

One computer can be hosted by more than one camera. In this case the computation is done by merging the pictures together, so as a result there is one big picture.

The data that is transferred to the server can be seen by the user, and the data is updated if there is a change in the client site.

V. CONCLUSION

The most important aspect of this application is the object that is viewed, and the background that is used in the process. The background is essential in the separation of object and background. So we need to use a good picture, where there is no object, didn't have many dark color, and preferably static.

And the object must have a different color than the background, so the compute can make the difference between the two.

With the success of this system to overcome the existing problem, and to count the object accurately, we conclude that this system can be made an implemented.

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