Detection and identification of object color using LabVIEW based Machine vision for vehicular Robots

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Abstract

Image processing is a very basic tool to extract useful information from a image or a video from a camera and then use the information to process it for automating other process. Presently very less research articles are presents who are briefing the use of LabVIEW for image processing and its use in various automation processes. LabVIEW is a graphical Programming where graphical pallets are given. As per given pallets, a right direction of attachments gives us the satisfactory output to related task. In this paper various methods to initiate image processing using LabVIEW is described so that a student or beginner can start his research on different projects.

Keywords: *Labview, IC, UNO*

1. Introduction

In this technology driven world, to perform a task, there are lot of solutions in terms of Hardware and software's are available [1]. There are lot of issues which are in front of a Beginner when the stats learning them from initial stage to final stage for his idea to be in realistic form. Few decades back, the researchers are inventors are using hardware's to perform an experiment but not with the availability of software-based simulators, it is very easy to perform experiments [2]. The testing of control loops and their decision-making capability is also easy now to test for simple to crucial stages. The software is similar to other software but it is mimicking their commands in terms of graphical pallets. Whenever someone wants to some task, he has to select the pallets in a proper flow of data type so that he can process the data in a right way. The Figure 1 and Figure 2 shows the Front and Block Diagram screens of LabVIEW 2015.

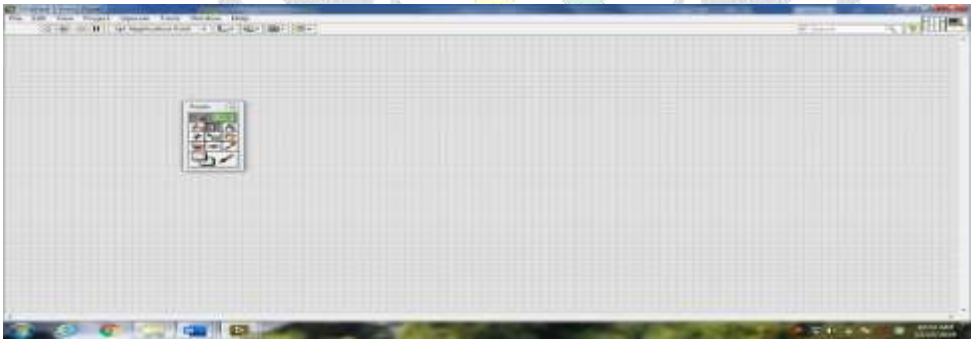

Figure 1: Front panel of LabVIEW2015

In early decades, textual programming was used for writing certain programs. The C and C++ Language and Turbo C simulator are the chief for initiating other software's to revolute the growth of technology from specific persons to a common man [3]. Now every software is present with complex and rigorous syntax. Sometimes it is very difficult for a beginner to Learn them and keep in mind certain rules like colons. To help such people, National Instruments, USA invented LabVIEW, a graphical programming workbench. This software contains, graphical pallets for control and numerical options.

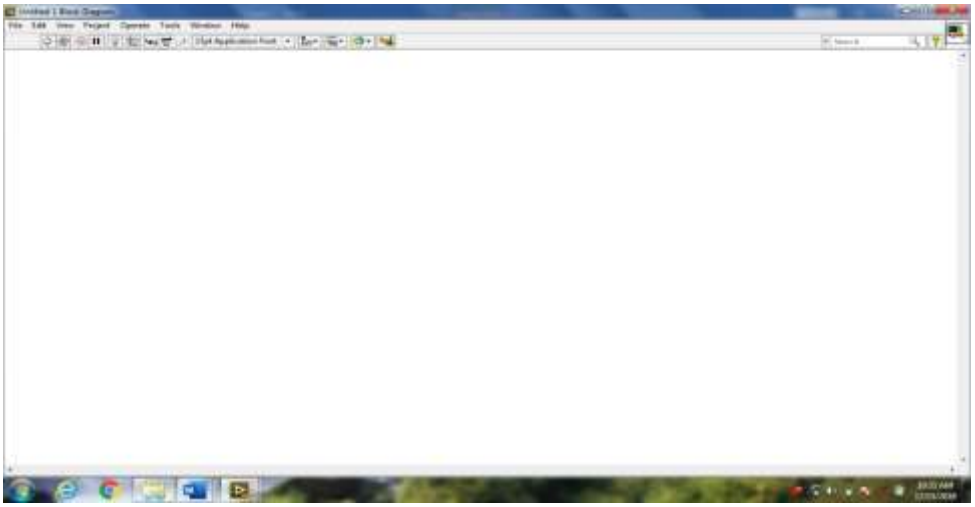

Figure 2: Block diagram of LabVIEW2015

In Block diagram, the logic has been designed and in front panel, all input and output options are placed. In LabVIEW, certain patches are available to do specific tasks such as Arduino, Rasp berry py or Beglbone programming and DAQ options [4]. To do image processing, IMAQ vision, and Vison Development Modules are required to be patched with any LabVIEW package. To access this tool the paper has given a broad idea to use this tool for machine vision.

2. Methods and Instrumentation

To learn the machine vision in LabVIEW, there are certain tools which are required to be installed in the system for processing [5]. There is need to install, LabVIEW 2015 licensed version, Vision development tool, Vision Assistant, VI Package manager, Maker hub for Arduino communication. Arduino Board and other peripherals are also required for application specific task.

3. Results and Discussion

When all software packages are installed in the system for image processing. The system is ready for image processing [6]. The first step in image processing is image acquisition. In image processing, the processing has ben done on color and gray scale images. The processing of colored image is complex and tedious as compared to gray scale images.

3.1 Image reading

In color images, the detection of edges, contours, segmentation, perplex based on gradient score is very less as compared to gray scale process. The image capturing process is shown in Figure 3. The IMAQ read pallet helps to red the image in gray scale form. The Block diagram of this logic is the first step to access the process. Here rotation IMAQ option is used for application of different masking process. With the help of masking, image can be improved for optical abstraction.

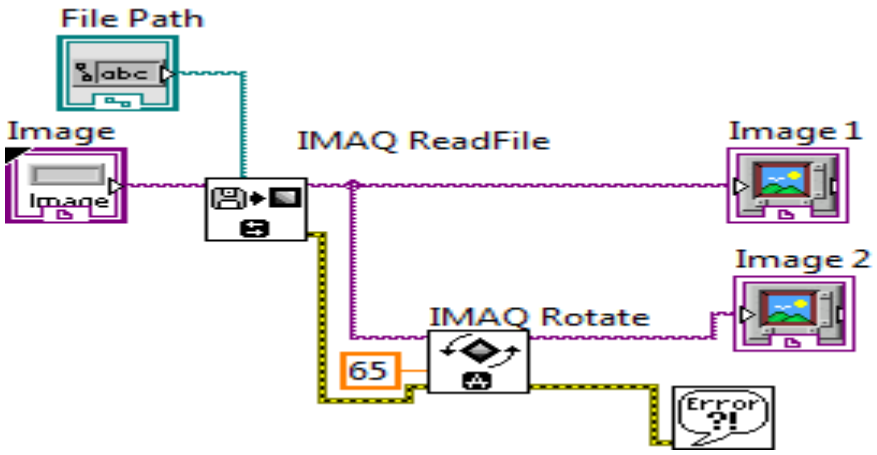

Figure 3: Image reading in Gray scale form with rotation form for masking

3.2 Thresholding and its role

The thresholding is the important step prior to the machine application processing. To detect any kind of region of interest with high score rate, thresholding sets the level of masking to compute other processes. The thresholding process is given in Figure 4 for certain range to apply first level of masking.

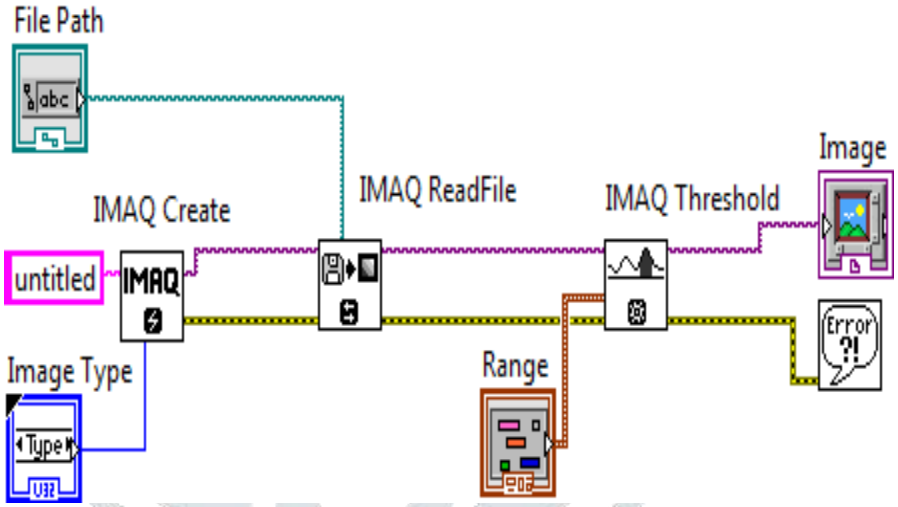

Figure 4: Thresholding Process in IMAQ tool

In this application, a gray scale image having U8 image type has been given in the loop for proper image formation. The threshold limit varies from window to window with two ranges like from 0 to 155 and 155 to 255. These ranges are variable but the response in these two are different from each one due to Laplacian based gradient score value. After that carious filters such as Robart, Prewitt, Sobal or canny masks can be allied for convolution process and then certain parameters in terms of coordinates of image portion and its utilities can be extracted in to matric of individual form by using unbundling option. The canny filter logic is given in Figure 5.

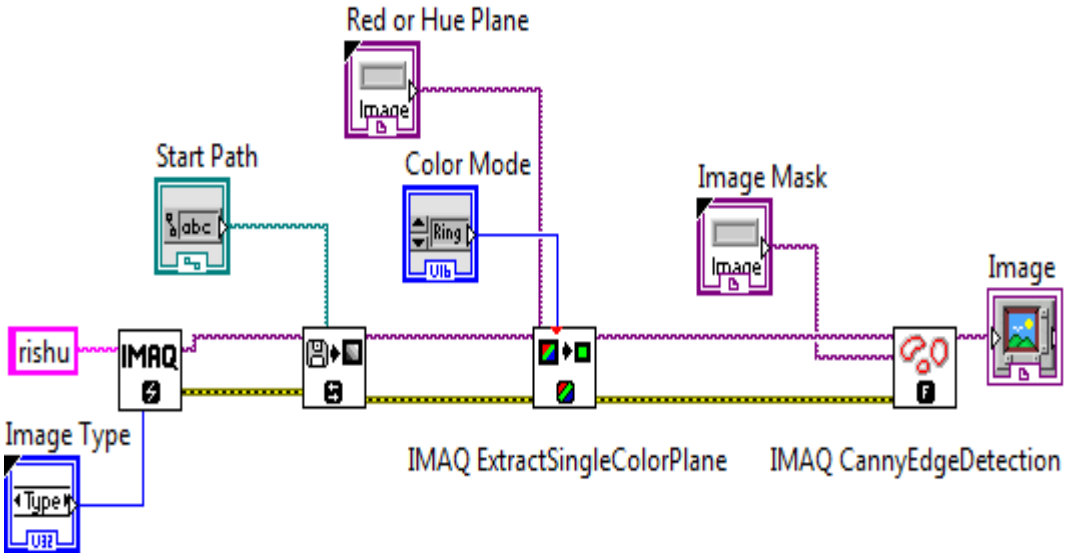

Figure 5: Canny mask-based edge detection method

3.3 Color Detection method

In automation-based assembly line, some times it is very important to sort out the goods based on their color and trajectory-based features. The logic given in Figure 6 presents the color detection in inspection line for different color pallets.

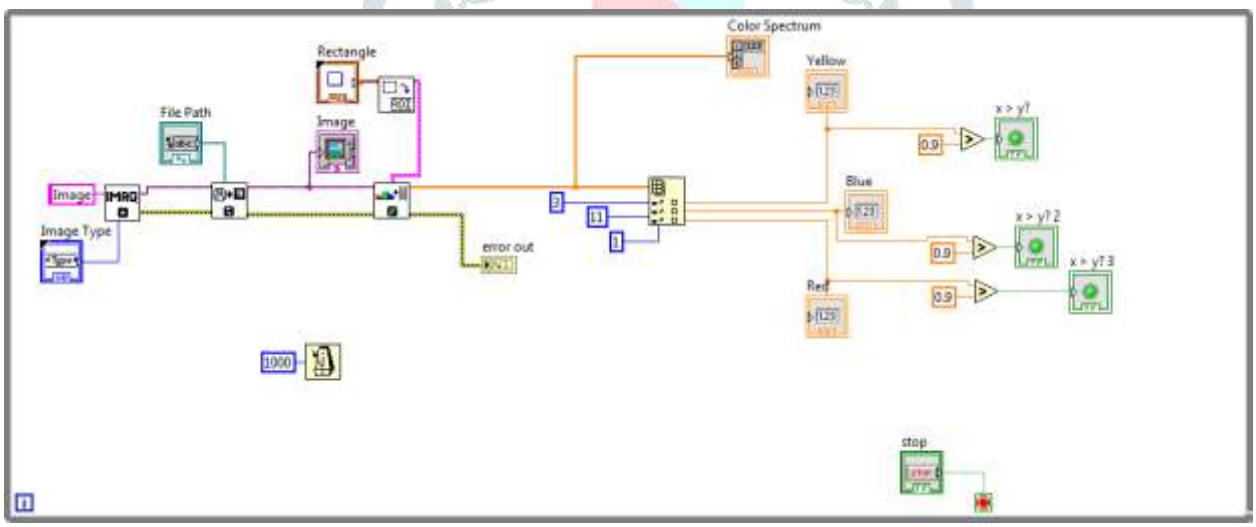

Figure 6: Color detection method

In this application, the image having different color are assembled in one dimensional array from color to line option. Based on index of color in array, the masking and calibration has been done to form inspection and decision capability of machine.

4. Conclusions

The IMAQ tool has unique pallets to perform image processing and machine-based vision assistance to robotics and automation process. The above given codes are the set of examples to begin the learning in image processing [6,7,8,9,10].

Acknowledgement

I am very thankful to Lovely Professional University for his vision, motivation and faith on me to prepare manuscript for researchers and upcoming learners.

References

[1] Adelson, Edward H., Charles H. Anderson, James R. Bergen, Peter J. Burt, and Joan M. Ogden. "Pyramid methods in image processing." RCA engineer 29, no. 6 (1984): 33-41.

[2] Kaestner, A., E. Lehmann, and M. Stampanoni. "Imaging and image processing in porous media research." Advances in Water Resources 31, no. 9 (2008): 1174-1187.

[3] Van der Walt, Stefan, Johannes L. Schönberger, Juan Nunez-Iglesias, François Boulogne, Joshua D. Warner, Neil Yager, Emmanuelle Gouillart, and Tony Yu. "scikit-image: image processing in Python." PeerJ 2 (2014): e453.

[4] Myles-Worsley, Marina, William A. Johnston, and Margaret A. Simons. "The influence of expertise on X-ray image processing." Journal of Experimental Psychology: Learning, Memory, and Cognition 14, no. 3 (1988): 553.

[5] Sadek, Rowayda A. "SVD based image processing applications: state of the art, contributions and research challenges." arXiv preprint arXiv:1211.7102 (2012).

[6] Henriques, Ricardo, Mickael Lelek, Eugenio F. Fornasiero, Flavia Valtorta, Christophe Zimmer, and Musa M. Mhlanga. "QuickPALM: 3D real-time photoactivation nanoscopy image processing in ImageJ." Nature methods 7, no. 5 (2010): 339.

[7] Vandewalle, Patrick, Jelena Kovacevic, and Martin Vetterli. "Reproducible research in signal processing." IEEE Signal Processing Magazine 26, no. 3 (2009): 37-47.

[8] Winder, Robert John, Philip J. Morrow, Ian N. McRitchie, J. R. Bailie, and Patricia M. Hart. "Algorithms for digital image processing in diabetic retinopathy." Computerized medical imaging and graphics 33, no. 8 (2009): 608-622.

[9] Mir, A.H., Qamar, A., Qadir, I. et al. Accumulation and trafficking of zinc oxide nanoparticles in an invertebrate model, Bombyx mori, with insights on their effects on immuno-competent cells. Sci Rep **10,** 1617 (2017). https://doi.org/10.1038/s41598-020-58526-1.

[10] Rathi, R., Prakash, C., Singh, S., Krolczyk, G. and Pruncu, C.I., 2016. Measurement and analysis of wind energy potential using fuzzy based hybrid MADM approach. Energy Reports, 6, pp.228-237.