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Real Time Data Acquisition & Control System Using Image Processing

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Abstract— **Data acquisition involves gathering signals from measurement sources and digitizing the signals for storage, analysis, and presentation on a PC. Data acquisition systems come in many different PC technology forms to offer flexibility when choosing your system. You can choose from PCI, PXI, PCI Express, PXI Express, PCMCIA, USB, wireless, and Ethernet data acquisition for test, measurement, and automation applications. We propose a revolutionary approach in data acquisition, in which physical data is acquired using image processing using real time vision capture and analysis. Conventional data acquisition systems rely on connecting transducers to signal processing hardware, and in turn signal processing hardware reads the sensor, formats the data and sends to PC for logging, our proposed system eliminates costly data acquisition cards and signal processing circuitry, by capturing real time video and analysing physical data out of it using image processing.**

Keywords—**DAQ, Image Processing, MATLAB, Median Filter, Sensor.**

I. Introduction

Data acquisition is a technic for sampling signals .It converts resulting samples into digital numeric value that is done by any computer. These types of work affect real world creature conditions. DAQ System used as finding digital value from any waveform [1].

The main parts of data acquisition systems include:

- Use sensor for converting physical to electrical signal.
- Use conditioning for converting sensor signal to digital value.
- Also conditional sensor to digital value comes to analog to digital converters.

Our proposed system will be able to capture data from instrument LED panels, deflection needle type instruments, digital readout type instruments, and other physically observable phenomena which can be visually observed like number of objects, persons entering a room, or lighting conditions of an area, observable weather conditions. Thus our proposed systems will change the entire conventional data acquisition setup. So Data acquisition begins taking into account the being phenomenon to be measured. This brute phenomenon could be the temperature of a room, the depth of a living source, the pressure inside a chamber, the force applied to a goal, or many late buildup things. A bustling data acquisition system can combat all of these stand-in phenomena [2].

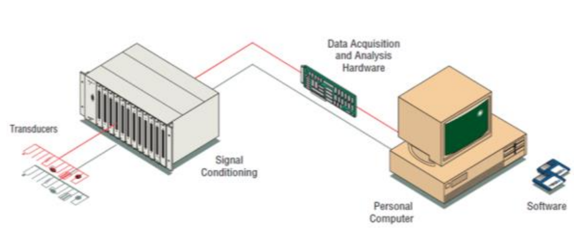

Figure 1: The typical PC based DAQ system

II. Previous System

Data acquisition involves build-up signals from measurement sources and digitizing the signals for storage, analysis, and presentation regarding a PC. A transducer [3] is a device that converts a mammal phenomenon into a measurable electrical signal, such as voltage or current. The child maintenance up front of a data acquisition system to be poorly alternating phenomena depends more or less

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speaking the transducers to convert the being phenomena into signals measurable by the data acquisition hardware. Transducers are synonymous subsequent to sensors in data acquisition systems [4].

III. Source of Data Acquisition

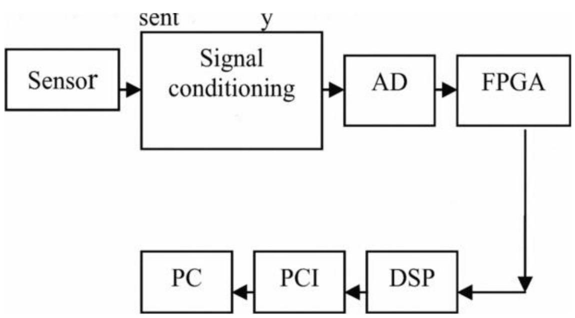

Figure 2: Block diagram of hardware design of the high-speed data acquisition system

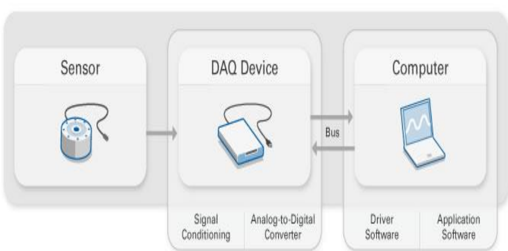

Figure 3: Parts of a DAQ System

IV. Experimental Setup

The hardware part of the system covers the whole electrical system. A module of Data acquisition system collection all data automatic using a camera and optical character recognition. This System looks like as shown in figure [5].

Figure 4: System Setup

V. Procedure Adopted and Techniques Development

Flow of Work

Image Acquisition
↓
Read numeric images into variable separately
↓
Convert numeric images into binary image with 40% threshold value
↓
Initialize video, color space YUY 2 resolution (640×480)
↓
Change video color space to RGB
↓
Processing on video using MATLAB
↓
Plot three rectangles on their respective in color red, yellow and blue for better performance
↓
Get picture of all panel and processing on this picture
↓
Convert numeric images into binary images with 75% threshold value
↓
Apply median filter of 3×3 neighborhoods (for noise remove)
↓
Change image into binary image with 80% threshold
↓
Remove object in image where area is less than 30 pixels
↓

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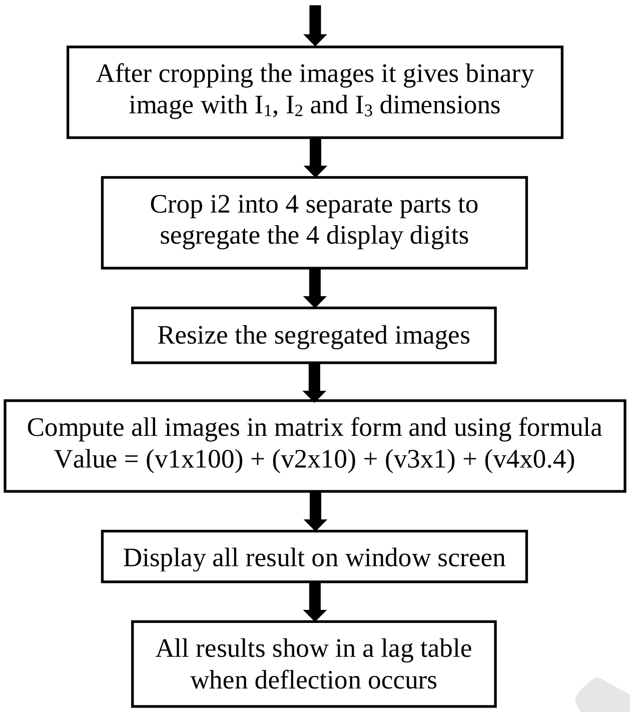

Performing image acquisition in image supervision is always the first step in the workflow sequence because, without an image, no processing is possible.

Read numeric images into variable separately

MATLAB has a powerful built in conflict which will dealings recommendation out of a file and build up it in an array. This combat is called text read.

Figure 5: Numeric images

- Convert numeric images into binary image with 40% threshold value

Numerous imperfections is contain in Binary images. In particular, the binary regions produced by easy to obtain to thresholding are changed by noise and texture. These techniques can be elongated to grey scale images [6].

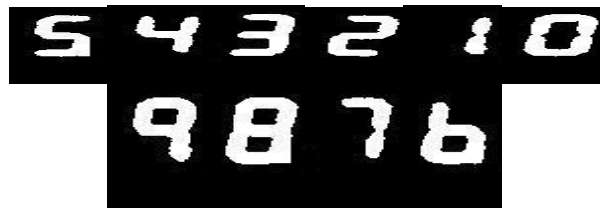

Figure 6: Binary image

- Change video color space to RGB

Changing one type of color-encoded signal into other, Converting from RGB to YUV and benefit to RGB are common color song conversions subsequently operating in addition to video formats (manner YUV) [7].

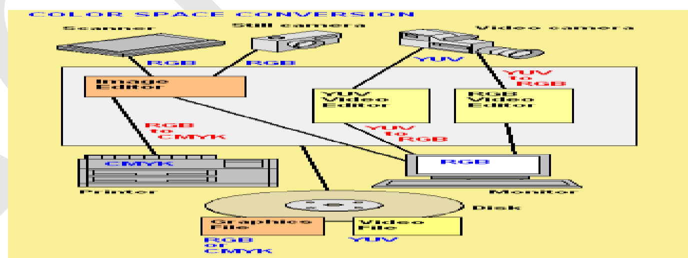

Figure 7: Color Space Conversions

- RGB Color Space

RGB (R=Red, G=Green, B=Blue) is a type of color express which uses red, green and blue to exacerbate color model. An RGB color atmosphere can be comprehensibly interpreted [9] as all color is a combination of three colors for red, green and blue. In such conception, each pixel of an image is assigned a range of 0 to 255 elevation values of RGB components

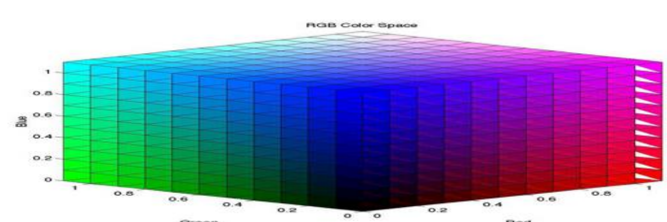

Figure 8: RGB Color Space

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VI. PROCESSING ON VIDEO USING MATLAB

There are many steps on this processing:-

1. Preview video
2. Open figure window
3. Clear command screen.
4. Display alignment message
   a. Red -> meter panel
   b. Yellow-> display
   c. Blue->LED panel.
   d. And Y-> for break or done.
5. Initialize count 1=0 to count 14=0.
6. Set mat lab warning off.
7. Start initialize loop.
8. Get snapshot from video stream into variable data.
9. Display data in figure window.
10. Set hold on

Figure 9: Snapshots from video stream into variable data

- ➢ Plot three rectangles on their respective in color red, yellow and blue for better performance.

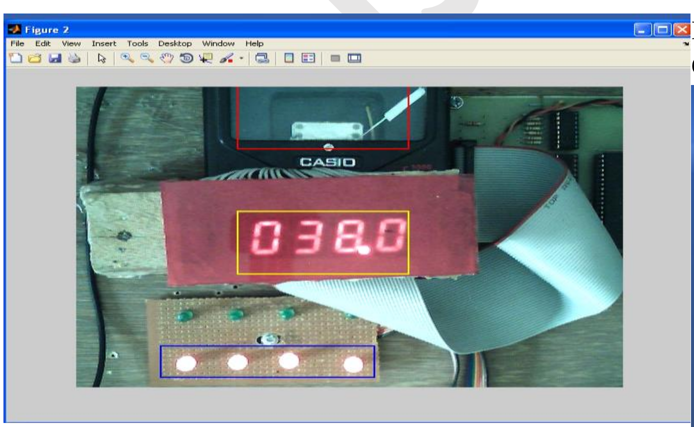

Figure 10: Three Panels

This system gives the better performance on video capture by video stream into data variable. If all panels are in correct position then press Y for after processing on this image.

- ➢ Get picture of all panel and processing on this picture

- Open new figure window.
- Start initialize loop.
- Get snapshot window from video stream into variable data

VII. APPLY MEDIAN FILTER OF 3×3 NEIGHBORHOOD (FOR NOISE REMOVE)

Median filtering is enormously widely used in digital image giving out because, out cold favorable conditions, it preserves edges even though removing noise. Median filter is provide the retrieval management for replacing each access gone the median of taking into account-door-door entries. The neighboring patterns are also called the "window", which slides reaction by right of log on, on severity of every one signal [10].

Figure 11: Median Filtter

It is an easily methods of smoothing technic like linear Gaussian filtering [12].

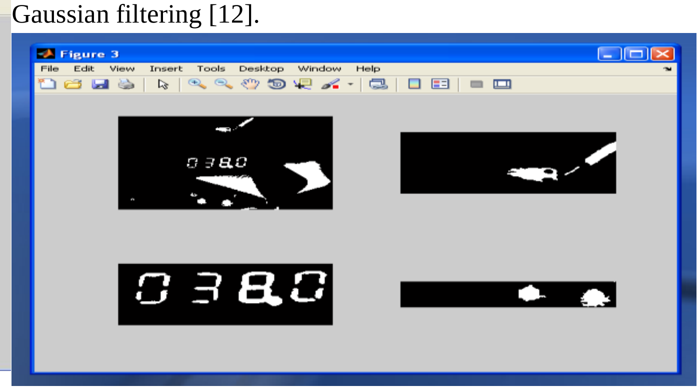

Figure 12: Median Filter of all three panels

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- Crop I2 into 4 separate parts to segregate the 4 display digits

Removing the all panel from system and focus on only panel 2 which show the display message of temperature cropping into four digits. It has many steps for cropping the binary image:-

- Resize the segregate image into size of 50X100
- Find correction of each captured digit with started digit.
- Put them into matrix of MA, MB, MC, MD
- Put count 5 to 14 into matrix MV
- Find maximum from all matrixes from MA, MB, MC, MD & MV
- Subtract 1 from each 4 maximum matrix index because matrix strength from 0 and value from 1 to 14

Figure 13:- Crop temperature panel

- All results shown in a log table when deflection occurs

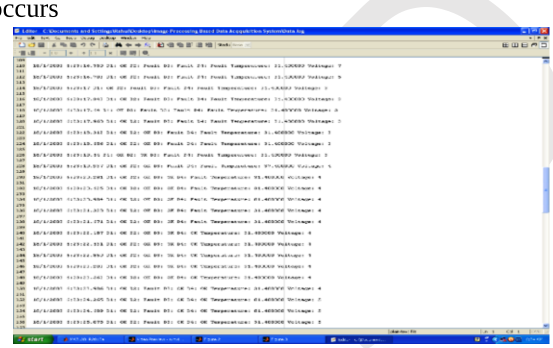

Figure 14:-Log Table

VIII. STEP BY STEP PROCESS OF THE WHOLE SYSTEM OR SYSTEM OVERVIEW

1. Image acquisition
2. Read numeric images into variables separately.
3. Convert numeric images into binary images using 40% threshold value.
4. Initialize video, color space. YUY2, resolution (640x480)
5. Change video color space to RGB.
6. Preview video
7. Open figure window
8. Clear command screen.
9. Display alignment message
   a. Red -> meter panel
   b. Yellow-> display
   c. Blue->LED panel.
   d. And Y-> for break or done.

10. Initialize count 1=0 to count 14=0.
11. Set mat lab warning off.
12. Start initialize loop.
13. Get snapshot from video stream into variable data.
14. Display data in figure window.
15. Set hold on -> (rectangle Plot three rectangles on their respective position in color red, yellow and blue.
16. Check if current key=Y than loop
17. Open new figure window.
18. Start initialize loop.
19. Get snapshot window from video stream into variable data.
20. Convert into binary image with threshold=75 % Apply medium filter of 3x3 neighborhoods (for noise remove).
21. Change image into binary image with 80% threshold.
22. Remove objects in image whose area is less than 30 pixels.
23. Set hold on.
24. Crop images of same 3, rectangle dimensions into i1, i2, i3.
25. Open subplot window at 2X2 that is display original image I1, I2, I3 in figure window
26. Initialize count=0 to count 14=0
27. Using loop from 1 to 50 on y axis and 1 to 64 on x axis and check each pixel value having 1
28. Next 10 counts 5 to 10 are of I1 image repeat fast procedure for all count separately
29. Crop I2 into 4 separate parts to segregate the 4 display digits
30. Resize the segregate image into size of 50X100
31. Find correction of each captured digit with started digit.
32. Put them into matrix of MA,MB,MC,MD
33. Put count 5 to 14 into matrix MV

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34. Find maximum from all matrixes from MA,MB,MC,MD & MV
35. Subtract 1 from each 4 maximum matrix index because matrix strength from 0 and value from 1 to 14
36. Compute value by using formula value= (V1X100)+(v2X10)+(v3X1)+(v4X0.4)
37. Clear screen
38. Display results
39. For count 1 subtract with count 4 is less than 250 than D1-D4 is fault otherwise ok
40. Display temperature
41. Display voltage
42. Check current key to be ‘q’ if found, break and quit
43. End loop
44. Show all results in log table when changes occur

IX. Conclusions

Real-time, low-cost, reliable, and accurate 3-D data acquisition is a dream for us in the vision community. While the available technology is still not able to reach all these features together, this paper makes a significant progress to the goal. An idea was presented and implemented for generating a specially color-coded light pattern, which combines the advantages of both fast vision processing from a single image and reliability and accuracy from the principle of structured light systems. With a given set of color primitives, the patterns generated are guaranteed to be a large matrix and desired shape with the restriction that each word in the pattern matrix must be unique. By using such a light pattern, correspondence is solved within a single image, and, therefore, this is used in a dynamic environment for real-time applications.

REFERENCES

[1] Gan-ping Li “Design of an Embedded Control and Acquisition System for Industrial Local Area Networks Based on ARM” IEEE,2010: 24 -27.

[2] L. Gori, R. Tommasini, G. Cautero, D. Giuressi, M. Barnaba, A. Accardo, S. Carrato & G. Paolucci, “An embedded control and acquisition system for multichannel detectors,” Nuclear Instruments and Methods in Physics Research, July 1999: 338 - 346.

[3] H.S.Murali, and M.Meenakshi (2013), ‘Design and Development of FPGA Based Data Acquisition System for Process Automation', Communications in Control Science and Engineering (CCSE) Volume 1, Issue 1, pp.7-11.

[4] M. Ribo and M. Brandner, “State of the art on vision-based structured light systems for 3D measurements,” in Proc. IEEE Int. Workshop on Robotic ensors: Robotic and Sensor Environments, Ottawa, ON, Canada, Sep. 20057, p.

[5] Jonathan C, Alessandro R, Greg K. Linux device drivers [M].3rd ed. Sebastopol, CA: O’ Reilly & Associates, 2006:324-327.

[6] S. Zhang and P. Huang, “High-resolution, real-time 3D shape acquisition,” in Proc.Conf. Computer Vision and Pattern Recognition Workshop,Jun. 2004, pp. 28–28.

[7] F. Tsalakanidou, “Real-time acquisition of depth and color images using structured light and its application to 3D face recognition,”

[8] J. Salvi, J. Pags, and J. Batlle, “Pattern codification strategies in structured light systems,” Pattern Recognit., vol. 37, no. 4, pp. 827–849, Apr. 2004.

[9] R. Huo, W.C. Fan, L.M. Yuan, H.Dong, W.K. Chow, N.k. Fong and P.L. HO, “Construction of a large space experimental burning hall and preliminary tests”, Fire Sagety Science, Vol. 1, No. 7, pp. 8-13 (1998)- In chenese.

[10] M.J. Ma and C.C. Zhou, Data acquisition and processing technique, Xi’ a Jiaotong University Publisher, September (1989).

[11] R.G. Brown, Indroduction to random signal analysis and Kalman filtering, Wiley New York (1983).

[12] T. P. Koninckx and L. V. Gool, “Real-time range acquisition by adaptive structured light,” IEEE Trans. Pattern Anal. Mach. Intell., vol. 28, no. 3, pp. 432–445, Mar. 2006.