

A Study on the Core Area Image Processing: Current Research, Softwares and Applications

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Abstract —Among various core subjects such as, networking, data mining, data warehousing, cloud computing, artificial intelligence, image processing, place a vital role on new emerging ideas. Image processing is a technique to perform some operations with an image to get its in enhanced version or to retrieve some information from it. The image can be of signal dispersion, video for frame or a photograph while the system treats that as a 2D- signal. This image processing area has its applications in various wide range such as business, engineering, transport systems, remote sensing, tracking applications, surveillance systems, bio medical fields, visual inspection systems etc., Its purpose can be of: to create best version of images(image sharpening and restoring), retrieving of images, pattern measuring and recognizing images.

Keywords — Types, Flow, Projects, MATLAB, Python.

I. INTRODUCTION

In computer concepts, digital image processing technically means that of using computer algorithms to process digital images. Initially in 1960's the image processing had been applied for those highly technical applications such as satellite imagery, medical imaging, character recognition, wire-photo conversion standards, video phone and photograph enhancement. Since the cost of processing those images was very high however with the equipment used too. But in 1970's those image processing systems were designed as cheaper computers and they are easily available too. Whereas in 2000's the core become most and best form of image processing as well as versatile and cheapest.

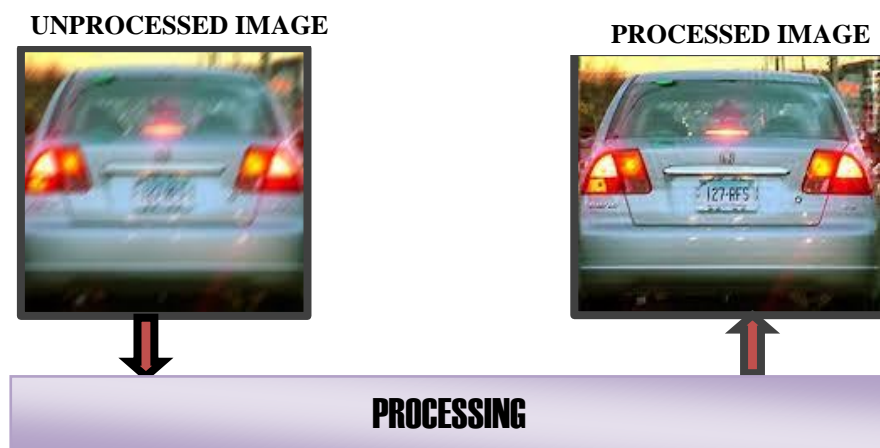


Fig1. Example of Digital image processing

Fig 1. Illustrates the traffic number plate detection with the help of surveillance camera for the accident or some traffic rules obeying system.

II. CATEGORIES OF IMAGE PROCESSING TECHNIQUES

Basically image processing can be divided into two main sub categories each of them plays a major role on them individually. Those sub categories are analog and digital image processing. Analog image processing is mainly for hardcopy form of input images such as photograph and printouts whereas digital image processing takes digital images as input that is images using computers and scanners.

Image processing actually includes several steps those steps are explained below:

- Image acquisition(i.e.) importing images,
- Analysing and manipulating those images and
- Displaying result of those images.

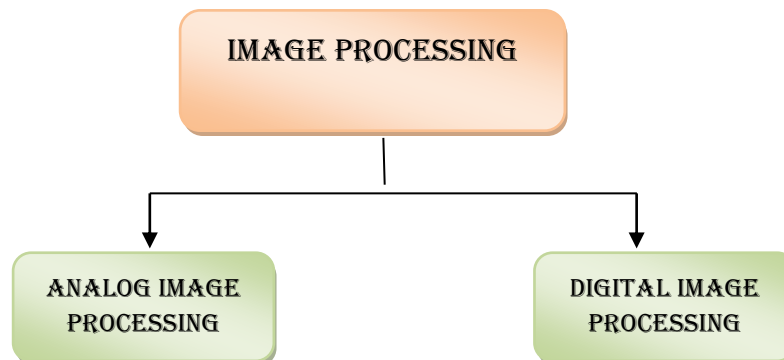


Fig 2. Division of image processing

III. BEST RESEARCH PROJECTS IN IMAGE PROCESSING

Image processing research projects can be done with various softwares but some of them effectively works. Few of those are MATLAB, Raspberry Pi and Python. Some of the best projects are explained slightly below:

- A. *Robot for ball tracing*: This project has been developed with Raspberry Pi, where the robot uses camera for capturing the images and performing image processing for tracking the ball.
- B. *Android phone for surveillance*: This project is helpful in the way that it monitors public places such as offices and homes with the help of android application
- C. *Medical image forgery*: This project is more helpful in the medical field for recognizing fake images that doesn't match with the real images.
- D. *Human act identification*: This project identifies human acts by using image processing techniques in the real life. It also can be used to identify gestures using the camera.
- E. *Computer vision to scan text, mouse options and smart selfies*: This project mainly function on the technique that an I to the machines or robot. These developers must be well known in the key concepts such as image processing algorithms, thresholding, perspective transformation and optical recognition.
- F. *Driver sleepiness detection*: The motive of this project is to avoid road accidents by detecting driver facial actions with the camera in front of the driver which mainly focuses on the eyeball of the driver.
- G. *Image cartooning*: This project is technically based on image detection algorithms and bilateral filtering.
- H. *Image erosion and dilation*: This project is used to reduce the features of an image by increasing the area and emphasize the object.

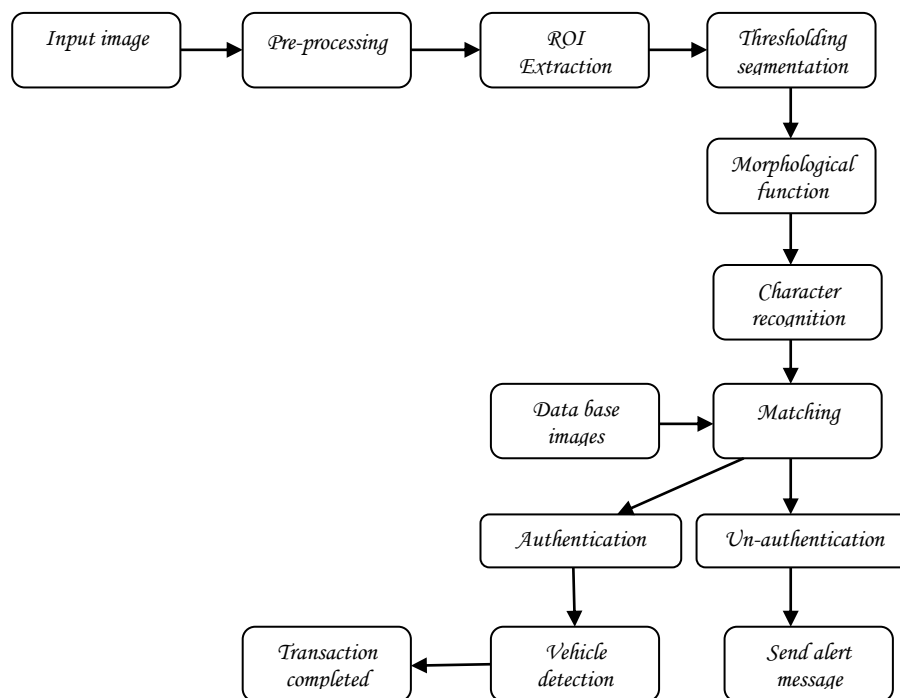


Fig 3. Flow diagram of license plate recognition

- I. *License plate recognition*: This project is developed to detect the criminal vehicle using surveillance cameras, to avoid illegal use of vehicles and to obey traffic rules.
- J. *Breast cancer detection*: This project works on the key concept called neural network. With this concept it detects the cancer cells and uses MIAS data base for performance testing.

IV. EFFECTIVE TOOLS FOR IMAGE PROCESSING

There are many more softwares that are helpful for proceeding with processing the images effectively among those some are prioritized and most commonly used. To list all the softwares they all are mentioned below:

Adobe camera raw, Amira, Apheliyn, Auto collage 2008, Avizo, Bitplane, Blingee, Bsoft, CamFind, Cellcognition, Cellprofiler, CONN, CVIP tools, DeBabelizer, Endow, Fiji, FMRIB, Freesunfer, GemIdent, Ginkgo CADX, GVU octave, HDR photostudio, Huygens, IDL, Ilastik, Image SXM, ITIC-SNAP, KNIME, MATLAB, Micropicom, Mango, Nrrd, Nvidia RTX, OpenCV, Python, PurVIEW, ScanIP, Scikit-image, SimpleITK, VIGRA, VXL, Warpalizer and Zeroth. Among these MATLAB and Python are commonly used now adays.

A. *MATLAB (Matrix laboratory)*: This is a high-performance technical computing. It combines computation, visualization and programming. Matrix laboratory is the most preferable software among developers because it posses ease-to-use software and it provides an user friendly environment. It consists of five main parts .They can be mentioned as follows:

- The language,
- Environment,
- Handling graphics,
- Function library and
- Application program interface

B. *Python*: It is a dynamic object-oriented language and that combines other languages and tools. It has many more applications on web and internet development, scientific and numerical computing, education, desktop GUI software development and business applications.

V. APPLICATIONS

As we know image processing is a vast area of research and it has applications in each and every fields some of them are listed below:

- A. *Image Sharpening and restoration*: Purpose of this processes is to make betterment of an image and to manipulate those images. This process includes blurring detecting edges zooming, sharpening, grey to color conversion, color to grey conversion, image recognition and retrieval.
- B. *Transmission and encoding*: It was the first image that has been sent via wire from London to Newyork. Now a-days it can be sent as live video or CCTV footage.
- C. *Pattern recognition*: It involves a study of image processing from different fields like machine learning in artificial intelligence.
- D. *Medical field*: Medical application of image processing is the most promising and confidential application. Some of its uses are listed below:
 - UV imaging
 - Gamma ray imaging
 - Medical CT
 - PET scan
 - X-ray imaging
- E. *Color processing*: It involves processing of color models such as RGB color model, HSV and YCbCr.
- F. *Video processing*: The technique involves noise reduction, motion detection, frame rate conversion, detail enhancement, color space conversion, aspect ratio conversion etc..,

VI. CONCLUSION

Thus, from the above observation it clearly states that image processing nowadays known as digital image processing is a huge vast area. It can be used for various image enhancement and prediction applications. That current researchers focus on major topics such as cancer imaging, MRI imaging, Brain imaging, Eye imaging technology, Automated software development and Instrumentation development. Future research can be innovative with parallel and distributed computing paradigms because that can only improve responses for the best results. Parallel and distributed computing can increase the sophistication and modern computing which will go beyond with traditional one. The future of this technology can be to the extent of scanning the Sun, Moon and the heaven too.

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