Digital Image Processing

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ABSTRACT

Digital Image Processing is a rapidly evolving field with growing applications in Science and Engineering. Modern digital technology has made it possible to manipulate multi-dimensional signals.

Digital Image Processing has a broad spectrum of applications. They include remote sensing data via satellite, medical image processing, radar, sonar and acoustic image processing and robotics. Uncompressed multimedia graphics, audio and video data require considerable storage capacity and transmission bandwidth. Despite rapid progress in mass-storage density, processor speeds, and digital communication system performance, demand for data storage capacity and data-transmission bandwidth continues to outstrip the capabilities of available technologies.

This is a crippling disadvantage during transmission and storage. So there arises a need for data compression of images. There are several Image compression techniques. Two ways of classifying compression techniques are mentioned here. 1) Loss less Vs Lossy compression 2) Predictive Vs Transform coding for correct diagnosis, the medical images should be displayed with 100% quality.

The popular JPEG image compression technique is lossy technique so causes some loss in quality of image. Even though the loss is not a cause of concern for non-medical images, it makes the analysis of medical images a difficult task. So it is not suitable for the compression of medical images. In the proposed work a Region Based Compression Approach using Block-Based Binary Plane Technique for medical images is developed. This is based on the fact that in the case of medical images, such as X-rays, only some part of the image is useful.

In this technique the X-ray image is displayed to the Physician. The Physician identifies the region (rectangular in shape) where the important information for the diagnosis is present. Then the part identified by the Physician is compressed using loss less technique so that it is extracted with no loss in quality when it is displayed.

The remaining part of the image is compressed with some loss. For the compression of region identified we use the Loss less Block Based Binary Plane Technique and for the other part Lossy Block Based Binary Plane Technique is used.

Features:

Plug-ins

Algorithms to manipulate images are externally implemented as plug-ins.Plug-ins are loaded in run-time via reflection. It provides an easy-way to extensibility and allows plug-ins integration. A plug-in to show a gray scale histogram, for example, uses the gray scale plug-in before the histogram generation.

Video Capturing

Video capturing is provided via Java Media Framework and allows developers to work with real-time video processing. For the plug-ins, the interface to work with videos and images are the same. In the case of videos, plug-ins can store past frames to analyze multiple frames.

Multi-threading

Marvin allows the processing of multiple images at the same time or the same image processed by multiple threads. Image processing plug-ins receive an image to be processed and a mask containing what pixels must be considered.

Performance Meter

Many image processing algorithms can be divided in few processes. An algorithm, for example, may be divided in five processes to find and segment the interest points of an image: representing the image in gray scale, border detection, binarization, Harris/Plassey application, render red points representing interest points..

GUI API

The plug-ins can have user specified attributes that determines how it works and the Marvin framework provides features to integrate a GUI (Graphical User Interface) with these attributes. The Plug-in developer sets the relation between the plug-in attributes and the interface components, added to the plug-in window.

Plug-in History

In some cases to achieve some result in an image, it is necessary to use a few processes. Preparing an image for pattern recognition, for example, in some applications it is interesting to remove noise, increase contrast and emphasize edges. For these cases that multiple processes are used, MarvinPluginHistory stores all plug-ins and their configurations applied to an image.

Application of digital image processing:

- Medical applications
- Restorations and enhancements
- Digital cinema
- Image transmission and coding
- Color processing

- Remote sensing
- Robot vision
- Image processing architectures
- Video processing

Advantages:

- Digital image processing made digital image can be noise free.
- It can be made available in any desired format. (X-rays, photo negatives, improved image, etc.)
- Digital imaging is the ability of the operator to post-process the image .It means manipulate the pixel shades to correct image density and contrast.
- Images can be stored in the computer memory and easily retrieved on the same computer screen.
- Digital imaging allows the electronic transmission of images to third-party providers

Disadvantages:

- The initial cost can be high depending on the system used.
- If computers crashes then pics that have not been printed and filed into Book Albums that are lost.
- Digital cameras which are used for digital image processing have some disadvantages like:
- Memory Card Problems
- Higher Cost
- Battery Consumption

FUTURE SCOPE:

The future of image processing will involve scanning the heavens for other intelligent life out in space. Also new intelligent, digital species created entirely by research scientists in various nations of the world will include advances in image processing applications. Due to advances in image processing and related technologies there will be millions and millions of robots in the world in a few decades time, transforming the way the world is managed. Advances in image processing and artificial intelligence6 will involve spoken commands, anticipating the information requirements of governments, translating languages, recognizing and tracking people and things, diagnosing medical conditions, performing surgery, reprogramming defects in human DNA, and automatic driving all forms of transport.

With increasing power and sophistication of modern computing, the concept of computation can go beyond the present limits and in future, image processing technology will advance and the visual system of man can be replicated. The future trend in remote sensing will be towards improved sensors that record the same scene in many spectral channels. Graphics data is becoming increasingly important in image processing app1ications. The future image processing applications of satellite based imaging ranges from planetary exploration to surveillance applications.

CONCLUSION

A major challenge for automatic image analysis is that the sheer complexity of the visual task which has been mostly ignored by the current approaches. New technological breakthrough in the areas of digital computation and telecommunication has relevance for future applications of image processing. The satellite imaging and remote sensing applications programs of the future will feature a variety of sensors orbiting the earth.