

# A Swot of Digital Image Processing and its Impact on Real World

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## ABSTRACT

A digital image is composed of picture elements, of ones and zeros and the digital image processing is the use of computer algorithms on a digital image for processing it and to achieve some target. In simple words image is a representation of real scene, either in black and white or in color, and either in print form or in a digital form. This is basically a subpart of digital signal processing. It has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data. In this paper I have addressed all the experiments on DIP and their use in the real life. Here the concentration is to aware the people to the role of digital image processing and tell how the experiments came from the lab and now it is being implemented in the real world. DIP has many applications and they are helping in the different area of our world.

**Keyword:** DIP, OCR, Fusion. Object Recognition.

## 1. INTRODUCTION

Digital image processing has three parts Digital, Image and processing. Digital means: Information represents in discrete form (in the form of Digit), Image means: a reproduction of the form of any object and processing means: Performing a series of operation on the data to convert into information. Basically a digital image is composed of picture elements, of ones and zeros. So DIP is Use of computer algorithms for processing on a digital image. Since images are defined over two dimensions (perhaps more) digital image processing may be modeled in the form of multidimensional systems[1].

### 1.1 History

Early 1920s - Bartlane cable picture transmission system.

- Used to transmit newspaper images across the Atlantic.
- Images were coded, sent by telegraph, printed by a special telegraph printer.
- Took about three hours to send an image, first systems supported 5 gray levels.

1964 - JPL began working on computer algorithms to improve images of the moon.

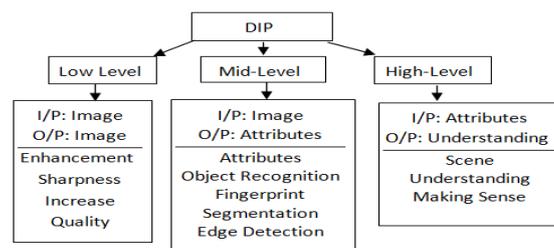
- Images were transmitted by Ranger 7.
- Corrections were desired for distortions inherent in on-board camera.

Evolving technology and algorithms => explosion of application areas.

## 1.2 Digital Image Processing Systems

- Acquisition
- Storage
- Processing
- Display
- Printing

## 1.3 Types

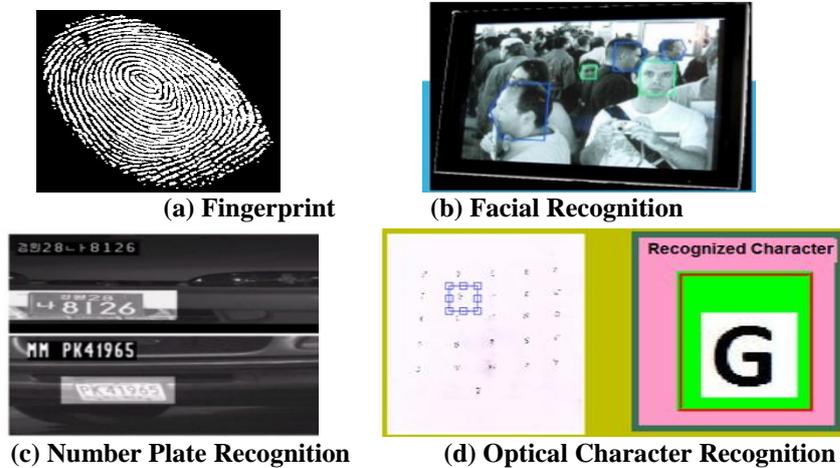


**Figure 1:** Types of Digital Image Processing

- A low-level process is characterized by the fact that both its inputs and outputs are images. Low-level processes involve primitive operations such as Image Pre-processing to Reduce Noise Contrast Enhancement Image Sharpening
- A mid-level process is characterized by the fact that its inputs generally are images, but its outputs are attributes extracted from those images (e.g., edges, contours, and the identity of individual objects). Mid-level processing on images involves tasks such as segmentation (partitioning an image into regions or objects), description of those objects to reduce them to a form suitable for computer processing, and classification (recognition) of individual objects.
- Higher-level processing involves “making sense” of an ensemble of recognized objects, as in image analysis, and performing the cognitive functions normally associated with vision[2].

## 2. OBJECT RECOGNITION

In digital image objects may be recognized and this process is called the recognition. We may recognize the fingerprint, number plate, or face from the image and from the videos.



(a) **Fingerprint recognition** is also a kind of “image acquisition”. If someone wants to check someone else identity, then he/she has to scan the finger using a scanner for the fingerprints. Multiple images of the same finger have been captured. Now the retrieved fingerprints will be an image of the fingerprint and will be used in the identification purpose. In this process the main concentration is to capture the centre point of the fingerprint, which contains many of the unique features. After capturing all images of the fingerprint, the next step is to convert the images to binary.

(b) **Facial recognition** is one of the most common biometric methods of identification. Here a face is detected from a person image and then features are extracted from the face image.

(c) **Number Plate Recognition** is also the part of object recognition. In this process a number may be recognized and extracted from the image of a number plate.

(d) **Optical Character Recognition**, usually abbreviated to OCR, is the mechanical or electronic conversion of scanned or photographed images of typewritten or printed text into computer-readable text. It is widely used as a form of data entry from some sort of original paper data source, whether passport documents, bank statements, receipts, business cards, mail, or any number of printed records.

### 3. IMAGE RESTORATION (PATCH REMOVAL/SCRATCH REMOVAL/HISTORICAL IMAGE RESTORATION)



Figure 3: Image Restoration [5-6]

Image inpainting can also be called image completion, where the missing region of an image is filled in a visually plausible way. In the above figure we can see that an unwanted boat is removed from the image. Similarly this technique may also be used to remove scratches from the historical image as shown in the picture. Text removal through image Inpainting [5].

## 4. EDGE DETECTION

An edge is a property attached to an individual pixel and is calculated from the image function behaviour in a neighbourhood of the pixel. It is also considered as a vector variable (magnitude of the gradient, direction of an edge). The purpose of edge detection in general is to significantly reduce the amount of data in an image, while preserving the structural properties to be used for further image processing.

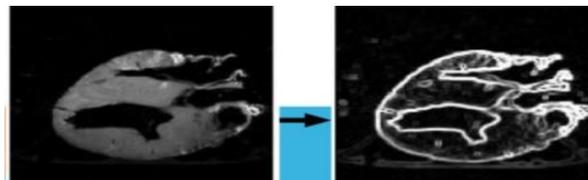


Figure 4: Edge Detection [7]

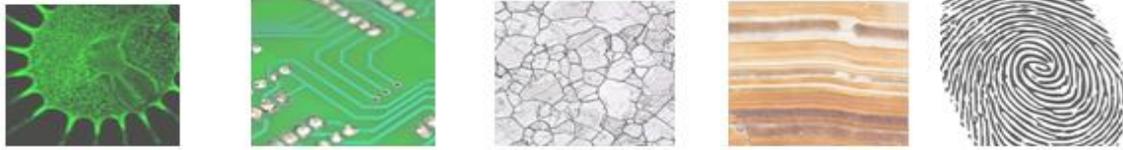
## 5. IMAGE FUSION

Multi-sensor image fusion means combining information from two or more images into a single image called fused image. The fused image can have harmonizing spatial and spectral resolution characteristics. Image fusion is a useful technique for merging similar sensor and multi-sensor images to improve the information content present in the images.



Figure 5: Image Fusion [7]

## 6. REAL TIME APPLICATION ON IMAGE PROCESSING



(a) Life Sciences (b) Manufacturing (c) Materials Research (d) Natural Resources (e) Security

Figure 6: Real Life Applications [8]

### 6.1 Life Sciences

Whether you are involved in cell biology, drug discovery or other life science research, Media Cybernetics helps individuals and organizations to extract and mine knowledge from images through its world-leading image capture, analysis, display, management, and collaboration solutions for scientists, professionals, and enterprises.

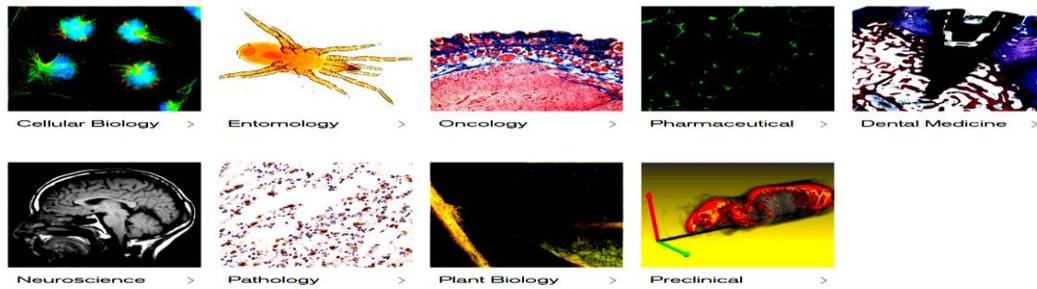


Figure 7: Use in Life Sciences [9]

### 6.2 Manufacturing

Media Cybernetics plays an important role in providing solutions for manufacturing industry to streamline the manufacturing process with efficiency, accuracy and quality. A vast variety of custom solutions has been developed based on different manufacturing process and applications.

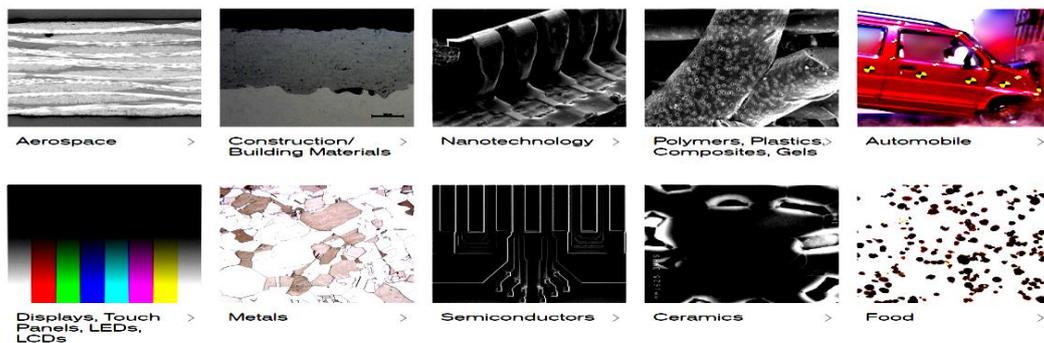


Figure 8: Use in Manufacturing Industries[9]

### 6.3 Materials Research

Based on more than 35 years of experience, Media Cybernetics provides innovative and cutting-edge image analysis solutions to the materials research field, which are specially customized and developed after collaborating with researchers and professionals in the field.

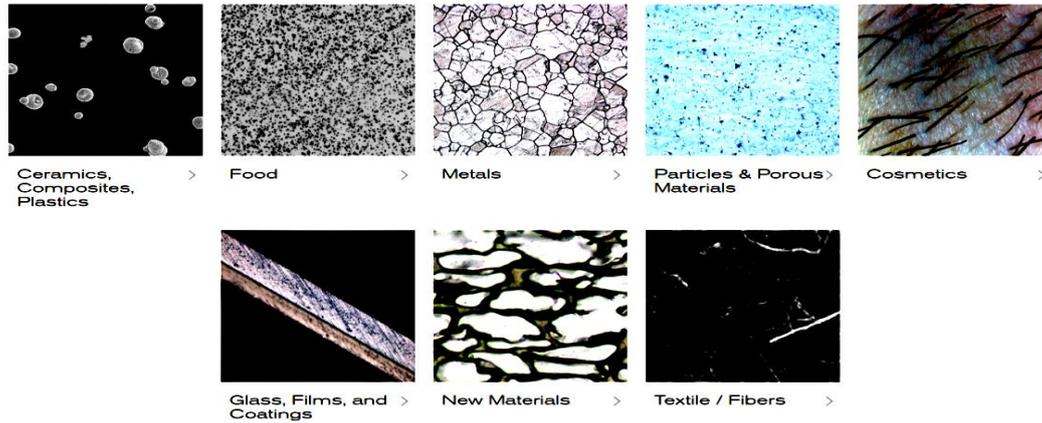


Figure 9: Materials Sciences Field [9]

### 6.4 Natural Resources

A collection of tailored solutions are offered by Media Cybernetics to the natural resources industry which enables researchers and professionals to extract valuable qualitative and quantitative information from images.

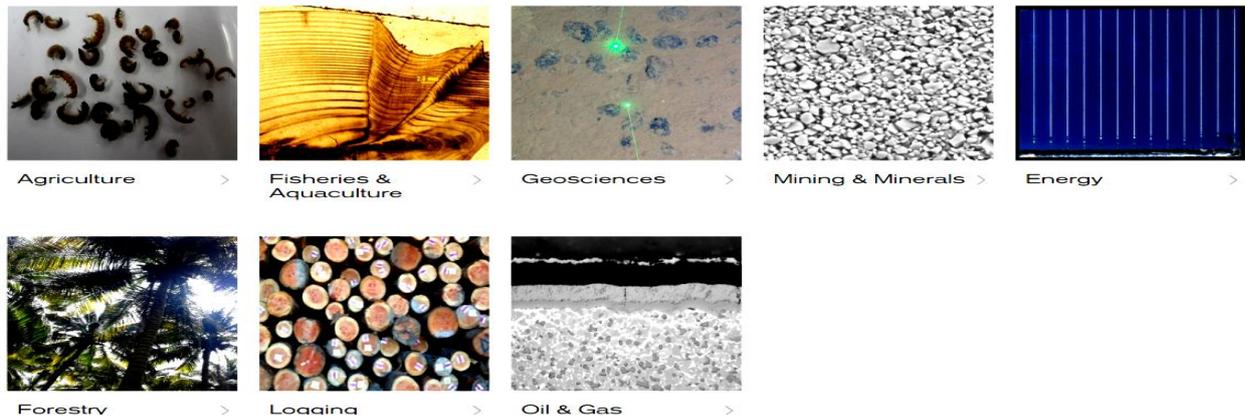
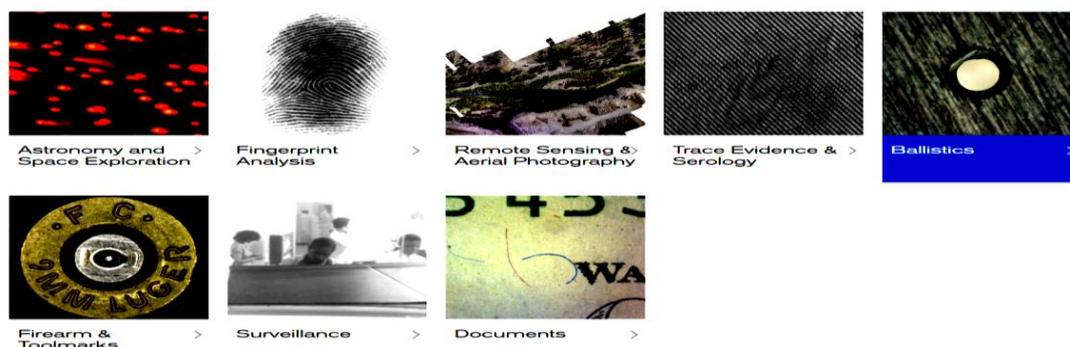


Figure 9: Use in Natural Industries[9]

### 6.5 Security

With the sophisticated software features, Media Cybernetics supplies solutions for numerous image analysis applications in defence and security industry. It is easy to identify an object/text/fingerprint from an image using digital image processing.



**Figure 10:** Use in Defence and Security industries [9]

## 7. ADVANTAGES AND DISADVANTAGES OF DIGITAL IMAGE PROCESSING

### 7.1 Advantages

- Remove unwanted objects.
- We can adjust exposure.
- Sharpness the picture.
- Reduce image noise.
- Increase visibility of detail.
- Adjust band optimize the image contrast characteristics.

### 7.2 Disadvantages

- It is very costly depending on the system used.
- Time consuming.
- Lack of qualified professional.

## 8. CONCLUSION

This paper makes a review on the current segmentation methods. From the above discussion we conclude that this field has relatively more advantages than disadvantages and hence is very useful in varied branches. There is no doubt that the trend will continue into the future. Digital image processing play a vital role in modern world as it is involved with advanced use of science and technology. More ever digital image processing is the cheapest method when comparing with other image processing. More research is needed though in order to improve the prevailing issues with regards to digital imaging.

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