

Frontiers in Computer Science

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Abstract- *In past two decades, there is a prodigious growth in the field of computer science. This field has emerged so hastily that even its speed is unrivaled for engineers. Researchers have investigated various trends and emerging fields in computer science. In this paper analysis of various on going studies in computer science is done to highlight the dynamic landscape in computer science.*

Keywords - *Digital Image Processing, Networking, OCR, NLP, Software Engineering, Cloud Computing.*

I. INTRODUCTION

Computer science is briskly augmenting research field fueled by looming application domains and ever-improving software and hardware that eradicate old bottlenecks, but devise new challenges and opportunities for researchers in computer science. Naturally, researchers pursue the evolution of their artifacts by tailoring their research interests. It is becoming area of curiosity for everyone that what is milestone in field of computer science or in what areas is computer science emerging. So we endeavor to provide gist of various areas of computer science.

II. DIGITAL IMAGE PROCESSING

It is a stream which is used on digital images to perform image processing by using computerized algorithms. Some of topics of digital image processing are as follow:

A. Image Acquisition

This is first fundamental step of image processing. This step is simple as given image is already in digital form. It is preprocessing stage which involves image denoising, image scaling etc.



Figure 1: Image acquisition by denoising

B. Image Enhancement

Image enhancement is done to highlight details of image or to highlight certain features of interest in an image [3]. It includes changing contrast or brightness of image. Image restoration is also a part of image enhancement in which degraded parts of image are restored to get full details of image.

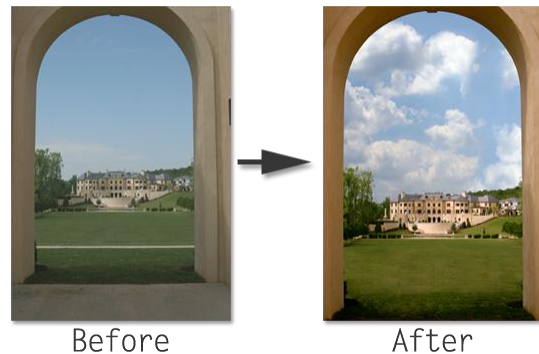


Figure 2: Image Enhancement by changing contrast

C. Compression

Compression is done to reduce storage amount. Many techniques (like split algorithm) for image compression are used so that less amount of space is required to store

and image. Compression should be done such that no data of image is lost and image recompression is possible.

D. Image Stitching

Sometimes it is not possible to cover whole view of scenery or some area. Image stitching is very useful technique in that sense. Image stitching stitches those two or more images to make a single large image like we have panorama view in mobiles.



Figure 3: Image stitching example

E. Object Recognition

Object recognition is used to extract an object from the image. Sometimes it used to change background or sometimes we just want to focus only on detailing of object in image.

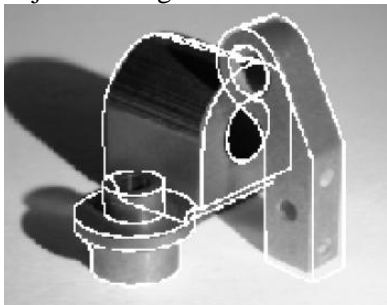


Figure 4: Object detection example.

F. Stenography

Stenography means hiding data inside image. Sometimes we want to send very confidential data, even in case of cryptography[3] we are in doubt of security of that data. In that case stenography is used to hide data in images. Interpreter will be able to see images only and not the data hidden in it.

III. OPTICAL CHARACTER RECOGNITION

Optical character recognition includes reading text from document images. This text can be in any language either in hindi, Punjabi, Bengali etc or in printed or handwritten format. The two main areas of research in OCR are:

A. Binarization Of Historical Images

The recognition of historical documents implies dealing with the degradation of paper due to paper aging. Typical types of degradation and noise include variation in background, uneven illumination or dark spots[4, 6]. Common problem of double-sided documents is that the back side of the document usually interferes with the front side because of the transparency of the document or ink bleeding. Binarization is a key step in document image processing modules since a good binarization sets the base for further document image analysis.

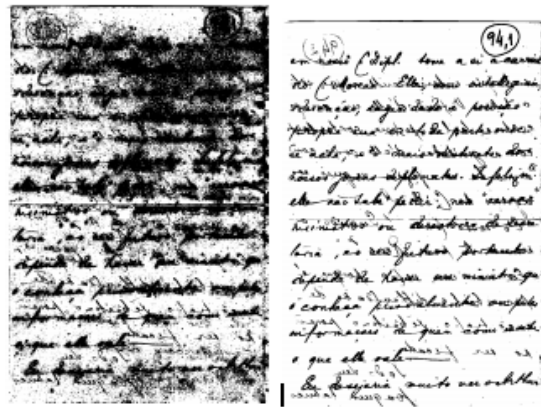


Figure 5: Degraded and restored text document.

B. Segmentation

The segmentation is a technique that divides printed or handwritten words into individual characters. It becomes more difficult of segment characters in case of handwritten documents as various persons have various writing styles and also it includes segmentation of broken, touching or overlapping characters.

IV. NETWORKING

In networking, packets are sent from one node to other node in a network. This network can be wired network, wireless sensor network, MANET (Mobile

AdhocNETwork), VANET (Vehicular AdhocNETwork) or wi-max. While sending data packets from one node to another, it should be taken care that consumption of energy should be minimized so as to prolong network's life [7]. Research work can be carried out to minimize energy consumption. Some more areas of research in Networking are:

A. Security

In a network, while sending packets from one node to other, various malicious nodes try to attack on other nodes of network. These attacks can effect routing of network or can try to steal information or modify packets or can consume maximum energy [8]. Some main attacks in networking are wormhole, rushing, sleep deprivation, denial of service, blackhole, byzantine, blackmail, Sybil, sinkhole attack etc. Research work can be carried out to detect and prevent these attacks.

B. Relay Node

Some nodes are far from each other so relay nodes are placed between them to carry out communication. Relay nodes act as repeater between two nodes [7]. Relay nodes should be placed optimally so to minimize energy consumption.

V. SOFTWARE ENGINEERING

There are various step of software engineering. Research can be carried out to automate these phases of software development like requirement prediction, quality analysis, agile methods etc [10, 11]. Other research areas are

A. Software Cloning

As we do evolution of software, the structure of software is becoming more complex and so the understandability and maintainability of software systems is deteriorating day by day[5, 9]. Copy and paste programming is a common activity but it introduces a negative point to reuse by creating Clones. To detect these software cloning can increase maintenance and reusability of code and is important direction of research.

B. Testing

There are various ways of software testing. Today various ways are developed to detect software. And choosing these test cases efficiently so that it takes minimum execution time and cover all faults is one of the challenges task. Ant Colony optimization is one of algorithm to

choose test cases efficiently which is motivated from behavior of ants.

VI. CLOUD COMPUTING

Cloud computing consists of large number of remote servers are interconnected to provide centralized storage of data and online access to computer services [1]. The research in cloud computing can be proceeded to ensure security of data stored on cloud or to optimize scheduling process so to minimize wait time of processes which are demanding cloud services online.

VII. NATURAL LANGUAGE PROCESSING (NLP)

Natural Language Processing is a stream which is concerned with interaction between computer and human languages. As we see various websites are coming in various human languages like in Hindi or Punjabi are part of NLP. Various fields of Natural Language Processing are sentiment analysis, opinion analysis, spam detection and filtering, machine language translation etc.

VIII. CONCLUSION

In this paper we tried to demonstrate various areas of research in computer science. A gist of research areas e.g. digital image processing, Optical character recognition, networking, software engineering, cloud computing and natural language processing are analyzed. A lot of work is done by previous researchers in these fields to create a landmark but more miles are left to go.

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