KNOWLEDGE-BASED IMAGE PROCESSING APPLICATIONS

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ABSTRACT

In today's world, the importance of knowledge based system is increasing as the competition is increased and the rate of new ideas and their implementation is rising day-by-day. There is a need of computerized assistance for effective filtering and display the pertinent information or data and it performs the decision making task. Sharing the knowledge is the most important aspect today. Image processing is the technology used to handle and manipulate images. Image processing is a process whose input and outputs are the images. Image processing is basically used to extract attributes from images and recognize the individual objects. This paper discusses the need of knowledge-based Image Processing applications.

Keywords : Knowledge, Knowledge-base, Image Processing, Image Processing Applications.

1.INTRODUCTION

Knowledge is a fact or condition of knowing something which is gained through experience or association by understanding any technique related to science or arts. As it requires understanding of information, knowledge is broader than data and information. Knowledge basically consists of the information, classification of information and metadata. It is used to compare the data and information. The main advantage of knowledge is a provision to find problem, go deep into it, create views and helps them to solve them efficiently. [1]Few   main
characteristics of knowledge are   the involvement of human interaction, their expression and communication with reality. It is a dynamic concept as the contents and
information changes according to time. It is expandable, compressible ,transportable, sharable and diffusive. The   knowledge   has some   economic   value. Knowledge is the strategic resource for creativity and innovation. The link between creativity and innovation is shown in figure 1, which includes knowledge creation, idea generation and idea implementation. [1]Knowledge creation starts with identifying knowledge, creating it, validating it and then deploying it. It is called knowledge cycle. Idea generation includes inspiration, imagination, formulation and defining the knowledge. It is referred as creativity cycle. The innovation cycle is the name of idea implementation which includes thinking, visualizing, designing and practicing.

2. KNOWLEDGE-BASE

Knowledge-base consists of the knowledge of a particular domain. It is a heart of any decision making systems. Knowledge-base is represented in the form of if-then regulations. It is need today to provide the right knowledge to the right people at the right time and helping people to share and put information into action for the benefits of the people, student or researcher. [2]

The knowledge can be stored in databanks and founds in presentations, libraries, documents, manuals etc. It can be shared among the people by using traditional methods such as workshops, meetings, tapes, videos, publications and so on. [3]There are various tools available or can be developed to manage the knowledge search and management. Few of them are database management tool, process management tool, search engines, collaborative tool etc. The knowledge management forms the knowledge teams first, develops a knowledge base, perform active process management, create knowledge centers, provide knowledge sharing platforms, etc.[3] The figure 2 shows the individual's knowledge sharing into the organizations internally. From this it is seen that Face-to-face interactions like meetings and conferences are the main methods of everyone's knowledge sharing.[4]

3. IMAGE PROCESSING

Image processing is any form of signal processing for which input is an picture. This image may be a video frame, photograph, any file created through paint application, scanned image etc. The output of image processing is an image or set of parameters / characteristics related to the image. Image processing basically treats the image as 2 dimensional signals.

The main purpose of image processing is to visualize the objects which are not visible, sharpen the image to get better image, restore the image, retrieve it back, extract the patterns and recognize the image.

Image Formation / Image Acquisition

For image acquisition sensors or camera are used like scanner for fingerprint, CCD camera for iris, face etc. In image formation the radiant energy emitted from the source is converted to 2-dimentional image. Image digitization can be done through image sampling and quantization.

Image Enhancement

This is treated as primary stage for any input image. While capturing the image, due to motion or interference some noise such as disturbance, blur etc is added automatically in the image. Features can not be extracted correctly from such images. To improve the quality of the image, enhancement techniques such as edge sharpening, noise removal, increasing contrast etc are used.

Image Segmentation

To extract the correct features, the correct region of interest is required. Therefore the image is segmented for getting meaningful information i.e. region of interest from it. For example if an eye is captured then iris is segmented as region of interest. The specific pattern can be searched easily through segmented area. For object tracking, different objects were segmented separately.

Feature Extraction

The specific pattern from a segmented image can be extracted through feature extraction algorithm. For example, If palm is a region of interest then star, grille, spots etc are the patterns for extraction. If iris is considered then collarette, frills, furrows etc are the patterns for extraction.

Description / Classification

The extracted features are compared with the available database and then the identification or verification is done. For classification various techniques like neural networks are used.

4. IMAGE PROCESSING APPLICATIONS

There are various applications of image processing such as character recognition, finger print recognition, iris recognition, palm recognition, retina recognition, signature verification, speech recognition and so on. In each type of recognition all the above steps are followed. For example, A few Kroger stores in Texas uses fingerprint recognition for the check out customers.[9] The fingerprint is used to validate the authorized users in a cell phone.[10] Finger geometry information is used in Disney world to check multiple visitors. Amsterdam airport uses iris scan to validate the identity of passengers.[8] The multi-model image processing of iris, face and fingerprints is used in India's UID project to protect the rights of common man.

All the researchers or students who wants to work on these recognition techniques they are in need of information about available techniques of each step, how the process can take place, how to extract patterns, how to create a test data and so on. This information must be in understanding format and only the required information should be provided. This can happen only when the knowledge base and inference engine is provided. That is why knowledge-base plays a very important role in image processing applications.

5. KNOWLEDGE-BASED IMAGE PROCESSING APPLICATIONS

Knowledge engineer will basically prepare a knowledge base by using the knowledge of image processing applications which works as a backbone of any system. Image processing steps were already discussed above. In every step knowledge-base plays very important role. This is shown in figure 3.
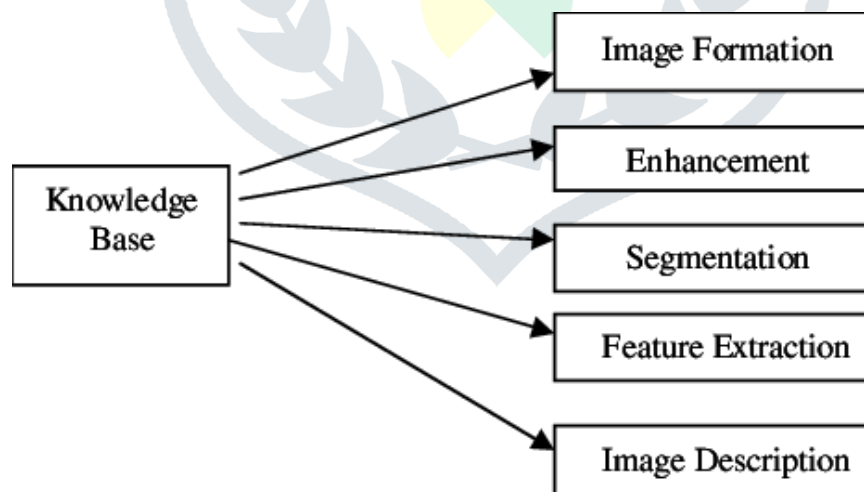

Fig. 3: Knowledge Based Image Processing

As knowledge base, the database of each application of image processing is separately maintained viz. Casia database for iris [11], Casia database for face, MMU database for iris etc. Any researcher or student can retrieve this database from knowledge base. Knowledge base can provide the information about how a person can access the database from it and what type of techniques is applied

to do so. It also gives information about how to read the database one by one for image processing. Even the programming code is maintained in the knowledge-base.

As noise is affecting the original image, to remove it enhancement is done. Knowledge base can provide information about what type of noise it is and how the technique is used to remove or reduce noise from the image. It gives different techniques available for noise reduction. Segmentation is done to get the region of interest. Knowledge base provides different areas of interest on the basis of application chosen. It also gives the information about different techniques available for each application and how one technique works differently on different applications.

Feature extraction is used to extract the patterns or characteristics. Each application has different features. Iris has its own unique patterns such as collarette, furrows, frills, color, texture etc. Palm has pattern like stars, lines, grills, spots etc.[7] Palm has features like wrinkles, lines, whorls etc. Depending upon the applications which patterns are extracted and what techniques are applied for it, this information can be supplied by the knowledge base.

On the basis of the extracted features, the classification takes place. Knowledge base gives the information about the best classification technique applied to get best results. Even it provides the information about the different techniques so comparison is possible for the researcher. It becomes very easy to identify or verify the individual.

6. CONCLUSION

Image processing is the most powerful process for handling and manipulating images. As the field advances, image processing applications will be posed again with new challenges. These challenges are related to the creation of knowledge-based Image processing applications and discovery of knowledge which is used by the student or researcher in coming years. In today's global competition, it is necessary to develop new knowledge-base with new innovative ideas. It is very important for new upcoming scientists to get correct data and information for managing new knowledge and integrate it with the existing knowledge effectively and efficiently.

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