

# Image Texture Feature Extraction Using GLCM Approach

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**Abstract-** Feature Extraction is a method of capturing visual content of images for indexing & retrieval. Primitive or low level image features can be either general features, such as extraction of color, texture and shape or domain specific features. This paper presents an application of gray level co-occurrence matrix (GLCM) to extract second order statistical texture features for motion estimation of images. The Four features namely, Angular Second Moment, Correlation, Inverse Difference Moment, and Entropy are computed using Xilinx FPGA. The results show that these texture features have high discrimination accuracy, requires less computation time and hence efficiently used for real time Pattern recognition applications.

**Index Terms-** Texture, Pattern recognition, Features, Frames.

## I. INTRODUCTION

Feature extraction involves simplifying the amount of resources required to describe a large set of data accurately. When performing analysis of complex data one of the major problems stems from the number of variables involved. Analysis with a large number of variables generally requires a large amount of memory and computation power or a classification algorithm which over fits the training sample and generalizes poorly to new samples. Feature extraction is a general term for methods of constructing combinations of the variables to get around these problems while still describing the data with sufficient accuracy. Texture tactile or visual characteristic of a surface. Texture analysis aims in finding a unique way of representing the underlying characteristics of textures and represent them in some simpler but unique form, so that they can be used for robust, accurate classification and segmentation of objects. Though texture plays a significant role in image analysis and pattern recognition, only a few architectures implement on-board textural feature extraction. In this paper, Gray level co-occurrence matrix is formulated to obtain statistical texture features. A number of texture features may be extracted from the GLCM. Only four second order features namely angular second moment, correlation, inverse difference moment, and entropy are computed. These four measures provide high discrimination accuracy required for motion picture estimation. These features are calculated and implemented using Xilinx ISE 13.4.

## II. EXTRACTION OF GLCM

In statistical texture analysis, texture features are computed from the statistical distribution of observed combinations of intensities at specified positions relative to each other in the image. According to the number of intensity points (pixels) in each combination, statistics are classified into first-order, second-order and higher-order statistics. The Gray

Level Coocurrence Matrix (GLCM) method is a way of extracting second order statistical texture features.

The approach has been used in a number of applications. Third and higher order textures consider the relationships among three or more pixels. These are theoretically possible but not commonly implemented due to calculation time and interpretation difficulty.

A GLCM is a matrix where the number of rows and columns is equal to the number of gray levels,  $G$ , in the image. The matrix element  $P(i, j | \Delta x, \Delta y)$  is the relative frequency with which two pixels, separated by a pixel distance  $(\Delta x, \Delta y)$ , occur within a given neighborhood, one with intensity 'i' and the other with intensity 'j'. The matrix element  $P(i, j | d, \theta)$  contains the second order statistical probability values for changes between gray levels 'i' and 'j' at a particular displacement distance  $d$  and at a particular angle  $(\theta)$ . Using a large number of intensity levels  $G$  implies storing a lot of temporary data, i.e. a  $G \times G$  matrix for each combination of  $(\Delta x, \Delta y)$  or  $(d, \theta)$ . Due to their large dimensionality, the GLCM's are very sensitive to the size of the texture samples on which they are estimated. Thus, the number of gray levels is often reduced. GLCM matrix formulation can be explained with the example illustrated in fig 2.1 for four different gray levels. Here one pixel offset is used (a reference pixel and its immediate neighbour). If the window is large enough, using a larger offset is possible. The top left cell will be filled with the number of times the combination 0,0 occurs, i.e. how many times within the image area a pixel with grey level 0 (neighbour pixel) falls to the right of another pixel with grey level 0(reference pixel).

# Image Texture Feature Extraction Using Glcm Approach

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## **Table of Contents Image Texture Feature Extraction Using Glcm Approach**

1. Understanding the eBook Image Texture Feature Extraction Using Glcm Approach
  - The Rise of Digital Reading Image Texture Feature Extraction Using Glcm Approach
  - Advantages of eBooks Over Traditional Books
2. Identifying Image Texture Feature Extraction Using Glcm Approach
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Image Texture Feature Extraction Using Glcm Approach
  - User-Friendly Interface
4. Exploring eBook Recommendations from Image Texture Feature Extraction Using Glcm Approach
  - Personalized Recommendations
  - Image Texture Feature Extraction Using Glcm Approach User Reviews and Ratings
  - Image Texture Feature Extraction Using Glcm Approach and Bestseller Lists
5. Accessing Image Texture Feature Extraction Using Glcm Approach Free and Paid eBooks

- Image Texture Feature Extraction Using Glcm Approach Public Domain eBooks
  - Image Texture Feature Extraction Using Glcm Approach eBook Subscription Services
  - Image Texture Feature Extraction Using Glcm Approach Budget-Friendly Options
6. Navigating Image Texture Feature Extraction Using Glcm Approach eBook Formats
    - ePub, PDF, MOBI, and More
    - Image Texture Feature Extraction Using Glcm Approach Compatibility with Devices
    - Image Texture Feature Extraction Using Glcm Approach Enhanced eBook Features
  7. Enhancing Your Reading Experience
    - Adjustable Fonts and Text Sizes of Image Texture Feature Extraction Using Glcm Approach
    - Highlighting and Note-Taking Image Texture Feature Extraction Using Glcm Approach
    - Interactive Elements Image Texture Feature Extraction Using Glcm Approach
  8. Staying Engaged with Image Texture Feature Extraction Using Glcm Approach
    - Joining Online Reading Communities
    - Participating in Virtual Book Clubs
    - Following Authors and Publishers Image Texture Feature Extraction Using Glcm Approach
  9. Balancing eBooks and Physical Books Image Texture Feature Extraction Using Glcm Approach
    - Benefits of a Digital Library
    - Creating a Diverse Reading Collection Image Texture Feature Extraction Using Glcm Approach
  10. Overcoming Reading Challenges
    - Dealing with Digital Eye Strain
    - Minimizing Distractions
    - Managing Screen Time
  11. Cultivating a Reading Routine Image Texture Feature Extraction Using Glcm Approach
    - Setting Reading Goals Image Texture Feature Extraction Using Glcm Approach
    - Carving Out Dedicated Reading Time
  12. Sourcing Reliable Information of Image Texture Feature Extraction Using Glcm Approach
    - Fact-Checking eBook Content of Image Texture Feature Extraction Using Glcm Approach
    - Distinguishing Credible Sources
  13. Promoting Lifelong Learning
    - Utilizing eBooks for Skill Development

- Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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