

Master Thesis Project Proposal Document.

Title - GPU cluster based  
brand logo detector  
in input video stream.

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## 1 Introduction

Pattern recognition, image search, product placement, Artificial intelligence, Recognition task in image, object detection.

What ? Pattern is defined as regularity in data as perceived by humans in the form visual, auditory, haptic and olfactory cues. Human brain is well equipped in identifying patterns in their environment, it has been possible by humans to identify regularity in the data due to the presence of memory. Visual perception is one of the most interesting and powerful feature of human beings. There has been a lot of research in understanding capability of human brain in recognizing visual patterns, but still the process behind identifying complex patterns is a little understood subject in neuroscience [3].

facts?

How ?

Why ?

## 2 Available Methods

Machine learning techniques, Supervised and unsupervised learning.

- SIFT descriptor matching method: All the SIFT and SURF based methods rely upon comparing SIFT/SURF descriptors to find the best match for the queried image. The process of database creation is by using sliding window technique to compute SURF descriptors for the brand logo image. Further, during the logo detection task in an input image frame, SURF or SIFT descriptors are computed for each window of the input image. During the process the raw descriptors obtained are matched with the database to determine the identical match. The window containing the matching descriptors is expected to contain the matched logo.

Problems: Compute SURF or SIFT descriptors of the input image by using sliding window method (an exhaustive search). Although SIFT or SURF descriptors are scale, rotation and position invariant but there are highly perspective tilt dependent. For example the descriptors of affine transformed images are less likely to be matching with the non-affine transformed logo image. Since the logos can occur in various tilt perspectives in the image frame, the SIFT or SURF descriptor based matching approach is a suboptimal solution.

- Delaney triangle based method:

- Bundle minimum hashing of Bag of Visual words methodBundle Min-Hashing for Logo Recognition Romberg et.al: Method description: Stores the warped versions of the logo image in the database. Image partitioning method is used instead of sliding window method during logo detection process.

Problem: The input image frame has to be analyzed to predict the location of the logo. Localisation is a problem of its own, hence a more emphasis is given to predict the position of the objects from natural scene images. The accuracy of detection depends on the robustness of prediction of the bounding boxes around objects containing logos.

- Convolution neural network:

Logo detection techniques can be broadly categorized into various methods as follows:

- Geometry based methods: In this technique the geometric features of the logos are considered for the detection and identification of logos in the input images. Few researchers have considered this approach to accomplish the task of logo detection in images and document images. Few of the related work are explained in this section to attain better understanding of the methods and the shortcomings of the discussed geometric methods.

One of the approach to detect logos in the document images emphasize on using geometrical invariant features as in [1]. In this paper, authors focus on creating an invariant signature that uses local affine features of the logo to enable the detection process. They use euclidean invariants to capture the affine features which are further used for logo detection, feature extraction and for matching purposes [1]. The signatures obtained from this method are geometrically invariant and highly discriminative for a particular logo, which is based on shape of the logo. The proposed method is highly robust to several geometric transformations such as rotation, translation and scaling. The comparison of the signatures obtained from this method makes it more computational intensive and also the detection of multiple instances of various logos in a image frame requires sliding window technique [1].

Later in year 1998, a new method for proposed to detect logos in the scanned images based on geometrical features as in [4]. Soffer et.al in [4] used the concept of identifying logos by using the negative shape features for similarity matching. The main idea of this approach is to enable the detection of shapes by computing the positive and negative areas of the logo in the scanned image. Further



