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GPS Aided Photo Search System (iGAP)

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Abstract- An iGAP Search Systemaids in identifying buildings through their photos captured by phone cameras. All that a user needs to do is, take a picture of the building with Android phone and upload the picture to this system. The system in turn returns the name and introduction of the building.
An image-based approach can be used to find location-based information from camera-equipped mobile devices. Content-based image retrieval methods are used to search the web or other databases for matching images and their source pages to find relevant location-based information.
In divergence to conventional approaches of location detection, this method can refer to distant locations and does not require any physical infrastructure beyond mobile internet service & simply a web service for information store. Also the Google API can be used to display navigation for the specified image - location on the Google map. In this paper, section 1 depicts the introduction of location-based information services. Section 2 describes the problem statement of iGAP. Section 3 outlines the existing system. Section 4 represents various technologies that can be used to create iGAP Search System. Section 5 portraysthe system architecture of iGAP.

Keywords - Google API, iGAP, GPS, content-based image retrieval, location-based information

I. INTRODUCTION

Location-based information services offer many promising applications for mobile computing. Although there are existing mobile computing interfaces or location based computing technologies for determining the precise location of a device, there are no common means to make a pointing gesture at a distant location.

Many phones are equippedwith features such as cameras and GPSs. These features provide useful information for users to discover and navigate their environments which is usually in the form of latitude/longitude and image. However, users may demand Meta information such as the names or introduction of the buildings around them.A system that combines network technologies and image retrieval algorithms is proposed to address this problem.

This paper presents an image-location based approach to specify queries for finding location-based information for the image. A user uploads a picture of a building, the system in turn returnsthe name and other introduction about the building.This system is composed of three layers: the client, the server, and the image retrieval component [4].

The mobile clientis based on Android mobile system. System administrators can sign into the system and manage all the building information, user uploaded photosand picture information [4]. As a mobile client, users only need to upload building photos to perform a search. Latitude and longitude are directly retrieved from GPS instruments [4].

The server is a conjunction of the client and the image retrieval component and has a database of the information and images of the buildings to be retrieved [4].

The image retrieval component finds its nearest image in the database, which indicates the building this image belongs to [4].A key problem in this system is how to estimate the similarity between a query image and those in the database. In this approach, the image is represented by frequency vectors.

II. PROBLEM STATEMENT

Most large scale search engines such as Google, MSN, Yahoo make use of text as query. In addition, these applications have already been put in mobiles to let more people use them without the limitation of place and time.

But the above mentioned search engines do not provide some enhanced features. This project is intended for partial development of Enhanced Searching and responsive service.

- Today there isn't any search engine other than some of the above mentioned ones that provide a better responsiveness to the user's request for the result.
- Today with a large number of people depending on Internet technology for the help even to see how stuff works, etc. So there should be enhanced results which are otherwise best provided by Google only.
- Aspect based Searching is not yet implemented by major content providers for a better result.
- None of the search engines, not even Google support the one of the ignored but applicable aspect of searching, i.e., image searching with image as a source for searching.

- Location personalization for the search criteria is not considered for general search which can help in getting précised location specific information.
- I consider Image & Location as the core contents for successful implementation of a search engine.

III. EXISTING SYSTEM

This program is inspired from GOOGLE Search Engine (a part of Google web services). Today the Google is the number 1 website for searching any kind of the information. In Google, it takes any kind of text data as input and shows all the possible results that almost match the entered phrase or the words from that phrase as list of websites hosting information on that as per a special ranking system.

A Web search engine is a tool designed to search for information on the World Wide Web [5]. The search results are generally presented in the form of a list and are called hits [6]. The search results may consist of web pages, images and other types of files. Some search engines alsomine data available in databases or open directories. Unlike Web directories, which are maintained by human editors, search engines operatealgorithmically or are a mixture of algorithmic and human input [5].

Typically, a search engine works by sending out a spider to fetch as many documents as possible. Another program, called an indexer, then reads these documents and creates an index based on the words contained in each document. Each search engine uses a proprietary algorithm to create its indices such that, ideally, only meaningful results are returned for each query [7].

IV. RESEARCH AND RELATED WORK

The research background and relevant related technologies includes: (1) Content based Image Retrieval (2) Color and Edge Directivity Descriptor (CEDD) (3) Location Recognition (4) Location-Based Information Retrieval

A. Content Based Image Retrieval

Content based image retrieval is a technique used to retrieve images based on image-specific characteristics such as color, texture and shape.In order to categorize and group images effectively we can think of an image to be made up of three levels of abstraction: the first level includes primitive features such as color and shape, the second level includes logical features which identify a particular object within an image and the third level includes abstract features which depict the significance of a scene.

CBIR can be thought of as comparing the target image to every single image in the image database and retrieving those images that are similar. Primitive features, namely color, texture and shape, are calculated for not only the target image but for every image within the database. Using these features a comparison algorithm will compute which images within the database are most similar to the target image and those images are retrieved. The capability of CBIR systems is stifled as they can only operate at primitive levels of abstraction. For example there are no CBIR systems which can search for a picture of a particular person given an image database. However there is a notion that combining primitive features along with text-based keywords will be able to overcome serious issues faced in image retrieval.

B. Color and Edge Directivity Descriptor (CEDD)

The color and edge directivity descriptor is a low level feature that can be extracted from an image and can be used for retrieval and indexing of an image. This is done by representing the image as a histogram on the basis of color and texture of the image. This descriptor is extremely suited for large database due to its size, which is only 54 bytes per image. Another important feature of this descriptor is that requires less computational power for its extraction as compared to other MPEG-7 descriptors. ANMRR (Average Normalized Retrieval Rate) is the phenomenon used to measure the performance of this descriptor. CBIR systems take into consideration a series of image-specific characteristics for effective image indexing and retrieval. The three most important, primitive characteristics, relating to images are color, texture and shape and most CBIR systems use a combination of the three features to retrieve images. These features are mapped on to a new type of dimension called as the feature space which is able to correctly depict visual characteristics. The key idea behind this extraction is that the features should be able to strongly resemble the visual content of the image. The color and edge directivity descriptor is able to combine in a single histogram important color and edge characteristics of an image and the descriptor provides this representation with a compact size of only 54 bytes.

C. Location Recognition

Location recognition systems seek to answer three pivotal questions

1) Where am I?
2) What is around me?
3) How do I get to a particular place?

There are two methods used for location recognition for mobile devices:

a. The GPS (Global Positioning System) module installed on mobile phones uses satellite signals to triangulate one's position however this method is not explicitly related to any cellular technology. Multiple satellites send periodic signals to the mobile device and the difference between them are calculated. Depending upon this difference the relative

position of the mobile device is calculated. For a mobile device to make use of GPS-based location services it must be equipped with a GPS receiver. The signals sent by the satellites are in an encoded form and can be decoded only by a GPS-enabled receiver. GPS are the most accurate location recognition system and can provide locations with error margins between 4m-40m if the GPS receiver has a clear view of the sky. The main drawback of GPS is that they require a robust infrastructure which can prove to be expensive. Also GPS receivers tend to consume a substantial amount of cell battery which can be troublesome [3].

b. The second one is GSM (Global System for Mobile Communication) in which the network is made up of multiple cells each with its unique cell ID. A cell is governed by a base transceiver station and keeps track of all mobile devices within its area. If a mobile device moves from one cell to another a handover process takes place in which resources relating to a mobile device are handed over. Handover can take place between BTS as well. A major constraint of this system is that cells are of inadequate size (ranging from 2km-20km) and also tend to overlap causing confusion.

D. Location-Based Information Retrieval

Search engines have now started using location-based criteria to conduct searches, which includes a text query and a user reference location. This enables the search engine to provide results closer to the user's geographic location, logically be of a higher precision. Unlike general web search engines location-based ones will rank the page according to geographical location as well. There are several pitfalls to develop a location-based search engine and so far there is no global location-based search engine. Some of the issues faced are location uncertainty, inadequate geographic data on web pages, language-specific and country dependent layout styles and multiple points being linked to a single resource. Even considering these inadequacies web search engines are providing location-based services for a mobile environment but they are restricted to certain geographical areas in the US and Europe.

One of the main tasks a location-based search engine must handle is the association of a web resource with its location thereby enabling it to handle location-based queries. A location-based query is different from a regular query as it requests for a topic as well as a reference location. For example for the query q= {"Restaurants in New York"} will denote Location L="New York" and subject S="Restaurants". Location-based search engines need to correctly distinguish between a location-based query and a regular query and although they differ considerably in structure they are handled in the same way. Search engines need to adopt the method of geo-tagging where geographic keywords within a web page are extracted and assigned as geo-tags. The geo-tags are used to associate a web page with a particular location.

V. SYSTEM ARCHITECTURE

Looking at the coarse architectural overview of the system as in Fig 1 it can be divided it into the following components; the mobile client (Android application), the web-based (Admin browser) client, the image retrieval modules (CEDD and Tanimoto Classifier) and the back-end image database.

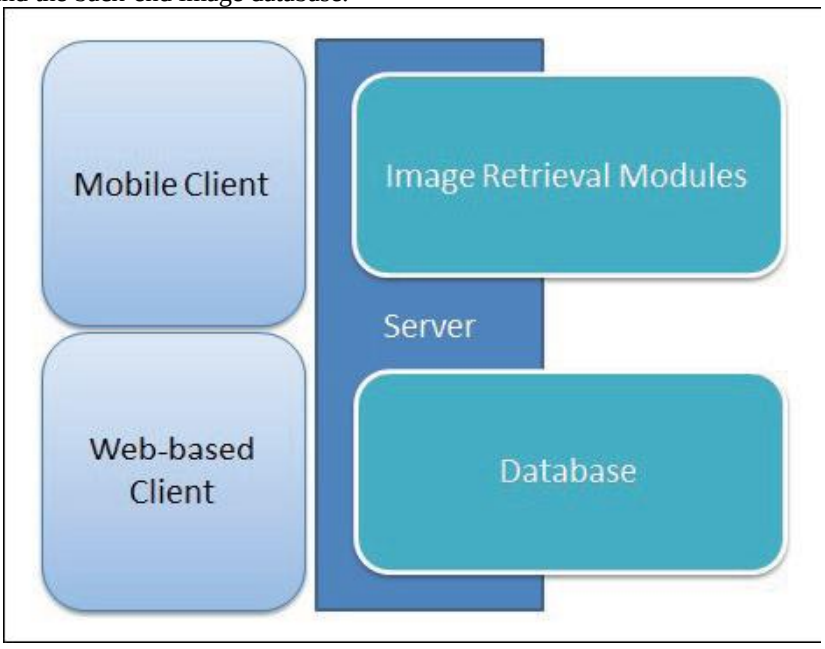

Fig1: Overall Structure of iGAP System

The mobile client is the most important component and is tasked with the following activities:

- Structuring of a query by using as input, an image, which has either been clicked by the mobile camera or that is present in the phone memory.
- Uploading of a structured query to the server. The structured query will include an image as well as location information (latitude & longitude) on the user.
- Displaying the result of the image search that was conducted by the server by either providing information on a particular building or returning an error message if no match has been found.

- If a match has been found the place of interest will be plotted on a Google Map, displayed on the mobile client, and the user will be provided with a short history on the building.

The web-based client, which is accessed by a web browser, is primarily tasked with handling the image database and includes the following activities:

- Adding, updating and deleting of images in the image database.
- Obtaining historical information on the place of interest and linking it to its image file.
- Obtaining location-based information (latitude and longitude) on the place of interest and linking it to its image file.

The image retrieval module includes algorithms for image indexing and comparison. Low level, color and edge features are extracted using the Color and Edge Directivity Descriptor (CEDD) method, and are represented by a histogram. The Color and Edge Directivity Descriptor is a characteristic property of an image and enables the image to be properly indexed. The low size (54 bytes) of the descriptor makes it optimum for use with large databases. For comparison a Tanimoto classifier-based similarity measure is used. The image database stores images that have been previously uploaded by the administrator. It serves as an image bank and stores multiple images. Provisions are made to store multiple image formats and image sizes.

VI. CONCLUSION

This paper proposes an image-based paradigm for location-aware computing. In this process, users take a photograph of the location and select a desired place. Content-based image retrieval approach will search for the relevant web pages which contains matching images. Unlike conventional approaches which detects nearby locations, this approach can detect remote locations without any additional physical infrastructure apart from mobile internet service.

Key Features:

- Results based on Images & Location.
- Provides user interactive environment.
- Results are pinned on Google maps with related information.
- Software is easy to operate which could be operated by any non-technical computer literate person.

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