

Chapter XVI

Analyst–Ready Large Scale Real Time Information Retrieval Tool for E–Governance

Eugene Santos, Jr.

Dartmouth College, USA

Eunice E. Santos

Virginia Polytechnic Institute & State University, USA

Hien Nguyen

University of Wisconsin, Whitewater, USA

Long Pan

Virginia Polytechnic Institute & State University, USA

John Korah

Virginia Polytechnic Institute & State University, USA

Huadong Xia

Virginia Polytechnic Institute & State University, USA

Fei Yu

Dartmouth College, USA

Deqing Li

Dartmouth College, USA

ABSTRACT

With the proliferation of the Internet and rapid development of information and communication infrastructure, E-governance has become a viable option for effective deployment of government services and programs. Areas of E-governance such as Homeland security and disaster relief have to deal with vast amounts of dynamic heterogeneous data. Providing rapid real-time search capabilities for such databases/sources is a challenge. Intelligent Foraging, Gathering, and Matching (I-FGM) is an established framework developed to assist analysts to find information quickly and effectively by incrementally collecting, processing and matching information nuggets. This framework has previously been used to develop a distributed, free text information retrieval application. In this chapter, we provide a comprehensive solution for the E-GOV analyst by extending the I-FGM framework to image collections and creating a “live” version of I-FGM deployable for real-world use. We present a Content Based Image

Retrieval (CBIR) technique that incrementally processes the images, extracts low-level features and map them to higher level concepts. Our empirical evaluation of the algorithm shows that our approach performs competitively compared to some existing approaches in terms of retrieving relevant images while offering the speed advantages of a distributed and incremental process, and unified framework for both text and images. We describe our production level prototype that has a sophisticated user interface which can also deal with multiple queries from multiple users. The interface provides real-time updating of the search results and provides “under the hood” details of I-FGM processes as the queries are being processed.

INTRODUCTION

One of the main challenges in E-governance is to effectively and efficiently find relevant information from vast amounts of dynamic heterogeneous sources quickly under the pressures and limitations of time, supporting tools, and resources. For instance, when natural disasters such as Hurricane Katrina (2005) or the Asian Tsunami of 2004 happen, we need to quickly locate the areas that are most affected and collect information in order to estimate the amount of relief items such as medicines, foods, and drinking water. Unfortunately, in such a situation, frontline communications are typically chaotic and/or there are too many channels of information from different sources that make the retrieval of relevant pieces of information a lot harder. For “hot spots” such as disaster relief areas, combat zones, etc., information is changing rapidly and as such, there is only a small window of time during which information remains valid. Additionally, various types of data representation are used such as images, blogs, maps, news reports, audios, and videos. Each type of data format contains important and indispensable information for the various governmental agencies. Therefore, in order to better assist these agencies in addressing these challenges, there is a clear and urgent need to develop a system that rapidly provides real-time retrieval capabilities of heterogeneous sources of information. There are three main issues that we need to address: (i) how to gather and retrieve

information quickly in a real-time setting given the limitations of resources and time; (ii) how to address the problem of **heterogeneous data**; and, (iii) how to improve retrieval success.

We address the above issues by developing a **framework** for intelligent foraging, gathering, and matching (I-FGM) that incrementally and distributively gathers, processes, and matches information nuggets to assist users at finding information quickly and effectively. In our previous work (Santos et al, 2005, 2006), I-FGM has been empirically demonstrated to be an effective tool for text retrieval on large and **dynamic search** spaces. Even though unstructured text is a typical format for most databases/sources, images are also popular with significant support from commercialized search engines such as Google, Yahoo!, and MSN. In order to demonstrate that I-FGM is a general framework for information retrieval, it is necessary to study the system’s ability at effectively handling such heterogeneous databases which contain at least text and images. In this chapter, we apply the I-FGM framework on image collections by using a Content Based Image Retrieval (**CBIR**) method. We approach this by incrementally processing the images, extracting low-level features, and then mapping them to higher level concepts. The novelties of our approach lie with the distributed storage, and incremental processing and matching of information nuggets extracted from a region-based wavelet image retrieval scheme. We deploy a concept-based image retrieval algorithm that maps low level features

25 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/analyst-ready-large-scale-real/9004

Related Content

A Case of Affordances: Collaborative Governance Using Smartphones

Swapnil Sharma, Umar Bashir Mir, Arpan Kumar Karand M. P. Gupta (2022). *International Journal of Electronic Government Research* (pp. 1-21).

www.irma-international.org/article/a-case-of-affordances/301256

Evaluating Social Networking in Public Diplomacy

Hyunjin Seo and Stuart Thorson (2010). *Politics, Democracy and E-Government: Participation and Service Delivery* (pp. 243-259).

www.irma-international.org/chapter/evaluating-social-networking-public-diplomacy/42585

E-Governance and ICT Enabled Rural Development in Developing Countries: Critical Lessons from RASI Project in India

G. Kannabiran, M.J. Xavier and T. Banumathi (2008). *International Journal of Electronic Government Research* (pp. 1-19).

www.irma-international.org/article/governance-ict-enabled-rural-development/2052

E-Transformation of Societies

L. W. Zacher (2007). *Encyclopedia of Digital Government* (pp. 754-762).

www.irma-international.org/chapter/transformation-societies/11589

Evaluation and Metrics of E-Government: From eEurope 2002 to Digital Agenda 2020

Haroula N. Delopoulos (2013). *Developing E-Government Projects: Frameworks and Methodologies* (pp. 290-322).

www.irma-international.org/chapter/evaluation-metrics-government/77098