Mobile, Ubiquitous Information Seeking, as a Group: The iBingo Collaborative Video Retrieval System

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ABSTRACT

iBingo features two or more users performing collaborative information seeking tasks, using mobile devices, Apple iPod iTouch in our case. The novelty in our work is that the system, called iBingo, mediates the collaborative searches among the users and performs a realtime division of labour among co-searchers so users are presented with documents which are both unique and tailored to the individual. This enables each user to explore unique subsets of the retrieved information space. We demonstrate iBingo mobile collaborative search on a video collection from TRECVid 2007.

Categories and Subject Descriptors

H.5.1 [**Information Interfaces and Presentation**]: Multimedia Information Systems; H.3.3 [**Information Search and Retrieval**]: Search Process

General Terms

Algorithms, Design, Human Factors

1. INTRODUCTION

As computing and digital technologies in general have evolved, we have always sought, and usually found, applications which support the social side of our nature. Computer networks are used to support email, chat and other communications among people, and the world wide web has now grown to offer social networking through MySpace, FaceBook and others. These forms of networked communication tend to facilitate inter-personal interactions over large geographic distances and are often asynchronous. However, often our preferred socialising is both realtime and co-present.

A special report in *The Economist* in April 2008 on mobile telecommunicaitons [**?**] argued that a world of ubiquitous wireless access to information is almost upon us and is changing the way we work, live, love and relate to places and to each other. The article observed the emergence of bedouin behaviour among people as we work and socialise, hopping

from one wireless access point to another. It argued that this *nomadism* is good for re-enforcing our in-groups (of people), our close circle of friends, family and co-workers, but at the expense of our interaction with strangers whom we increasingly shun as we focus inwards on our own in-groups.

When we interact in groups, one of the things we regularly do is search to find information, and we do this both in social and in work settings. "Did Al Pacino star in the movie Scarface ?", "What is on TV tonight ?", "Where can I find a good recipe for soda bread ?". We're constantly asking questions of each other and more often than not we answer those questions from among our social circle. "Yeah, he played the lead role, Tony Montana", "Nothing much, except a movie later" and "Oh I have one at home" are typical replies. Nowadays, with ubiquitous access to online information as an assumed norm, when we cannot answer these questions we have the internet on our mobile devices to help us.

At present, most search systems are designed to support single-user searching in a stateless manner, i.e. with no continuum between one query and a user's follow-on or subsequent queries. Several systems such as I-SPY [**?**] have gone beyond that to leverage a user's or a group's collection of searches and relevance judgments but again the support is for a single searcher, working alone. In scenarios where a group of collocated people wish to do a shared online search, together, usually just one person does the searching and the others watch or provide input. If more than one device is available and more than one person searches then they do so independently as the system doesn't support synchronised collaborative search in any way. Although there may be verbal synchronisation within the group, without sufficient coordination of collaborating users' search processes, users may find themselves replicating the efforts of their co-searchers.

In our work we have developed approaches to supporting synchronised collaborative information retrieval where the "wisdom of the crowd", or more correctly the wisdom of the group of co-searchers, is leveraged to the benefit of the group's information need. This benefit includes eliminating redundancy and repetition among co-searchers and increasing efficiency. Our system, called iBingo, allows users on mobile devices (Apple iPod Touch) to synchronously search to satisfy a common, shared information need, and it is described in the next section.

2. THE IBINGO MOBILE COLLABORATIVE SEARCH SYSTEM

In IBINGO, co-searchers can work independently to locate relevant information, however their indications of relevance are exploited to the benefit of the group. IBINGO also allows users to explore different facets of the shared information need by enabling each user to freely explore separate information "trails" during their search. In the IBINGO demonstration system, we apply techniques of *division of labour* among co-searchers, wherein the system which mediates the search, and will decide which of the returned search items are to be presented to each co-searcher.

Initially the division of labour coordination policies seek to provide all co-located searchers with a set of highly relevant and diverse results. Then as an individual searcher locates relevant items and begins to pursue an information trail, the collaborative engine will adjust the result set provided to this user in order to provide high recall. Judged relevant items are used to seed the information trail for this user and as such the system returns as many highly similar items from the collection to this user. In addition the collaborative engine uses this information to coordinate each collaborating user's activities to ensure they each explore different facets of the information space. In this way we can maximise the effectiveness of the group search and ensure good coverage of the collection.

IBINGO as shown in Figure 1, allows two or more co-searchers, each one using an iPod Touch, to communicate wirelessly with a central mediating server (a laptop computer) which performs searching on a corpus of around 50 hours of broadcast TV video taken from the TRECVid 2007 search collection [?]. A mediating layer within IBINGO makes calls to a multimedia search engine which supports text searching against closed captions and speech recognised text, as well as a variety of image-based search types. The search engine functionality is described in [?].

the demonstration, the laptop provides an overview of the progress of the collaborative search for observers to view and in particular, the laptop displays all the relevant items found while also displaying the documents currently being examined by each collaborating user. This shared display can also allow users to monitor progress of the search. As the system uses wireless communication between the iPods and the laptop, users do not need to be beside the central server but can move about in a freeform fashion.

The results of the initial search, which are multimedia video shots, are then presented to each co-searcher who make relevance judgments independently of each other. As these relevance judgments are made and fed back into the system, the collaborative layer of IBINGO intelligently reformulates the query and re-ranks as yet unseen video shots according to the division of labour policy. The net effect of having the system coordinate the collaborative search is that co-searchers are free to interact with each other about issues of the retrieved items and not about synchronising their search. Consequently, communication within the collocated group shifts from discussions about coordinating the search task to conversations on the results of the process.

At the moment, mobile internet enabled devices such as the iPod Touch offer unique portable platforms to effectively support groups wanting to search together. Shared tabletops and public displays are gaining popularity and prevalence at the moment. These novel interactive surfaces including MERL's DiamondTouch [?] and Microsoft's Surface, offer new opportunities for supporting synchronous collocated collaborative search. The techniques developed within the IBINGO system will then easily transfer to those other platforms.
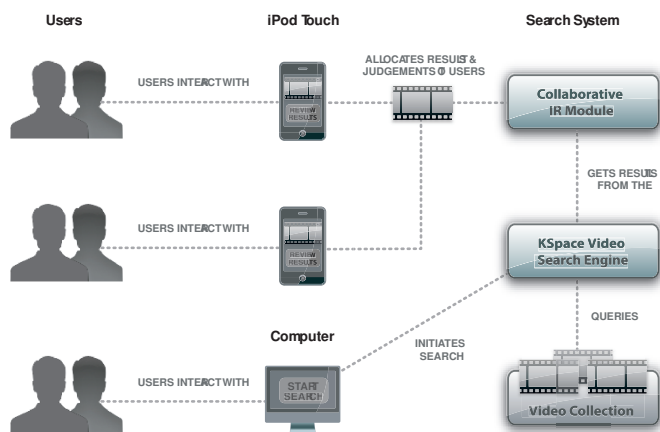
Acknowledgment

Figure 1: The IBINGO mobile collaborative search system

In our demonstration system, a collocated group search is initiated via a laptop interface, after which the search is controlled by users using Apple iPod Touch devices, although in reality an iPod could easily be used to initiate the search. In