CoFox: A visual collaborative browser

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ABSTRACT

This paper outlines the preliminary design of a novel synchronous collaborative web browsing system named CoFox. CoFox differs from other collaborative web browsing systems in that it provides a live video stream of web content being viewed by the remote user as the main awareness supporting mechanism. Additionally, it allows users to scroll through the remote user video screen capture to re-watch any part of the search session. As well as screen capture features, also included is a set of collaboration tools including video segment annotations, shared links and instant messaging. CoFox provides a platform for a pair of users to tackle collaborative tasks; which may greatly benefit from the expertise of more than one individual. We outline the graphical user interface components from which CoFox will be composed, the hypothetical benefits provided by such a system and finally describe a possible user-based evaluation methodology.

Categories and Subject Descriptors

H.5.0 [**Information interfaces and presentation**]: General

General Terms

Design, Human Factors

Keywords

Information Retrieval, browser, collaborative, paired, synchronous, visual

1. INTRODUCTION

Many existing collaborative web browsing systems such as SearchTogether [5] or Coagmento [10] make use of a shared history amongst the members of the group. The shared history contains suggested URLs, queries used, snippets of information extracted from web pages, etc.

As such, when a member of the group wants to re-visit a result, they need to access the shared history in order to visit the relevant pages. Similarly, pages from the shared history must be re-loaded to access to the information. Many web pages require session data to show the relevant information previously found by a user (ticket booking systems for example), and it would be impractical to store a URL since the session context would change.

In addition, if users are collaborating remotely and synchronously, to the best of our knowledge, there are no tools to support a visual method of referring to fragments of information whilst still in context, analagous to pointing to information in a physically co-located scenario.

Finally, the explicit ordering of activity exposed by the video capture may increase awareness of the progress of the other participant throughout the task.

This position paper introduces a prospective study involving the creation and evaluation of a collaborative browser for pairs of users, named CoFox. CoFox has been designed with consideration of the aforementioned issues to study user behaviour and strategies for remote visual collaboration. CoFox is a collaborative browsing system enriched with visual feedback of the remote user, through the use of a "remote user window" which is contained in the remote user area. The "remote user window" provides a live visualization of the remote user's current browser tab. Along with the "remote user window" the remote user area includes the following collaborative tools:

- Video history bar: This bar will be placed under the remote user window, with functionality similar to that of a video player progress bar. This will allow the user to explore the previous activity of the remote user by scrolling through the bar.
- Annotations: Users will be able to associate text annotations with segments of video history which represent important contextual information. Annotations will be synchronised and shared with the search partner.

The remote user area includes an instant messaging (IM) system that allows users to communicate with their search partner. The IM system in conjunction with the "remote user window" helps the users to concurrently discuss and evaluate results they have previously found.

In Section 2 we summarise the motivation for the CoFox system. Section 3 provides a brief review of existing collaborative systems. Section 4 discusses the intended benefits users may experience with CoFox. Section 5 presents the system prototype and explains each component. Section 6 outlines an evaluation procedure. Finally, Section 7 concludes the intended future work and directions.

2. MOTIVATION

There are many existing systems which faciliate collaboration through algorithmic mediation. Alternatively, some systems allow users to manually organise results by sorting them in different containers which are shared with a group of users. Although these systems have been proven to help users collaborate effectively, a common factor to many is the steep learning curve of new concepts and working practices in order to maximise collaboration effectiveness. The motivation of this study is to explore other alternatives for collaboration. By adapting and combining everyday elements, such as video players, instant messaging clients and a browser history we wish to faciliate a more natural approach to collaboration, as is observed in the group information immersion and sharing in physically co-located environments.

By using video and keyframe annotations as described later in section 5, we want to explore new methods of supporting collaborative activity and evaluate their effectiveness when compared with individual web searching.

3. RELATED WORK

Collaborative systems, such as SearchTogether [5], focus on the group dynamics of collaboration. It does so by keeping a common history of the activity of all users. Each user is provided with tools to store, sort and access queries or URLs contained in the history provided by any of the group members. SearchTogether also provides a tool called "split search", which divides the results of a search amongst the users for them to evaluate.

Alternative input and output devices have been extensively studied in collaborative search tools. For example, CoSearch [1] is a system developed for co-located search by exploiting the use of many pointing devices or mobile phones, in order to explore results or to suggest new queries. Other systems such as WeSearch [7] use a table-top multi-touch display to allow a group of co-located users to collaboratively search, share results, discuss and evaluate information. A drawback of this system is that it can not be used remotely.

CoSense [8] was intended to help ease the sensemaking process when users are engaging in collaborative information seeking activity. CoSense organises all data related to the collaborative session, such as chat messages, URLs, comments associated with the URL, etc. CoSense uses novel information visualization technique to reduce the complexity of data presented to the collaborating users.

Coagmento [10] is a collaborative system designed to allow multiple users to collaborate on a project. Coagmento records navigational information such as queries and urls, which can be later accessed by any of the collaborators in a project, at any point in time. It also supports snippet creation from information contained in the visited web pages and the creation of comments, which are also associated with a particular project and shared with other collaborators registered in it.

Whilst some of these systems allow a user to view the remote user's screen, it is not used as part of the user's search process and it is regarded as a supplemental feature (as in the case of SearchTogether). Our study takes a primarily visual approach to collaboration, supporting awareness through the sharing of both users screens as a live video (video history), building the system around this visual context and division of labour through the use of the built-in instant messaging system.

4. EXPECTED BENEFITS

We hypothesise that by addressing the issues outlined in Section 1, users will experience some of the following benefits using the proposed system:

- A more natural method of collaboration by allowing the users to refer to pieces of information in context, whilst using IM. The work introduced by E. A. Isaacs and J. C. Tang [3] comments on the significance of not requiring a conscious action for behaviour which is normally unconscious. Allowing users to point through the use of highlighting on a synchronised image of your current document avoids the need of having to tell the remote user, where to look for the information being evaluated to keep it in context as it would happen in a conversation.
- The results can be evaluated efficiently through the use of the "remote user video history bar". The remote video bar allows users to re-create the whole searching session of their search partner. The segment annotations made by the users when finding relevant information, will prove a good tool to identify keyframes associated with desired results.
- The system is very user friendly, in particular for novice users. By allowing the users to examine the steps carried out by their remote search partners we are providing a potential tool for helping novice users learn from more experienced users.
- The system will allow users to collaborate even when accessing dynamically generated web pages. Some approaches such as the ones proposed by D. Lowet and D. Goergen [4] require complicated handling of the DOM (Document Object Model) tree of web pages using JavaScript. On the contrary, CoFox extracts a screenshot of the local browser and sends it over to the remote browser. This approach solves the problem of collaboratively accessing dynamically generated pages whilst still keeping some degree of security by not allowing users to interact directly with the remote user's results which might contain personal information such as emails.
- High user satisfaction. The users are presented with a friendly and straightforward GUI, which resembles a simple web browser. In addition, the exploration of the video history through scrolling will be more satisfying than having to use a primarily textual approach.

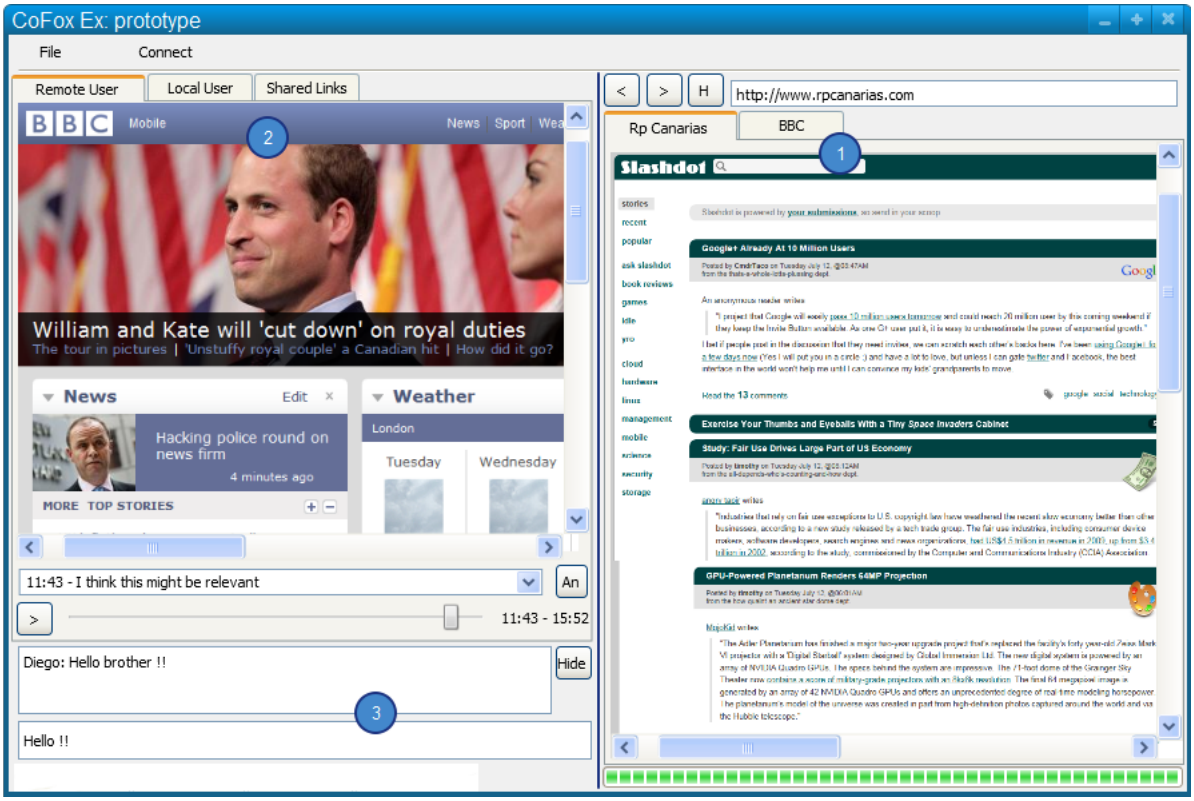

Figure 1: CoFox: Graphical user interface prototype

5. SYSTEM PROTOTYPE

Figure 1 shows the proposed interface prototype for CoFox. It has two major areas: the remote user area (2,3: Left panel) and the local user area (1: Right panel). The local user area is built to resemble a standard web browser and therefore it comprises all basic elements, such as navigation buttons, address bar and navigation tabs.

The proposed collaborative tools are built in the remote user area. Occupying the largest area is the remote user video frame (2: Left panel). The remote user video frame allows the local user to see what the remote user is doing at all times. This represents the main mechanism of awareness built in CoFox and most of the functionality builds around it.

The remote user video frame includes a play button and a slider bar. The slider bar allows the local user to scroll through the remote user's video history and analyse previous points in time, so that local users can see how remote users navigated to a particular web resource.

Likewise, clicking on the "local user" tab CoFox will present the local user with a similar frame which allows the user to interact with his own video history, see previous information, make new annotations, or review the annotations made by the remote user.

Since it can be difficult to make sense of the remote user's video history on its own, users can create keyframes centered in particular fragments of information just by right clicking on them and choosing the appropriate option from the contextual menu. These keyframes can have associated text annotations containing further contextual information. If the users wish to navigate to a particular keyframe, they only need to move the slider provided or select the event in the drop down box right under the video stream.

If the local users wish to examine more specific information related to the remote user's navigation, they can click on the script tab. This will show another window which contains, in a textual fashion, the sequence of steps followed by the remote user during their session.

There is another frame which can be accessed by clicking on the "shared links" tab. This frame contains a list of links that have been shared with you, or by you, with another user.

At the bottom of the remote user area (3: Left panel) there is an IM area. The IM area allows users to communicate textually and it can be hidden at any moment to gain more space in the remote user area by clicking the hide button. The IM area also shows events related to the collaboration such as when a remote user shares a link with the local user.

6. EVALUATION

A user evaluation will be carried out to study the effectiveness of the proposed system. This evaluation will compare the performance achieved using CoFox with collaborative functionality and without. During the evaluation, the users will try to complete three tasks in three different scenarios.

These scenarios are:

- Solo: Each user completes the task on his own. It simulates the scenario where two users with a common information need search individually to later report their findings to each other.
- Together: Each pair of users completes the task using the same computer(Co-located). It simulates a very common scenario as identified by S. Amershi and M. Morris [2] in which a pair of users sitting at the same computer try to satisfy a common information need.
- CoFox: Each pair of users completes the task using the proposed system on two separate computers. This scenario simulates the proposed system where two remote users with a common information need work together to fulfil it.

The users will also be given questionnaires to collect qualitative information about the system, in order to determine the user satisfaction perceived by the users when using CoFox for collaborative tasks.

Quantitative data will be collected from user interaction logs. This data will be analysed in order to assess the efficiency of the approach followed by the system through measures such as queries per session, overall results viewed and query and result view time distributions.

7. CONCLUSIONS

This paper has introduced a study in progress describing the design of CoFox, a collaborative browser built around visualisation of the remote user screen. The proposed functionality allows users to scroll through the video history of the local or remote user, increasing the awareness of the processes carried out by the users during their information seeking. To further support awareness, the system will include a tool for textual annotations that will allow the users to associate contextual information to specific keyframes of the local and remote video history during their information seeking activities.

To support division of labour, the users are able to organise themselves, discuss and evaluate results by using the IM system provided. In addition the users can share links that they evaluate as important with the other users and attach annotations. To study the performance of our approach, we have designed our system to be used by a pair of users. This decision has been taken not only to carry out our experiments outwith the effects of group dynamics, but also because paired collaboration is the most recurring type of collaboration.

Finally a user evaluation will be carried out to collect qualitative and quantitative data when using the system in the different scenarios. The data will be analysed and used to assess the comparative performance of the system.

Through this study we aim to explore a different alternative by using video history and keyframe annotations along with the previously studied IM and link sharing. The results of the study will give further insight into whether this approach is a viable alternative to consider for collaborative web browsing.

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