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Project Proposal

iMobile: Redesigning the mobile interface

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1 Project Description

The aim of this project is to investigate an alternative interface for the mobile platform. Thus far, most mobile interfaces have simply been adaptations of the desktop metaphor, in which users employ applications to perform tasks and hierarchical file structures to organise information [1][2].

The new interface that is to be developed will shift focus away from the desktop metaphor, and instead look at developing a more natural way for users to interact with their personal information. This will be done by developing a prototype interface that runs on Android enabled smart phones.

Particular focus will be on novel ways of representing information organisation and information retrieval. A mobile adaptation of the Lifestreams [2] desktop system will be used for information organisation, making use of a unified inbox and organising data by time. Search will form a fundamental part of the interface and an associative query system similar to Feldspar [3] will act as the backbone for information retrieval.

This new interface is to be evaluated against traditional application oriented mobile user interfaces such as those of iPhone and Android.

2 Problem statement

The hierarchically organized, application based desktop metaphor used on many user interfaces today has been shown many times to be an ineffective way of both organizing and retrieving data [1][4][5]. When the same concepts were then ported to be used also on mobile computing devices the same problems remained, and actually became worse. This worsening was due to the fact that there lay many inherent differences between mobile and stationary computing devices [6] [7]. However, at a desktop level, many of these problems were investigated and solutions were given in an attempt to replace these outdated ideas (see related work section). Unfortunately, none of these systems or concepts has yet been actualized on a mobile level. What the research proposed in this paper aims to do is to investigate how successful these ideas from previously proposed systems would be when implemented on a mobile system as a single-user interface. This new interface would, once created, completely replace all the data organization and retrieval tasks already performed on the devices in a non-application specific, non-hierarchically stored way. Instead, the system would implement ideas mainly stated in two separate papers—the Lifestreams [2] user interface and the Feldspar [3] search interface. These look, respectively, at the inter-dependant yet separate areas of data organization and data retrieval.

2.1 Data organization

For data organization, the central idea that designs will revolve around is that of the Stream. A Stream is a virtual area on the user's device where all their data is stored, regardless of application type. The stream would then be ordered by time, with new items entering the system being placed near the front of the stream and older items then being pushed towards the back. Further organization would be achieved via the implementation of constructs called views, which are inspired by the Haystack system [8]. These views are persistent visualizations of data filters which are defined by the user. Any new or existing data fitting into the filter's criteria would then be displayed in its view. These views would also be application
independent and time ordered, and would act as the primary filing system – essentially allowing for data organization using user defined criteria. Although singular items could also be added or removed to any single view, and multiple views will be able to be split or merged, the main method for creating views will be through a sophisticated querying method. This querying method is explained further below as the data retrieval.

2.2 Data Retrieval

An important feature seen in many of the systems proposed as new paradigms for
computer interfaces (such as lifestreams) is search based data retrieval. For this reason it can be seen that having an effective search query construction interface is an important aspect of this new interface. The paper from which this project will be drawing inspiration and from which will be implemented on the mobile interface is the one describing the Feldspar Associative Query System. Feldspar is a desktop query system that uses associative retrieval of personal information [3]. Feldspar takes the philosophy that people remember things by association and uses an orienteering approach to retrieve information, allowing users are able to specify multiple queries to refine their search. When implemented on the mobile interface a linking system, as seen in the Life Ideas [15] paper, will also be integrated. This would allow the user to browse through related sets of documents, with relations being worked out from tags and other textual information.

2.3 Research questions:

On implementing this system which would incorporate the above mentioned proposed solutions, the research questions which will be investigated will thus be:

1. a) Can a time ordered user interface with user defined contextual organizing based on the Lifestreams system be implemented successfully on a mobile platform?

1. b) If so, would it be preferable (with preferability being defined xxbelowxx)?

2. a) Can associative query based data retrieval system based on the Feldspar system be implemented on a mobile platform?

2. b) If so, is it preferable?

3 Related Work

Query systems can be divided into two types, orienteering and teleporting [11]. Orienteering is the most natural user search behavior and involves refining search results through a series of iterative query steps until the target result is reached. Searching the web and querying personal information are different. When querying personal information, the user has knowledge about the data they are searching for and is familiar with the search results that are displayed [12] [13]. A number of query systems including Life-Idea [15], FaThumb [14], Stuff I've Seen (SIS) [9] and Feldspar [10] were looked at. Of the four query systems examined, Feldspar was found to be the most suitable. Feldspar is a desktop personal information management system that is centered around associative search. The user is given hints or clues as to the type of data that they may search using. The use of simple language links makes building query phrases intuitively easy. In terms of the data organisation aspect of the project, only [2] and [8] have tried to implement similar ideas, but only at the desktop level. On mobile devices the implementation will be extremely novel.

4 Procedures and Methods

4.1 Development Platform

The system will be developed on the currently popular Android platform. Android phones are currently on the rise, with Google - who manufacture the phones - claiming that 200 000 Android enabled phones are sold daily. Development on the phone is done entirely in the Java programming language, with Android specific classes and functions being available through the Android Software Development Kit (SDK) and Android Development Tools (ADT). These provide a comprehensive set of functionality to aid development including, amongst other things, debuggers, libraries and a computer based mobile phone emulator. The officially supported integrated development environment (IDE) is Eclipse, which is available most major operating systems.

4.2 System Design

As mentioned earlier, the interface prototype will consist of two components; the information retrieval system (or query system) and the information organisation system. The information query system will be based on the Feldspar desktop solution, which provides associative search functionality. Users are able to build queries based on associative clues or hints. The user then has the ability to refine searches using multiple queries.

The data organisation system will be an implementation of Lifestreams. All information will be stored in a unified inbox ordered by time (with recently used items appearing first). This information will then be able to be filtered using the underlying query system. Popular queries and filters can be saved and used as an organisational feature.

4.3 Expected Challenges

Due to time constraints, it will not be possible to implement a fully-fledged working implementation of the Lifestreams and Feldspar systems on a mobile platform. The main focus will thus be to build an application that conveys the feeling of the interface. That is, to provide enough functionality for the user to get a good feeling for how the system is supposed to work. Ultimately allowing users to be able to compare and test it against other systems.

Due to constraints of the mobile device such as screen size, the Lifestreams and Feldspar systems may very well need to be adapted to make them operable on a smartphone. The interface that is developed for the mobile may end up looking completely different to the desktop version. While this is fine, it is important that the concepts adapted from the desktop system are still present.

4.4 Testing and Evaluation

This is an experimental computer science project, with one of the main goals being to determine whether a non-application oriented mobile interface is more useful and preferable to users than an application oriented mobile interface. It is thus very important that once the interface prototype has been developed, extensive user testing is carried out. The newly developed interface will be compared to two traditional application oriented mobile interfaces, namely, iPhone and Android.

Satisfaction with the various systems will be determined using questionnaires and interviews with users. The qualitative data gleaned from these methods should provide insight into user preferences and an indication as to which is the overall preferred system.

Quantitative data such as the time taken to complete a set task and the number of steps or key presses required to complete that task will also be recorded. This information should indicate the system that provides the user with the most rapid results.

Since the newly developed system may be foreign to many users, this may affect performance. Users using a system for the first time may not be familiar with how things work and thus perform poorly compared to other systems (that are more familiar to them).

It is thus important to carry out tests not only for first time users which gives an indication of how intuitive the system is to use, but also perform longer term testing that allows users to learn the system first and only then measure their performance. It would also be useful to note the learning curve of each system (i.e. the effort required before one is proficient with that system).

5 Ethical, Professional and Legal Issues

Due to the nature of the project, a large amount of user testing is essential to

compare the various interfaces. Ethics Clearance from the University is required to perform the experiments outlined in the previous section. Since many of the experiments will be involving University Students, permission from Student Affairs is also required.

6 Anticipated outcomes

6.1 System

It is expected that the entire system described above should be able to be completed. While it may not include the entire functionality of a full mobile user interface, all of the data accessing and organization systems proposed should be present. The system will handle all data organization and retrieval, but the actual opening and handling of files will be done by the appropriate system tools and applications native to the device (see figure 1 in the appendix for descriptive diagram).
Namely we expect to have:

- Time ordered "stream" for general storage of user information
- Fully functional associative query system for the information
- User defined contextual views of queries
- Unified user interface for the entire system.

6.2 Expected Impact

The most essential components of the chosen system—time ordered data, user defined contextual views and associative querying—were all chosen to complement the way the human mind works. Thus, it is expected that the system should be intuitive for novice users. Also, through the performance of the query-based organizations, experienced users should be able to use the system in fast and efficient ways. Below are the specific impacts expected from the implementation of the system.

6.3 Time Ordered Views vs. Hierarchical Filing

It is expected that users will find the Streams/View method of data organization easier to use than traditional hierarchical filing systems. The fact that information will be organized according to user defined query filters, as opposed to application type, will mean users can store data in more natural ways. As [10] paper showed, users tend to think about files as being grouped by association or projects, rather than grouping them by type or other such criteria. Thus we expect user productivity and also for user satisfaction to increase as compared to on traditional systems.

6.4 Associative Querying vs. Files/ Linear search

As it has been proven before, having an orienting approach to searching is a more

effective method than traditional search methods. Traditional search based interfaces—though proven to be an improvement on file based systems— are better than having the user do a manual linear search. As a result, it is expected that this system's associative search based interface will surpass traditional systems in terms of data access. It is expected that, although overall time spent searching might be longer, users will find the information returned more easily and accurately.

6.5 Key Success Factors

Success rates for this project will be judged by two factors. Firstly, it will be judged by whether or not we are able to port the desktop computer based systems to smaller, mobile phones. This part of the project will be easy to evaluate, as one could simply go through the list of functions mentioned above to see if they have been implemented.

The second part of this project will be tested for success over three components: (1) the data organization, (2) the query system and (3) the overall system in its entirety. Over these three areas the same questions will be asked, namely (a) whether or not users prefer the system when compared to traditional ones and (b) whether the users on the new system have increased productivity (measured by the speed and accurateness of task completion). These six factors —1.a, 1.b etc—will be how success in this part project will be judged. It can then be seen that this second section of the evaluation process are highly dependent on success within the first part of the project.

7 Project Plan

7.1 Risks

7.1.1 Hardware Failure

There will be two Android smart-phones being used, which allows for two people to perform development, testing and evaluation in parallel. Should one of the devices fail, the phases mentioned above can still be completed, however more time will be required for each phase. Should both devices fail these phases will come to a halt unless a new device can be obtained soon after.

Severity: High

Likelihood: Low

Mitigation: Should one device fail development will continue using the last remaining device and the timeline adjusted to accommodate for extra time that will be required. Should both fail an alternative approach will be used, where by the interface will be simulated on a desktop computer.

7.1.2 Conflict between Group Members

Should a conflict arise between group members, it may lead to severe disruption.

Severity: High

Likelihood: Medium

Mitigation: Clear communication between group members is of vital importance. Weekly meetings should be held to aid in promoting this communication.

7.1.3 Group members leaving

Should a group member not be able to continue with the honors course due to failure or personal reasons. The project will not be able to be completed as the work load would be too high for one individual.
Severity: High
Likelihood: Low
Mitigation: The work shall be divided up into modules that are as independent of each other as possible. Each module should be of significant size so that an individual is able to submit it as an individual honors project.

7.1.4 Failure to obtain Ethical Permission

The research goals of the project depend highly on user evaluation and testing of the system. Should ethical permission not be granted by the University, it will not be possible to allow user experimentation and the project will most likely come to a halt.
Severity: High
Likelihood: Low
Mitigation: Ethical permission should be applied for as early as possible. Two or three weeks are generally required before a response is received.

7.2 Resources Required

The main requirements for the project will be mobile devices (either cell phone or pad) that are running the Android operating system. In terms of development nit much is required besides a set of two Computers with the Android SDK and ADT on Eclipse, which can be installed on the project members personal computers. During the User testing and evaluation stages of the project money for incentives would also be needed.

7.3 Gantt Chart

Please refer to appendix for the Gantt chart.

7.4 Milestones

Project proposal due	19 May
Presentation of project proposals	26 May
Initial project web presence	14 June
Final project report due	31 Oct
Project poster due	3 Nov
Final project web presence due	7 Nov
Project demonstrations	8 Nov
Individual reflection paper due	11 Nov
Final project presentation	18 Nov

7.5 Work Allocation

The nature of the proposed system allows itself to be easily split in two in terms of the work allocation. This main split would have one member Working on the data organization, and the other working on the data retrieval. This split can span the entire length of the project, from design till testing, with only the final evaluation of the entire system as a whole requiring both members active participation. The work will thus be allocated as follows: Mohato Lekena will be implementing the data organization functionality while Matthew Krog works on the data retrieval query systems. The only area of work overlap will be in the very last stages when both sets of functionality need to be integrated into a single system and tested.

8 References

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9 Appendix

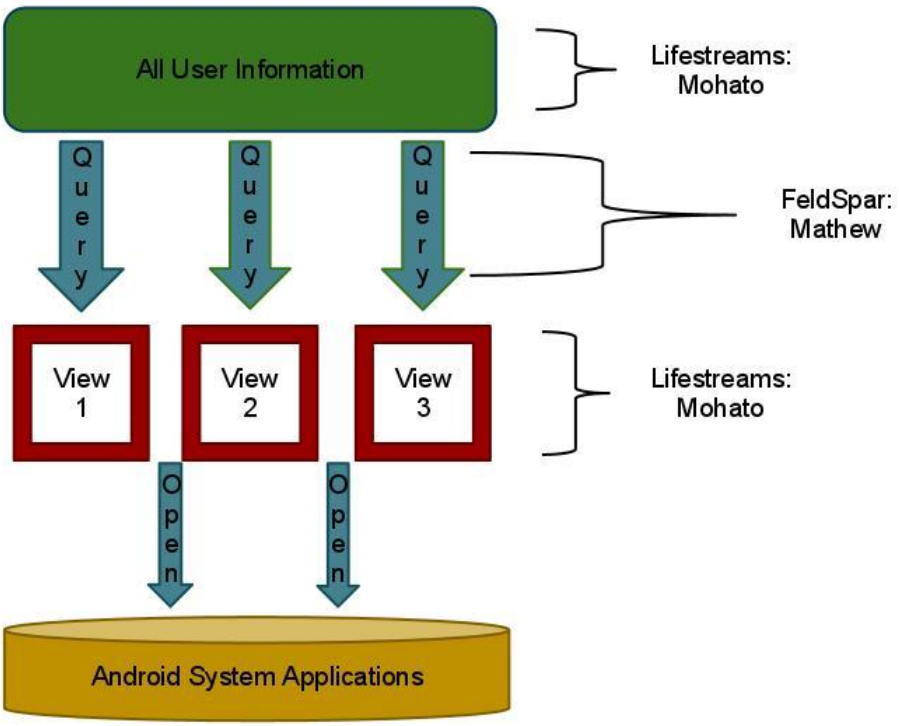

Figure 1: System description diagram

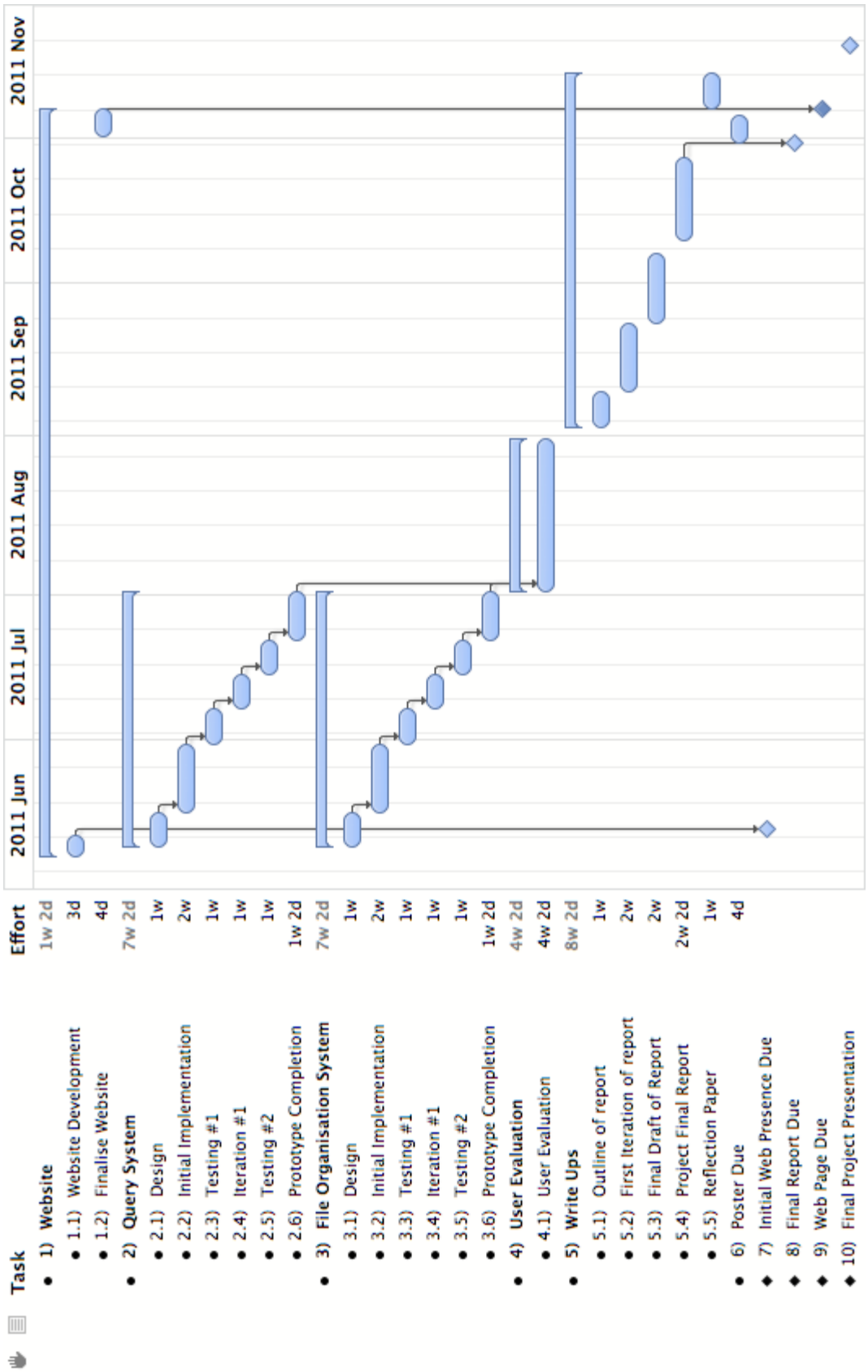

Figure 2:Gantt Chart