CASA: A Home for Mobile Computing at UVA

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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ABSTRACT
At UVA, the use of mobile devices for education-related tasks has been strained by the large number of third-party and UVA applications needed to perform common tasks and by the lack of utilization of the unique hardware in mobile devices. The Collab and SIS App (CASA) seeks to remedy these problems by integrating many essential feature sets commonly used by UVA students into a single mobile application while simultaneously unifying the interface for these separate tasks. Constructed based on the input of UVA students, CASA is a conceptual user interface design that had strong potential for success if it were to be implemented. Once the design was complete, my team and I evaluated its effectiveness using standard user experience tests conducted on the UVA student body with overwhelmingly positive results. CASA seeks to provide a home for mobile computing at UVA, and if it were to be implemented, it would, due to its hallmark of distinction of function within unity of purpose, provide a usable and efficient solution for mobile computing at UVA.

1. INTRODUCTION

The University of Virginia is an old school. Yet despite its age, it has generally kept up with the times, providing all the modern amenities one would expect from a well-respected university. However, one aspect in which there is a notable shortcoming is the realm of mobile applications. Perhaps the primary issue that plagues mobile computing at UVA is the fact that all the functionalities for which a student may wish to use a mobile device are scattered between separate applications. By decreasing the user-friendliness of UVA's mobile computing solutions, this fragmentation of feature sets between many apps adversely affects the ability of the student body to effectively utilize their mobile devices in their day-to-day activities.

This lack of user-friendliness is what inspired my team and I to design a solution to improve the lives of UVA students with respect to mobile computing. The Collab and SIS App (CASA) as we chose to call our solution, was designed to be a home for mobile computing at UVA, and to bring together all the essential feature sets used by students daily. Designed as a semester-long course project for the CS3240 Human-Computer Interaction class at UVA, CASA primarily sought to address the user-experience issues present in mobile computing solutions then in use at UVA [3].

2. RELATED WORKS

As the goal of CASA was largely to bring together existing features, there were naturally many preexisting individual apps that we used to some extent as aspects of our design. However, before we began the process of thinking about how to bring all these things together, we also explored the mobile application for Instructure's Canvas

learning management system as this app already did several of the things we hoped to do with CASA.

The Canvas mobile app, matching its desktop companion, is a very feature rich application, excelling in bringing together all the temporal aspects of educational content. This was highly appealing to us as this is somewhat lacking in UVA's Collab, requiring students to utilize external tools to integrate their various class schedules for example. Integrations such as those found in the Canvas mobile app, in addition to its bottom tabbed navigation bar, were highly influential in our design of CASA.

While the Canvas mobile app provides many excellent features that we desired to replicate, we also sought ways to bring together other aspects of educational mobile computing. However, there was a need to not add so many features that the app became hard to navigate or understand. We attempted to limit ourselves to features that would truly benefit from sharing state and data with UVACollab. Thus, the seven main individual apps whose feature sets we hoped to integrate were

- UVACollab [8]
- UVA SIS [7]
- Transloc [4]
- UVA Saferide[1]
- Any generic Calendar application
- Any generic To-Do list application
- Any Navigation application (e.g., Google Maps) [1]

This septet of applications provided the inspiration for the collection of features that we chose to integrate into CASA. By utilizing the design paradigms and features of these already existing applications, we sought to increase familiarity for our users, and by combining them together, we hoped to create something that was more useful than its individual constituent parts.

[1] Safe Ride has since ceased to be its own application, having been integrated into TransLoc under the OnDemand section.

3. PROCESS DESIGN

The crux of the issue we sought to address with CASA was the disconnected nature of the tools and functionality that are regularly used for educational purposes on mobile devices at UVA. The primary goal of our solution was to unify the mobile computing experience. To this end, there were two major tasks in the design of CASA: determining what features to integrate; and molding the interactions and relationships between these features into a useable, useful, and efficient system.

In deciding what features to integrate into CASA, we had two primary goals: to utilize the unique hardware present in mobile devices and to bring together the most used mobile tools. The former led to the utilization of the GPS and camera systems on mobile devices to provide geolocation features and an integrated scanner respectively. The latter goal in determining which features to incorporate inspired us to include the aspects of the feature sets of the seven apps previously, however, we introduced several integrations between these as well. The calendar and to-do feature sets were augmented by automatic population of events and tasks from the classes in UVACollab and the to-do list in SIS. We introduced a feature into SIS that allowed for a more succinct display of the progress a student has made in a particular degree program. With regard to geolocation features, we tied together route planning such as can be found in Google Maps with automatically populated stops based on class schedules from UVACollab and SIS, and with the information from the two facets of the University's public transportation systems, TransLoc (buses) and Saferide (on-demand transportation after bus hours). To complete the unification of all of

these features, we added a Home feature that provides a summary of all temporally relevant information, such as upcoming calendar events. We also included a single common notification system for all these feature sets to decrease clutter. Thus, having determined the different materials, we proceeded to put together the structure of CASA.

In determining the layout of a system with many separate feature sets such as CASA, unification of information must be balanced with a need to distinguish features. We determined that to maintain some distinctions, the various features would be grouped into five topics, with a navigation bar having a tab for each topic at the bottom of the screen facilitating switching between topics. Within each topic, navigation between features was provided by a side menu that could be collapsed or expanded by means of a hamburger icon in the top left corner, or by swiping from the left edge of the screen. Thus, by embedding each topic within this common structure, we were able to maintain distinction of function while emphasizing unity of purpose.

4. RESULTS

While we knew that our design was founded on the opinions of our fellow students, to verify that it met the criteria we had derived from their input, we performed empirical testing to determine how successful CASA really was. To this end, we constructed a minimal prototype using UI mockup tools. This allowed us to employ two forms of testing for CASA: timed tasks and a satisfaction questionnaire.

To conduct our timed tests, we chose three benchmark tasks that we performed ourselves using the current system to gain a baseline against which to compare our users' performance. This allowed us to measure the increase in speed that a user could gain from using CASA as opposed to the current system. We had each user perform each of the three tasks three times, which allowed us to determine how easy it was to learn how to use CASA. These tests yielded highly satisfactory results, with the time needed to complete the benchmark tasks being at least halved compared to the baseline. The subsequent repetitions saw very sharp reductions in user errors, indicating that CASA is learnable. Thus, we were able to demonstrate that CASA provides tangible improvements in the user experience of mobile computing at UVA while being sufficiently easy to learn and remember how to use.

Although timed tasks are an excellent way to determine how effective an application is, to evaluate the less tangible aspects of the user experience such as visual coherence, we chose to use a slightly modified standard usability questionnaire known as the System Usability Scale that yields what is essentially a letter grade for the user experience of a system [5]. After administering our questionnaire to our timed task participants, the score for our application was 82%, or a letter grade of "B". Thus, having used various empirical means to evaluate the success of our design, we concluded that CASA promised to be a successful application if it were implemented.

5. CONCLUSION

CASA was designed to be a home for mobile computing at UVA, and though it never moved beyond a UI mockup prototype, the results of our evaluations show that it would have indeed provided tangible benefit to the UVA community. As if to confirm this hypothesis, about halfway through the semester following that in which we designed CASA, UVA's SIS launched a tool that provided a degree progress summary functionality very similar to that which we had prototyped in CASA. Though we never

received any communication that this was related to our prototype, our client/advisor that gave us feedback during our design process was a member of UVA's software user experience team, and we suspect that they may have been inspired by our work. This demonstrates that our ideas were practically useful, and provided concrete advantages to the student body at UVA.

6. FUTURE WORK

Since CASA was developed only in the form of its interface without any actual implementation, the logical continuation would be to implement CASA as a functioning piece of software. Although there would be technical challenges in doing this, the biggest problem with implementing CASA lies in the recent obsolescence of UVACollab. The usefulness of CASA hinged largely on addressing shortcomings of UVACollab, and with Instructure's Canvas learning management system scheduled to replace UVACollab in the fall of 2023, there is little point in addressing these shortcomings [6]. Though some aspects of CASA would still be useful, Canvas has a very competent mobile application already that was itself inspirational and motivational for the design of CASA [2]. Thus, the need to develop a mobile app such as CASA will be substantially reduced once Canvas is introduced.

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