HAIL Gmail: Hierarchical Adaptive Interface Layout

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Abstract. We present an interface that allows users to read and send email with ease compared to standard email interfaces. In particular, the target audience of this interface is users with disabilities. Many people with severe disabilities are required to use mouse substitution interfaces, for instance the Camera Mouse. The Hierarchical Adaptive Interface Layout (HAIL) model allows for larger interactive buttons that are aligned on the edges of the screen and content that rests in the center of the window, which in conjunction with the Camera Mouse, should provide users with more fluid interactions when reading or sending emails. The email client we designed uses HAIL specifications and Gmail integration.

Keywords: Adaptive User Interfaces, Video-Based Interfaces, Camera Mouse, Web Browsers, Social Networking.

1 Introduction

Various accidents and diseases can cause serious paralysis. The four most common causes of paralysis are stroke, head injury, spinal cord injury and multiple sclerosis (MS). Lifestyle risk factors for paralysis include, but are not limited to, obesity, physical inactivity, high blood pressure, and smoking. Head and spinal cord injuries can be caused by motor vehicle accidents, accidents while playing sports, or other diseases. Other causes of paralysis include cancer cerebral palsy, and lyme disease. Due to the large number of people who are paralyzed and number of potential causes of paralysis, it is necessary to create technology that can be accessible to any user, even those with severe paralysis.

The HAIL interface is a piece of software that can be used by a much larger target audience, that includes those with severe disabilities and paralysis. The HAIL interface has been used with the program Camera Mouse but can also be used with other mouse substitution interfaces. The Camera Mouse uses the video camera attached to a computer to track the user's

head or parts of the face. As the user moves the part of their body that is being tracked, the mouse pointer on the computer window will move in the same direction. By dwelling the mouse pointer on a certain button or link for a preset time interval, the Camera Mouse will click and follow that link. For those with limited fine motor skills, the Camera Mouse may be an ideal substitution for the default mouse on a computer.

A great amount of research has gone into giving people with disabilities an easier time using the Internet. Previous efforts to create accessible interfaces include designing larger buttons, adding confirmation boxes, dynamically changing the layout, or growing the size of links.

In his prior research, Magee created a web browser and a Twitter client using the HAIL interface. His research was oriented as a proof of concept of the idea of an adaptable interface. Following Magee's research, the HAIL Gmail interface was created more as a practical application.

2 HAIL Gmail

2.1 Interface

The HAIL Gmail interface's purpose is to allow any person, even those with severe disabilities, communicate with others through the Internet. HAIL Gmail uses the Gmail API created by Google and is based upon Google's original email client, the most commonly used in the world with over one billion active users per month. In this prototype, we have only included the most necessary features, primarily reading and sending, but more advanced features are planned as future work. Compared to Gmail created by Google, HAIL Gmail is much less cluttered and has less advanced functions, ideal for users with disabilities. The interface requires an Internet connection. HAIL Gmail is divided into two different windows - one for reading emails and the other for composing emails.

2.2 Reading

The HAIL Gmail Read screen has the inbox in the center of the window and buttons on the edges. The buttons on the edges are fixed, while the inbox is allowed to scroll up and down. The green buttons on the left and right side of the screen allow scroll the inbox up and down by two table entries when clicked. The two blue buttons on the bottom of the screen allow for refreshing and composing. If the user would like to see if they have received any new messages, they may click the Refresh button which reloads the page. If the user would instead like to write an email to another person, they may click the Compose button which will bring them to the Send screen. The inner table in the center of the window displays each email received by the user. For each

email, the sender, subject, and time sent are all displayed within the table. The text which displays the subject of the email is a link. When they link is clicked, this will open that email in
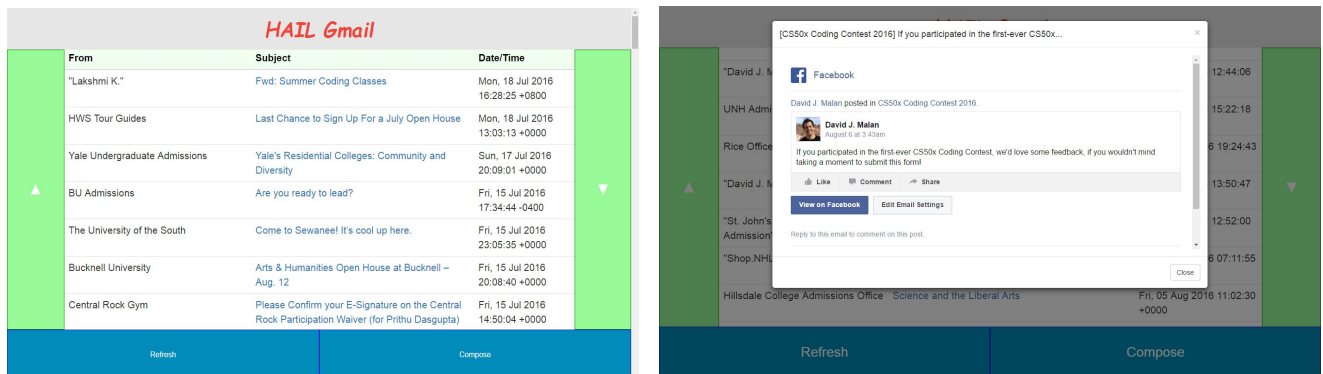
an overlaying window, which can be closed to return to the Read screen.

2.3 Sending

After clicking the Compose button on the Read screen, the user will be brought to the Send screen. Like the Read screen, the Send screen has buttons on the side and the main functions in the center of the window. The center of the window has three text fields: two smaller text fields for To and Subject, and a larger text field for Message. If the user desires to type, they may click and focus in on one of the text fields. After clicking a text field, the onscreen keyboard will appear at the bottom of the screen. For all three text fields, the user may enter text using the onscreen keyboard. The two smaller text fields for To and Subject also has a dropdown menu of preset recipients and headings that the user may select. On the sides of the window are two green buttons. If the user would like to restart their email with blank text fields, they can click the Cancel button on the left, which resets the Send screen. If they would like to return to the Read screen, they may click the Inbox button the right side of the screen. To send an email, click the blue Send button at the top of the screen. If not all three text fields are completed, when the Send button is clicked, an alert will tell the user to fill remaining text fields. If all three text fields are filled, a yellow trigger will appear stating that the message was sent successfully and the three text areas will reset. If no Internet access is present, emails will not send successfully.
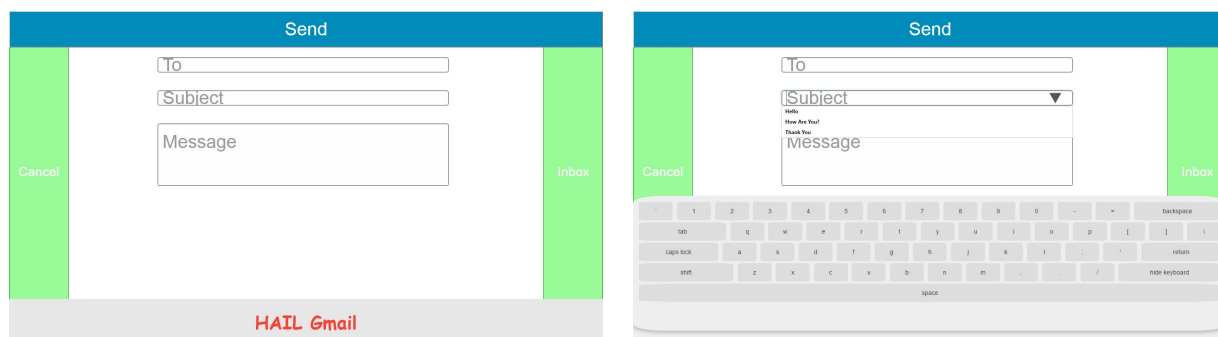
3 Experiments and Results

We conducted several user studies with a total of 7 users without disabilities, whose age ranged from high school to college. Test subjects had different levels of prior experience with the Camera Mouse. Those with no Camera Mouse became acquainted with the software by playing the Camera Mouse game "EagleAliens" for a few minutes before testing the HAIL Gmail interface. The goal of these studies was to obtain a qualitative assessment to see if HAIL Gmail was easy to understand and use.

Experimentation of each test subject consisted of three different trials which mirrored the intended everyday use of HAIL Gmail when it is deployed publicly in the near future: opening and reading email, sending emails without the onscreen keyboard, and sending emails with the onscreen keyboard. The time elapsed to complete a trial and the number of errors committed while performing the trial were both recorded for each test subject.

Reading emails was a simple task for the test subjects, taking an average of about 13.57 seconds to find, open, read, and close a specified email with 0 errors committed. Composing and sending emails took longer. Sending an email without the onscreen keyboard took an average time of 88.25 seconds with an average of 1.14 errors committed, while sending with the onscreen keyboard took an average time of 204.40 seconds with an average of 3.57 errors committed.

While reading emails was very quick, sending emails took longer time. Test subjects had trouble precisely operating the onscreen keyboard in conjunction with the Camera Mouse. Comments from subjects included grouping characters that are used most often together closely on the onscreen keyboard , having different keyboard layouts that the user can scroll between and using auto suggestions for text.

4 Current and Future Work

As an HAIL application, we noticed three major areas to improve upon. First, the center of any window should be "rest area" where no mouse interactions would take place. Buttons and links should only reside on the sides of the screen, and the mouse can remain in the center of the window so no accidental mouse clicks take place. The second is how to manage the adaptability of the interface. Possible ideas include scrolling through multiple pre-programmed interfaces, having the user select preferences prior to use, or having the computer recognize the abilities of the user and creating the interface based on that information. The third is the method of text entry. In HAIL Gmail, an onscreen keyboard was used when writing emails. Users stated that typing using the onscreen keyboard and the Camera Mouse was rather tedious and time-consuming and caused many mis-clicks. Other possibilities for text entry include text-to-speech, speech-to-text, or preset messages.

In its current state, HAIL Gmail only features reading and sending emails. To improve upon this, we plan to implement other features from the original Gmail interface using the Gmail API. Possible features to add include creating drafts, replying and forwarding emails received, searching and sorting emails by topic or senders, adding attachments, and sending to multiple recipients.

We plan to deploy HAIL Gmail either as a web application or as a plugin in the near future. As Magee wrote in his previous paper, similar to how a smartphone device provides a basic interface for a variety of smaller "apps," the HAIL framework would allow HAIL applications to share the same user interface program. We also intend to implement HAIL Browser as a more practical application, building upon the proof of concept Magee previously created.