The iPad as a Class Presentation Platform

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Abstract – The Apple iPad was developed as a platform for the consumption of media and comes with dedicated applications installed for playing audio and video, displaying photos, web browsing, reading electronic printed material such as books, newspapers, and magazines, note taking, calendar, and email. The iPad is a little smaller than an 8.5 by 11 inch pad of paper and weighs approximately 1.5 pounds. The small form factor, multimedia support, and ease of connection to projectors and classroom multimedia systems make the iPad a potentially useful platform for presenting class material. It could be considered an alternative to a tablet PC or laptop for presenting material. In this paper, the capabilities and limitations of the iPad as a classroom presentation platform along with some faculty and student impressions of the iPad's potential as a class presentation platform will be discussed.

Keywords: iPad, Apple tablet, Presentation platform

INTRODUCTION

The Wi-Fi only version of the Apple iPad was released on April 3, 2010 with the 3G version released approximately a month later on April 30, 2010. iOS 4.2 for iPad, an update of the device's operating system, was released November 22, 2010. The authors' first exposure to the iPad was on April 22, 2010 at an Apple iPad information session at Armstrong Atlantic State University, Savannah, GA given by Mr. Andre Vlajk, Higher Education Account Manager GA and AL, Apple. The session included demos of the iPad along with an overview of iPad applications, Apple's productivity suite - iWork, readers, and relevant third-party apps. The session also included a discussion of how the iPad might be used in education. Initially the authors were looking at using the iPad/iPhone/iPod Touch as a platform for programming courses, but after this session and an additional information session at Armstrong on June 26, 2010 also given by Mr. Vlajk, the authors started investigating how the iPad could be used in the classroom.

Our initial impression was that the iPad would make a good classroom presentation platform and possibly serve as an alternative to a tablet or notebook computer. The iPad is easily connected to portable projectors and classroom multimedia systems for displaying electronic media, giving slide presentations, playing audio and video clips, and displaying web pages. There are several third party apps that support the importation of schematics and diagrams which can be annotated by drawing on the iPad touch screen before or during a lecture. It appeared that one could easily integrate slides, web based material, audio, and video into classroom presentations and annotate/sketch on prepared material as needed to answer questions.

There are many iPad trials going on in education and Apple now has a dedicated education site [2]. A comprehensive list of iPad pilots in education is provided at [12]. Most of the education trials involve students using the iPads for collaborative work in and out of class and for electronic course material/etext reader. For example, Seton Hill University provided a 13" Macbook and iPad to all full time students entering in fall 2010 [16] with the idea that students will all use ebooks rather than textbooks and use the devices to take notes, share files, and engage in interactive learning experiences. Several business and MBA programs have integrated iPads into courses or teach courses on how to utilize the technology [6][7][18].

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In the Useful iPad Apps section, apps that were investigated for the efficacy of class use are discussed. The Classroom Presentation and impression section provides some examples of our use of the iPad in the classroom and our impressions of how well it worked. The Summary section provides a suggested suite of apps, what they best support for science and engineering class presentations, and the advantages and disadvantages of the iPad for use as a class presentation platform. In the Future Work section, additional areas that would enhance the use of the iPad as a class presentation platform are discussed.

OVERVIEW OF IPAD AND PREINSTALLED APPS

The iPad is 7.47 by 9.56 by 0.5 inches and 1.5 or 1.6 pounds depending on the model. It has a 9.7 inch diagonal touch sensitive LED screen with a 1024 by 768 pixel resolution. It is powered by a 1GHz Apple A4 processor, comes with either a 16GB, 32GB, or 64GB flash drive, and either Wi-Fi or Wi-Fi and 3G. It has a 3.5mm headphone jack, microphone, speaker, and dock connector port. It requires a computer with iTunes 9.1 or later and USB 2.0 support. Battery life is excellent with up to 10 hours using Wi-Fi and up to 9 hours using 3G.

The iPad comes with Calendar, Contacts, iPod, Mail, Maps, Notes, Photos, Safari, Videos, and YouTube applications (apps). The iBooks app is a free install, however the productivity suite of Keynote, Numbers, and Pages costs $9.99 each. The Calendar app works like other calendar appointment applications, allowing the user to add, store, and edit events. The Contacts app is an address-book application that is used for contact management across the device. The iPod music player app allows for the playback of audio files and is primarily intended to replicate the functionality of the iPod music player device on the iPad. The Mail app provides full-featured email access for a number of protocols. Maps is an app built around Google Maps that allows the user to map locations and retrieve directions between points. The Notes app is a note-taking app that can store snippets of text. Photos is a photo gallery app for the iPad and provides a central location to store images; some applications can access this photo gallery and use the images. Safari is the iPad's built-in web browser and provides a complete browsing experience equivalent to non-mobile versions of web software. The Videos app allows playback of locally stored videos and the YouTube app allows for the playback of videos stored at the YouTube.com website. More details on the iPad's technical specifications and preinstalled apps can be found at [1].

USEFUL IPAD APPS

During the course of examining iPad apps appropriate for presentations, it was determined that it was necessary to address four major categories: presentation, web browsing, general file display, and sketching/annotation. What started as a broad task became easier as both the iPad's operating system and various apps were updated adding functionality over the course of the evaluation period.

All of the applications discussed in the following subsections have the ability to send a separate display signal over VGA to an external projector or display, a feature that is necessary for public presentation. As noted before, this attribute is not available for every application; the iPad does not have the native ability to mirror the current display. Connecting the device to an external display does require the purchase and use of a Dock Connector to VGA adapter. Apple's official App Store has all the discussed applications available for purchase if they are not included with the iPad. Any application noted as being examined was purchased, installed, and tested on a physical iPad as opposed to simply being considered and researched.

Presentation

The de facto presentation software for Apple computers using OS X is Keynote; unsurprisingly, this is also the case with the iPad and iOS devices. Keynote is Apple's answer to Microsoft's PowerPoint and has the downside of being one of the more expensive apps available for the iPad. It is slide-based presentation software that allows text and multimedia items to be displayed on an external screen. The application provides a VGA-out display of the slideshow and has controls that are shown on the iPad during the presentation. This on-device screen allows the presenter to view their slides, use a virtual laser pointer, and provides a running count of elapsed time or a clock displaying the current time.

Originally, the mobile version of Keynote had a number of limitations and quirks regarding its abilities in presentation mode; a November 2010 update brought many usability and feature improvements to the software, in particular, the presentation aspects. Initially, the presenter only saw a rudimentary control interface on the iPad

while presenting and could only move one slide at-a-time in presentation mode. In addition, there were issues with leaving the Keynote application and coming back to the presentation; often, Keynote would not automatically return to the last presented slide. This often meant swiping or tapping through dozens of slides to get back to the appropriate slide. The latest update seems to have resolved these problems by adding a mirrored view of the current slide with multiple display options, access to an overview of all slides, and the ability to leave the slideshow and have it return to your slide flawlessly. The initial shortcomings did force the evaluation of other presentation software, namely a product called 2Screens. At that time, however, that app did not perform most of the functionally necessary for our purposes and seemed to have some other major limitations; the most limiting being that it did not appear capable of loading or displaying most common presentation files. There have been some updates to the 2Screens product since then, but those changes have not been tested.

Both PowerPoint and Keynote presentations can be used with the mobile version of Keynote. Small edits are easy to perform on the iPad, but larger edits are easier on a computer. One can embed both audio and video files within these presentations, with some limitations on file type and codec, as well as use about 40 different fonts [3]. A codec is a device or computer program that encodes and/or decodes a digital signal. When referring to digital audio and video signals it typically refers to a computer program that can read or write audio and video files in certain audio and video formats for playback or storage. For the most part, the presentations were imported and displayed correctly whether they originated on either a Windows or Apple machine using either PowerPoint or Keynote. However, the results and success of the use of transitions, animations, audio, and video varied depending on the originating platform and software. The chances of a smooth transition went down considerably as the complexity of the presentation rose.

Web Browsing

As noted before, Apple's default web browser, Safari, does not currently provide VGA-out capabilities. Expedition is a third-party iPad web browser that provides browsing functionality and mirrors its display to VGA-out. This software provides most of the features one has come to expect from a web browser and even allows one to view PDF files directly in the browser. Unlike Safari, Expedition does not provide or support tabs, which make jumping between sets of web pages difficult and tedious. However, Expedition is able to render web pages and directly display most web files, including PDFs, correctly.

A well-documented, missing web element is the lack of Adobe Flash support on the iPad. While this has not proven to be a major problem for our needs, some websites, like our university's current site, rely on Flash for the majority of the navigation for their site. This is a fact to consider when evaluating the feasibility of using the iPad for presenting material. Connecting to Wi-Fi networks that require authentication through a web portal is another issue that showed up in testing. The iPad sometimes disconnects from the wireless network when it enters its "soft" sleep state, a feature that saves battery power, but can cause confusion for the user. If the app being used when waking the device is not a web browser, it is often difficult to ascertain that the iPad no longer has a network connection. Even once that is figured out, a swap to a web-browsing app and a re-login is required to get Internet connectivity back.

General File Display

Upon initial release, there was not a lot of support on the iPad for working with multiple file types. Originally, time was spent evaluating eBooks, specifically the EPUB format for dissemination of lecture notes, textbooks, or other classroom materials. EPUB is short for electronic publication and refers to a free and open e-book standard of the International Digital Publishing Forum (IDPF). EPUB files have the extension .epub. The EPUB format proved to have problems in the area of representing material related to scientific- and mathematical-related disciplines and was abandoned for this study. The format currently provides no apparent benefit over the standard practice of providing PDFs of material and is quite a bit weaker in the control of content formatting; however, if EPUB eventually allows video and better equation formatting, a reevaluation will be necessary. Standalone PDF viewing originally required a third-party app even though Safari could display web PDFs. GoodReader, a third-party app, was originally one of the few ways to display files stored directly on the iPad and came highly recommended by an Apple Educational representative. Later releases of iBooks allowed PDF reading, but not the external display of those files, leaving GoodReader as a general-purpose solution to file display.

The process of transferring and storing files on the iPad is awkward. File transfer typically requires a synchronization operation between a computer and the device coupled with having to choose which application's

storage space to place the file. Each app is given a set storage space associated with it where it can store and access files. Apps cannot access other app's storage space, which can allow for some redundancy in storing files. However, some apps can access the photo and video galleries. For further details about the synching process and a webpage that demonstrates and outlines the process of moving files to and accessing said files on the iPad, see [13]. Throughout the paper, the act of synching refers to the synchronization between the iPad and an iTunes installation which will ensure each device has the same files.

The provided YouTube app worked well for showing online video, although a slow network can cause many problems including stuttering, audio and video out-of-sync , and issues with the iPad going to sleep while waiting for the app to accumulate a proper buffer. For other video formats and codecs, VLC is a free app for the iPad that plays a number of formats. Due to possible license and legal issues [20], there has been some question of whether or not VLC will continue to be offered through the official App Store. Audio is one of the iPad's strong suites, which is expected; iOS is the same operating system that powers the current generation of iPod Touches and iPhones, both noted for their music playback abilities.

Sketching and Annotation

The ability to sketch freehand diagrams or to hand-annotate existing images or files is an important feature for presentations involving schematics and drawings. During our initial examination, the authors overlooked the VGA-out capabilities of Sketchbook Pro, which lead to the examination of the third-party apps PaperDesk and Whiteboard Pro. Both applications provided basic sketching functionality, but were not as adept at annotation. In the end, the app that provided the most polished experience was Autodesk's Sketchbook Pro. Sketchbook Pro provides multi-touch gesture support, a number of brush types and colors, as well as the ability to work with layers in a drawing. Users can access image files from the iPad's Photo Gallery; a nice feature that allows one to store images in a central location instead of an app-specific area. Using this feature, a presenter can import images, of a circuit for example, and create a new layer in the drawing, which provides for non-destructive annotation. Using a blank canvas, the presenter could also write notes or draw drawings onto this virtual whiteboard. This nearly eliminates the problem of some presentation areas where the projector screen actively blocks the whiteboard.

An October 2010 update to GoodReader added the ability to annotate PDF files and the ability to save those annotated files. In addition to this notes feature, a drawing feature has been added. This now gives the presenter the option to converting their presentations into PDF for the ability to annotate and draw on their slides and save those new files. Unfortunately, this feature was not available during classroom tests that could have utilized this new functionality.

While we tried to cover the major areas of need for our particular situations, we realize that each discipline has its own set of needs. [4] and [5] provide lists of useful iPad Apps for education and business.

CLASSROOM PRESENTATIONS AND IMPRESSIONS

After some research and trials, some advantages and limitations were apparent. The iPad is very light and much easier to carry around than a notebook computer plus books. It is instant on and apps are instant on so there is minimal wait time when turning the device on or launching an app. It is easy to connect to a projection system via a VGA connector and the screen resolution is as good as or better than most classroom projectors. The touch screen is very responsive and image quality on the screen is very good. The etext and PDF readers are very good and it is relatively easy to view images and play audio and video. However, there were two main initial limitations: no multitasking and limited VGA-out.

The lack of multitasking made switching between apps a bit awkward at times but this has been addressed in the iOS 4.2 update and the iPad now supports multitasking although it does seem to lower battery life. The limited VGA-out is a larger issue. The screen is not mirrored to the VGA connector by default and not all apps support VGA-out. Safari does not have VGA-out so web based materials cannot be displayed without using a third party app. We were initially unsure if the sketching apps supported VGA-out and without screen mirroring, demonstrations of software cannot be displayed without using screen-casting software to create a video of it outside of the classroom. There are not currently dock to HDMI and dock to DVI-D connectors which may cause some compatibility issues with newer projection systems and monitors. Other professionals and educators have also used the iPad as a presentation platform and came up with similar advantages and limitations as the authors, for example [8][9][10][11][15][17].

Three different instructors teaching three different disciplines used the iPad in the classroom at some point during the fall semester of 2010. The device was used in a programming class, an engineering class, and a public health class. Each participant felt the iPad was a highly portable and convenient solution for presentation. Connecting the device to a projector was as easy as connecting a notebook and worked equally as well. An advantage of having the apps support VGA-out rather than using screen mirroring is that no additional settings need to be altered for the projector to display the signal.

In the public health class, an 11-minute YouTube video with audio (using the iPad's headphone jack for audio) was played over the multimedia system in the classroom. There was one issue with the device falling asleep while doing the introduction to the lecture, which, as noted before, required exiting to a web browser, reconnecting to the internet, and allowing the video to re-buffer before display. Otherwise, the participant noted the ease of transporting the device and its instant-on nature as benefits compared to a notebook computer. The Auto-Lock setting, the amount of time that the screen will shut off after no activity, can be adjusted by going to Settings > General > Auto-Lock and modifying the Auto-Lock interval. The Auto-Lock interval can be set to two, five, or fifteen minutes or never.

In the programming and engineering classes, slide presentations consisting of text, code snippets, diagrams, and formulas were given. The programming presentation was created in Keynote 09 on a Macbook Pro. The diagrams were created using Keynote 09's graphic tools. The presentation was transferred to the iPad through iTunes. Most of the information transferred directly, although some of the purely aesthetic features of the graphics, like drop-shadows, reflections, and some gradients were removed for the mobile version of Keynote.

The engineering presentation was created in PowerPoint 2007 on a desktop computer running Windows XP. Using lecture notes created in Word 2007, text, formulas created using Microsoft Equation Editor 3.0, and images were copied into PowerPoint 2007. The images and formulas were resized in PowerPoint and the text was converted to a font that the iPad version of Keynote supported. Presentations were tested before class and PDF versions of the slides were transferred to the iPad as a backup. Prior to creating the presentation, previously created PowerPoint 2003 presentations were both transferred directly to the iPad and converted to Keynote 09 using a Macbook Pro. Both versions were viewed on a LCD computer monitor. The image quality was comparable and at least for text, formulas, and graphics, no apparent benefits of converting to Keynote were noted.

The device worked well for displays of slide presentations both in the programming and engineering classes, however, the demonstration of real-time events like compiling programs or executing code was not available at the time. There were no issues connecting via the VGA connector to the classroom presentation system and the students had no problems viewing the material as presented. Students in the classes indicated that the slides were clear and easy to read. In the programming class, there was an issue with the lack of ability to demonstrate code editing and execution directly from the iPad. Students were not as receptive of downloading code samples to see the results of their execution on their own; up until that lecture, the instructor usually demonstrated the working code samples before asking the students to create or modify code on their own. The engineering class students' only concern was whether class notes/examples would be posted online as usual. In the engineering class the projector in the classroom is relatively old and the projector intensity was not bright enough to see the slides clearly without the lights turned off. This meant the whiteboard could not be used the same time but this would also have been the case if using a notebook.

We did not have any of the problems indicated by some people who tried presentations using the iPad early on. We were very methodical about trying everything out we could think of and waited to try some things until apps had been updated or we found an app that appropriately supported what we wanted to do. Our impression of its limitations is consistent with other people who have used the iPad for presentations.

For science and engineering students and professors, carrying an iPad rather than a bag of references would be nice, but current etext policies pose a problem in that etexts are purchased for typically six months of use and thus would not be available as references later. Students could access course materials at any time however. iPads cannot replace a computer as they cannot run most engineering or computing applications and were not designed as creation devices. One can use a Bluetooth keyboard with the iPad but in general, only minor edits should be done on the iPad as it has limited storage, a somewhat awkward file structure, and not all apps support importing or exporting files off the device.

SUMMARY OF IPAD AS CLASSROOM PRESENTATION PLATFORM

During the course of this research, we have identified a set of essential apps and hardware for presenting with the iPad.

For someone desiring to use the iPad for classroom presentations, we recommend the following: 16GB Wi-Fi version of iPad ($499), Dock to VGA connector ($29), and an iPad case ($39). If one plans on using the iPad to create content a Bluetooth-enabled keyboard and either the 32GB or 64Gb version of the iPad is desirable. The iPad feels overly smooth without some kind of case for external protection so a case is recommended. Other useful accessories are the Apple iPad Camera Connection Kit and an iPad dock if a keyboard will be used.

Besides the iPad and accessories, the following apps are recommended: Keynote ($9.99), GoodReader ($0.99), SketchBook Pro ($7.99 when we purchased currently on sale for $0.99), and Expedition ($0.99). Prices provided for apps were from December 2010 but app prices do change fairly often. Even though Keynote is relatively expensive as far as apps go, no other software is close to matching the features and ease of use that Keynote provides. GoodReader should be considered an essential app for general file display and an acceptable substitute for presentation and annotation/sketching if the user is willing to convert presentations to PDF format. If one is presenting material from the web often, Expedition provides the VGA-out capability for web content. For sketching, no other sketching software provides the same level of tools and functionality as this Autodesk Sketchbook Pro.

The advantages and limitations of using an iPad for classroom presentations are summarized in Table 1. Additional tips for preparing presentations for the iPad can be found at [3][13][14][19].

Advantages	Limitations
Small form factor	Keynote does not let one annotate slides, although
Long battery life	GoodReader allows one to annotate PDF versions of slides
Instant on	Expensive compared to netbook or lower end notebook
Quick transition from application to application	Does not mirror screen through VGA-out
Multi-touch screen (allows drawing using	Not all apps support VGA-out
finger)	No USB port for transferring files via flash drive
Relatively inexpensive compared to a tablet pc	Awkward file transfer and storage
Very good ereader	iPad version of Keynote does not currently support the use
Excellent multimedia support and playback	of a remote to control presentations

Table 1, Summary of iPad Advantages and Limitations as a Presentation Platform

FUTURE WORK

We have used the iPad to give slide presentations consisting of text, formulas, and graphics objects created in Keynote or PowerPoint. The authors plan on using the iPad in classes more extensively in spring 2011 and updates along with tutorials with screen shots illustrating how to do various things on the iPad will be posted at [13]. Multi-tasking is a new feature in iOS 4.2 and should be examined as a means to presenting different types of material in a quick and efficient manner. More tests with converting presentations to PDF so they could be annotated as presented using a PDF reader that supported annotation such as GoodReader needs to be done to see if the limitations of the PDF slides are outweighed by the ability to annotate the slides, which Keynote does not support.

More work will need to be done exploring the iPad Keynote version support of embedded audio and video in presentations. Audio embedded such that it immediately starts to play when the slide is reached was successfully performed, but we have not successfully integrated audio that can be clicked to start. We also have not experimented enough with embedded video to be confident that it will or will not work with the iPad version of Keynote.

A major limitation of the iPad for engineering classes is that there are not versions of engineering software such as CAD applications, computer language compilers, circuit simulation etc designed for the iPad. To use these applications as part of class demonstration one would need to use the iPad to remotely connect and control another computer that could run the application. There are some apps that appear promising for this for we have not investigated this as of yet nor verified that the remote access would work across the firewalls that would be

encountered in most university or business wireless networks. This could also be a solution to presenting real-time demonstration material in a programming class.

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