Contents

1 Individual work creating Minutes for Panel 2 10/29/2012

1.1 Members Present

Professor Watkins, Professor Thompson,, CTDI team, Griffin Dunn, Colin Madigan, Phil Stahlfeld

1.2 15:00 to 15:05 Review

Reviewed Documentation and Technical Specifications

1.3 15:05 to 15:15 Discussed Completed Work

1.4 Image Processing

- Showed progress with Python filters
- Discussed ideal image quality

  Used CamScanner as ideal to strive for
- Showed progress with ImageJ filters
- Discussed attempts to ob

1.5 Sourcecode

- Showed that ImageJ could be useful because it is open source.
- Discussed attempts at obtaining CamScanner source code. Concluded that it would be too difficult to find useable code through java decompiling.
- Prof. Thompson suggested that if Microsoft does not respond to our email soon we should talk to both him and Prof. Watkins so that they can try their contacts within Microsoft.

1.6 15:15 to 15:25 Discussed Future Plans

Discussed Gantt Chart

- Prof Thompson suggested that we allocate more time for tasks that could be more difficult.
- ProPANE was asked if they had looked into OpenCV along side Python and Java filters.

  No, but it is scheduled into our workflow
- Discussed how we planned to come up with a final plan

  By trying many approaches and choosing those that show that they can effectively meet our goals

15:25 to 15:30 Wrap Up Questions

ProPANE showed that they could 'speak in full sentences' and that they were on the right track.

2 Group Work Preparing For Panel 2 10/24/2012

- Began creating presentation document for Panel 2

  This document was then discarded as we came up with a new structure for the document

- Created powerpoint of our current work on image processing.
- Worked a little with colin on Gannt Chart
- Developed gameplan with group on what we'd do for Panel 2

3 Individual Work Collecting Whiteboard images with various cameras 10/22/12

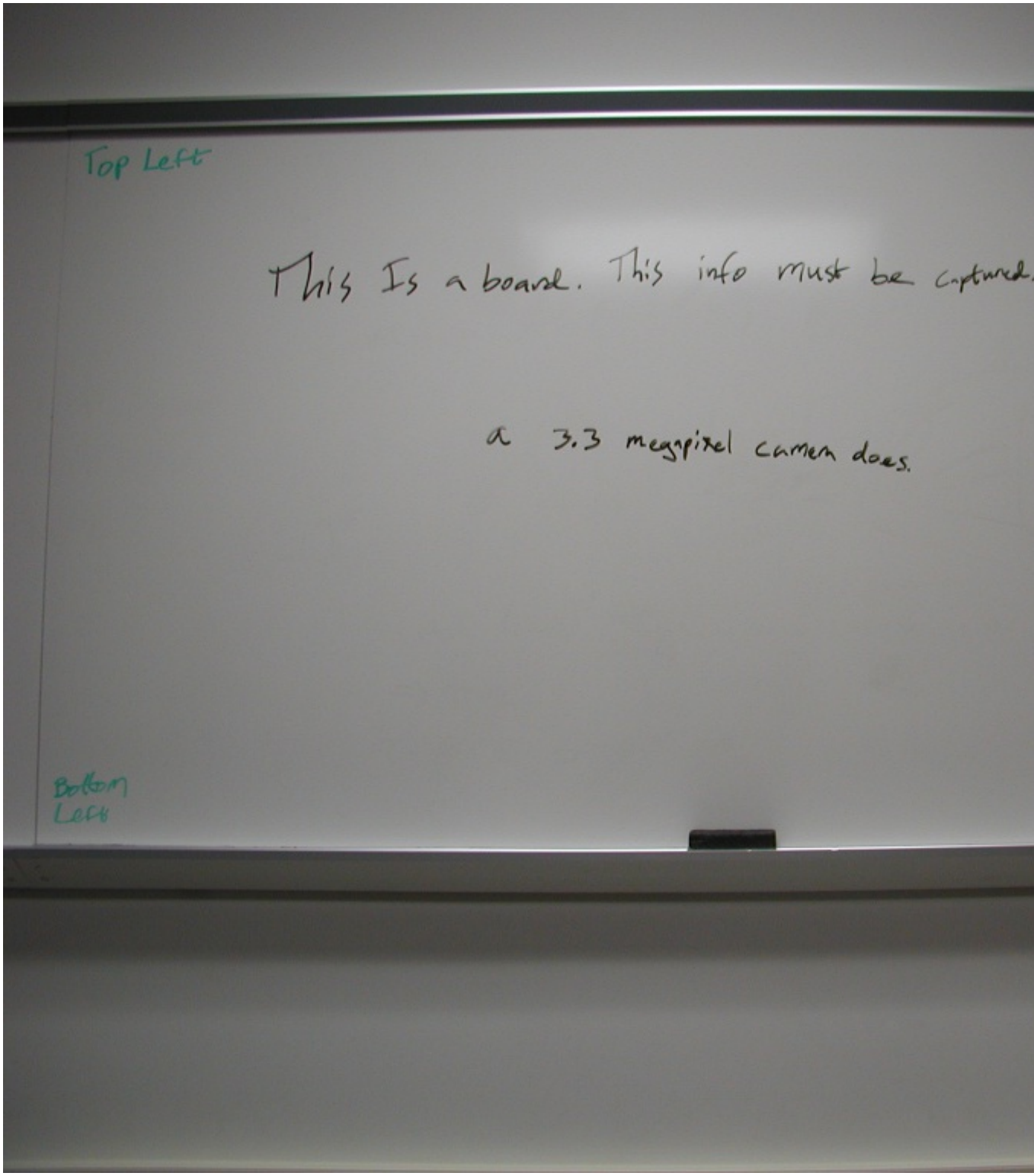
3.1 Purpose

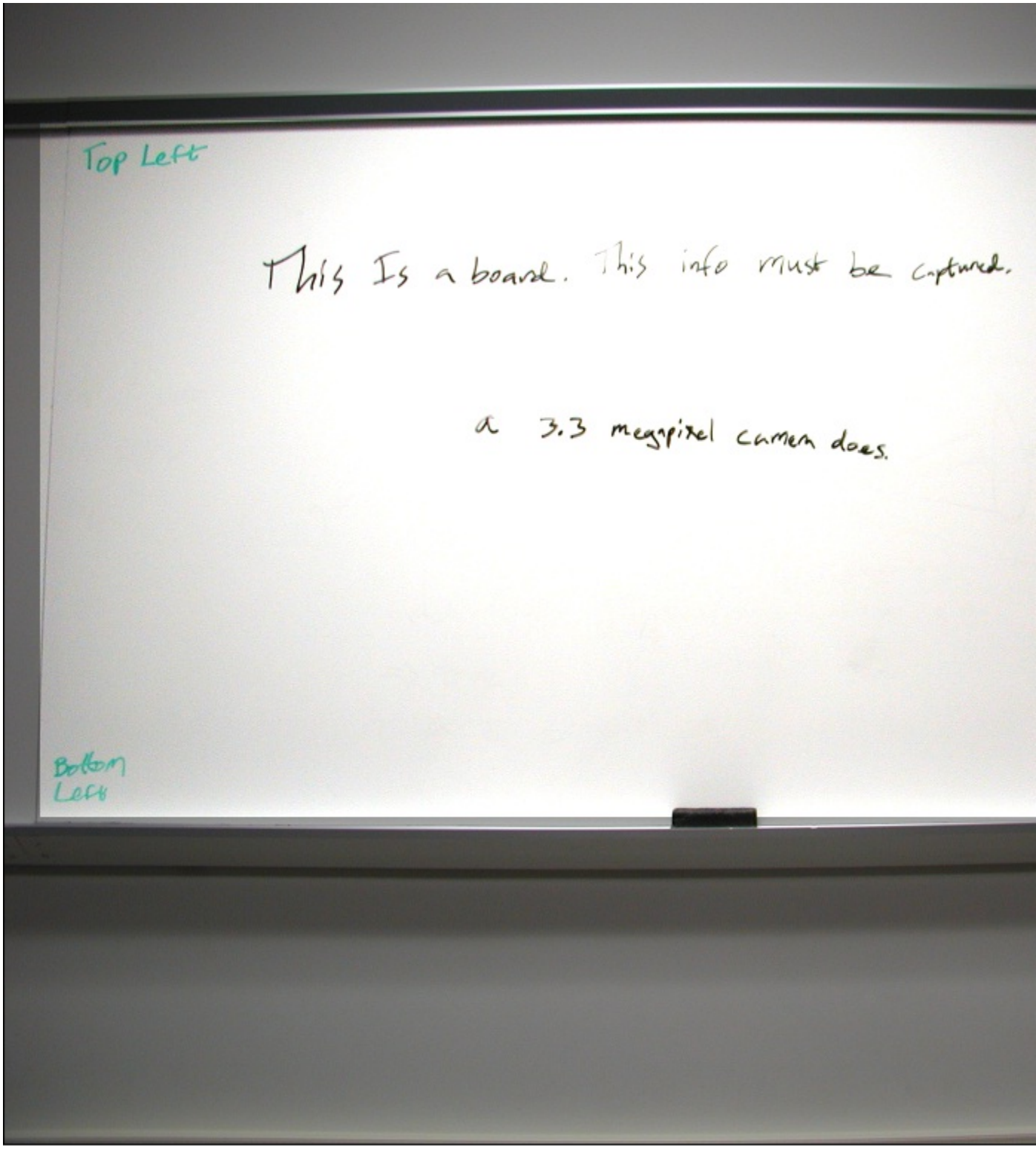
Today I worked to collect several images of whiteboards using different cameras. The purpose of this exercise was to gain a better understanding of what is needed from our image capture device. Analyzing the results of a range of devices we hope to better understand what the limiting factors are with indoor image capturing.

3.2 Setup

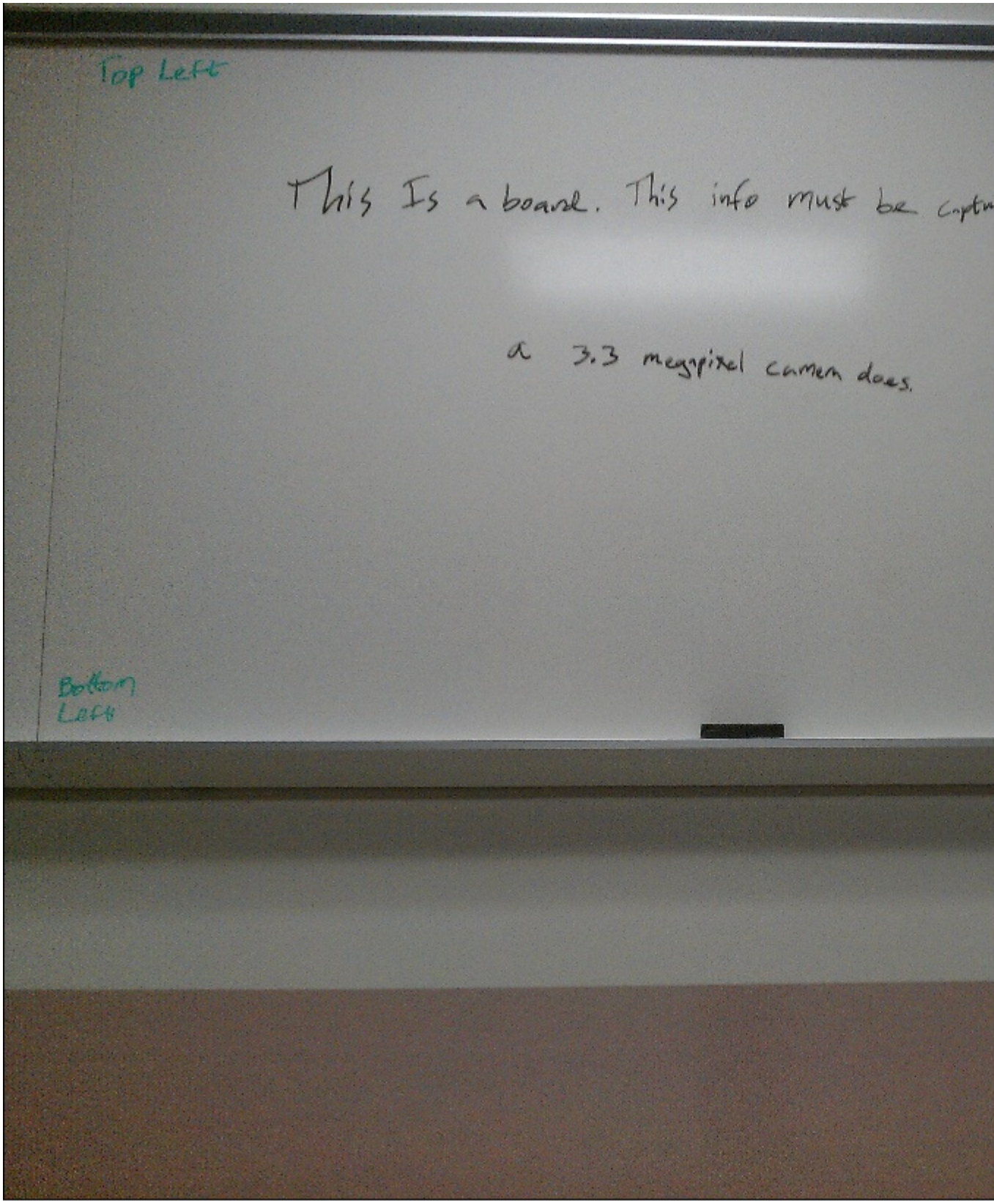
I captured images from two main locations: On a table in front of the whiteboard and on top of the projector. I decided to add images from near the projector just in case the table is too close to the whiteboard. Note that the Whiteboard was 8 feet wide for all of these images.

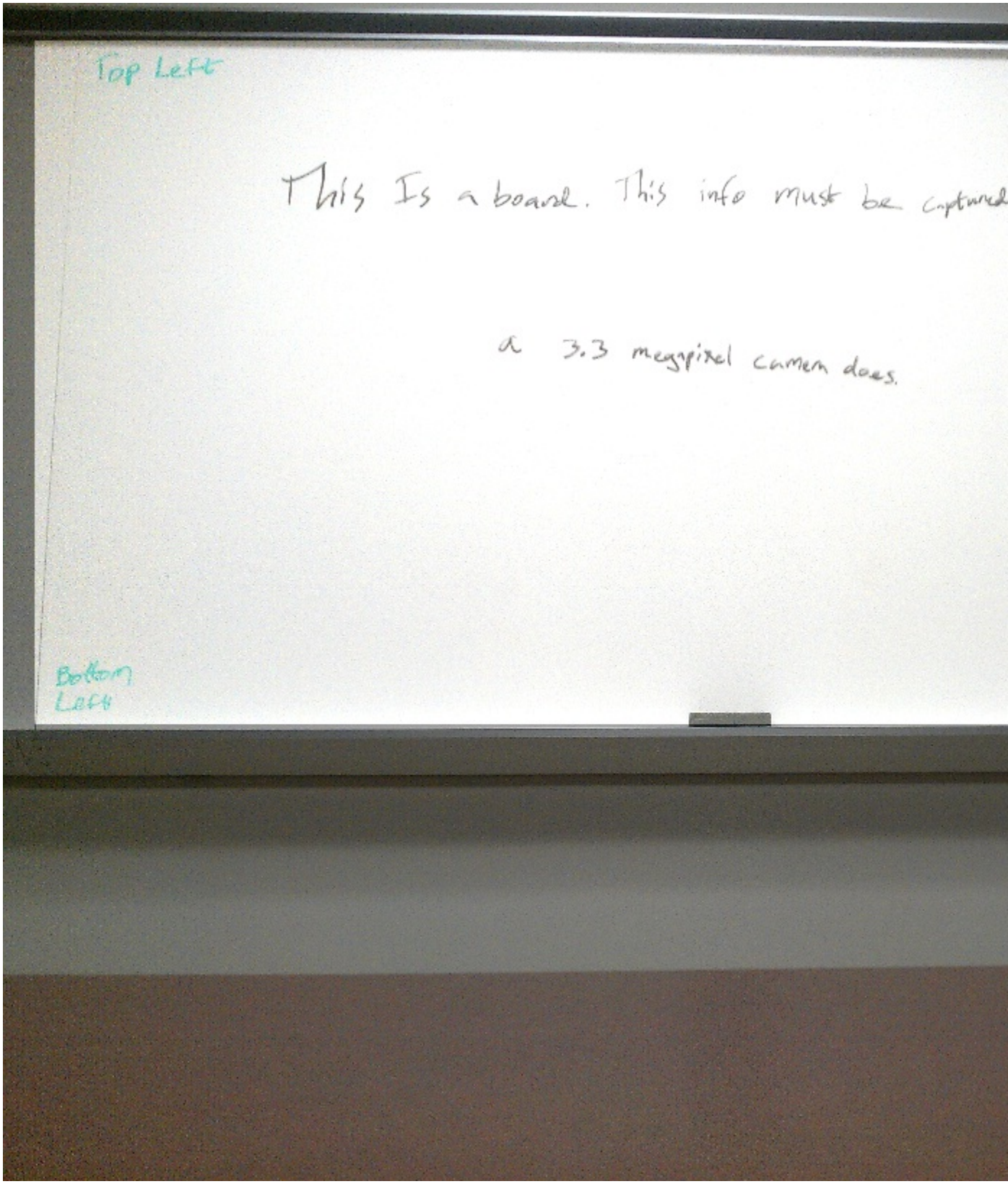
The following images were taken 9 feet away from the whiteboard with a 3.3 Megapixel Olympus C-3040ZOOM:


Top Left
This Is a board. This info must be captured
a 3.3 megapixel camera does.
Bottom
Left

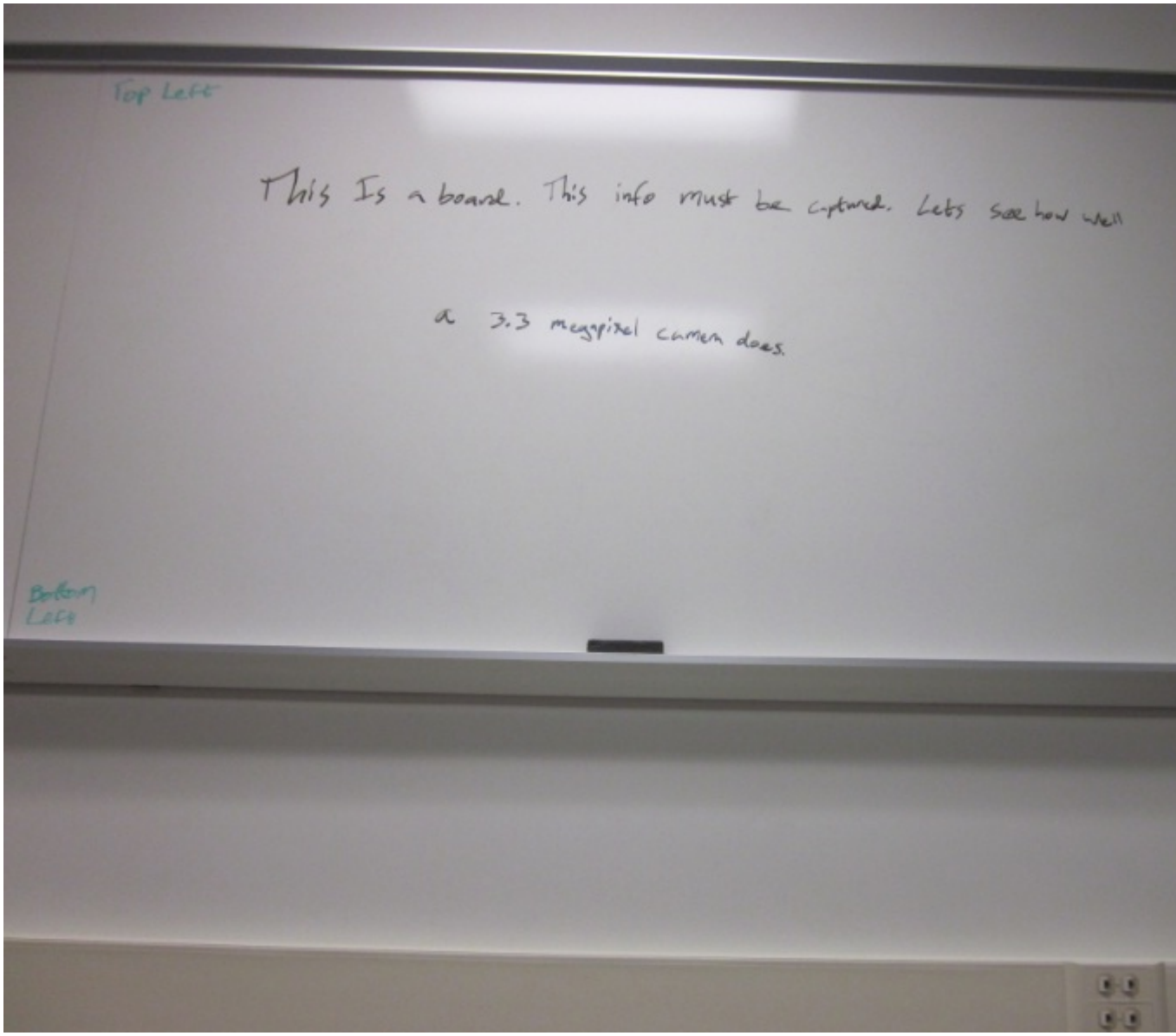


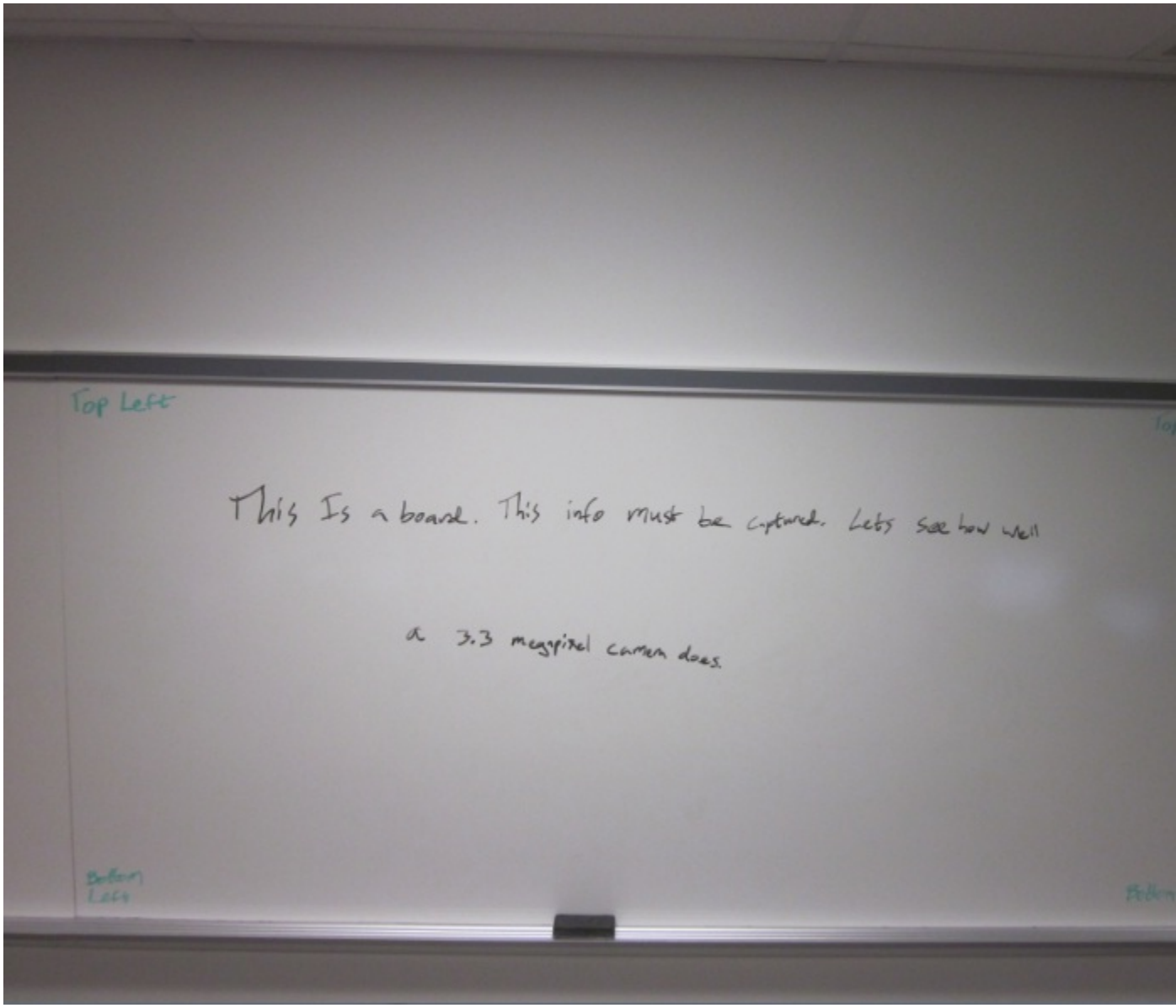
The following images were taken while 9 feet away from the whiteboard with the HTC Inspire's 8 Megapixel camera:


Top Left
This Is a board. This info must be captu
a 3.3 megapixel camera does.
Bottom
Left



The following images were taken while 7.5 feet away from the whiteboard with a 12.1 Megapixel canon powershot sd1300:


Top Left
This Is a board. This info must be captured. Lets see how well
a 3.3 megapixel camera does.



Notice how much less glare there is from the lights when the camera is at projector height. This will make removing background noise much easier. Not only that, the highter vantage point would likely capture more of the bord and less of the professor.

3.3 Conclusion

Note that all modified images were modified using ImageJ, the open source image editor i found that uses java The 3.3 MP camera and my 8MP camera both required about 9 feet distance from the board minimum, while the newer canon powershot sd1300 only required about 7.5 feet distance from the board.

Something that isn't as immediately obvious, but is more noticable when looking at the fullsize images, is the fact that the higher megapixel cameras did a better job capturing information because zooming in allowed for crisper, clearer letters.

4 Individual Work on Sourcecode 10/20/1023

4.1 CanScanner Sourcecode

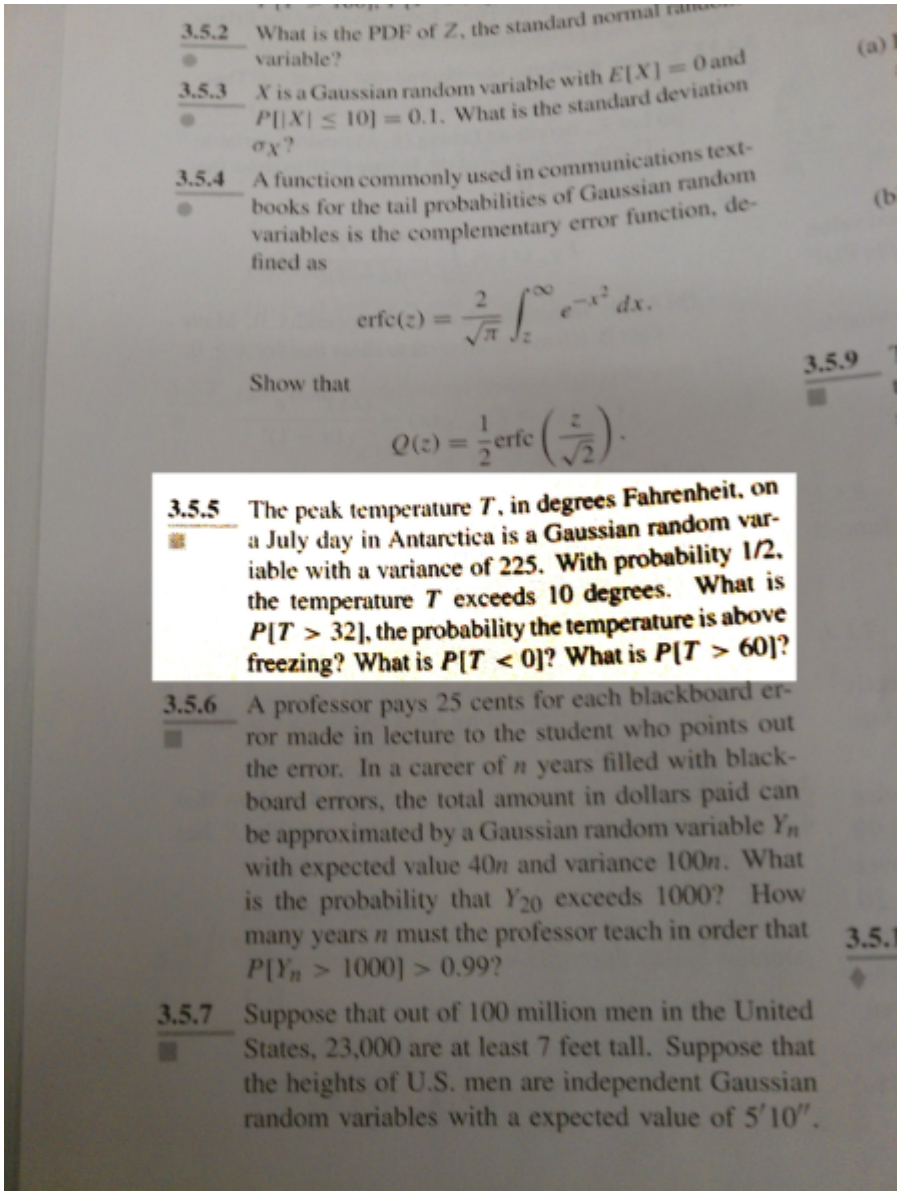
I viewed CamScanner's sourcecode by following the instructions on this forum:
http://stackoverflow.com/questions/3593420/android-getting-source-code-from-an-apk-file

- Download .apk
- Rename remove .apk ending from name and put .zip in it's place
- Extract all files
- Download dex2jar
- Run dex2jar on the classes.dex file found in CamScanner's extracted files
- Run java decompiler on the classes.dex.dex2jar file created in step 5
- Save all class files

After attempting to understand CamScanner's code for 1.5 hrs, I decided that the code wasn't readable enough to use in our project. It might have useful information in it somewhere, but the decompiled naming scheme, lables, etc weren't readable enough for easy analysis. Will go back to this sourcecode if other options fail.

4.2 Alternative Program

I found an opensource program called ImageJ. This program has features similar to CamScanner's image filtering options...though they don't work as well. By adjusting the brightness and contrast of an image i was able to greatly enhance text's clarity:



3.5.2 What is the PDF of Z, the standard normal random variable?

3.5.3 X is a Gaussian random variable with $E[X] = 0$ and $P[|X| \leq 10] = 0.1$. What is the standard deviation σ_X?

3.5.4 A function commonly used in communications textbooks for the tail probabilities of Gaussian random variables is the complementary error function, defined as

$$\text{erfc}(z) = \frac{2}{\sqrt{\pi}} \int_z^\infty e^{-x^2}\, dx.$$

Show that

$$Q(z) = \frac{1}{2}\text{erfc}\left(\frac{z}{\sqrt{2}}\right).$$

3.5.5 The peak temperature T, in degrees Fahrenheit, on a July day in Antarctica is a Gaussian random variable with a variance of 225. With probability 1/2, the temperature T exceeds 10 degrees. What is $P[T > 32]$, the probability the temperature is above freezing? What is $P[T < 0]$? What is $P[T > 60]$?

3.5.6 A professor pays 25 cents for each blackboard error made in lecture to the student who points out the error. In a career of n years filled with blackboard errors, the total amount in dollars paid can be approximated by a Gaussian random variable Y_n with expected value $40n$ and variance $100n$. What is the probability that Y_{20} exceeds 1000? How many years n must the professor teach in order that $P[Y_n > 1000] > 0.99$?

3.5.7 Suppose that out of 100 million men in the United States, 23,000 are at least 7 feet tall. Suppose that the heights of U.S. men are independent Gaussian random variables with a expected value of $5'10''$.

I think that this program could be useful if we decide that we want to write an image enhancement progarm in java or if we want to include some enhancement features in an android app.

4.3 Python Libraries

I briefly looked into different options we had in python and found two libraries that looked like they might be useful for image enhancement:

The ImageFilter module has many pre-defined enhancement filters for the 'filter' method.
http://www.pythonware.com/library/pil/handbook/introduction.htm

Advanced enhancement features can be found in the ImageEnhance module.
http://www.pythonware.com/library/pil/handbook/imageenhance.htm

5 Risk Meeting, Future Tasks 10/18/2012

5.1 ProPANE and Prof. Thompson Meeting

We met with Prof. Thompson today to discuss our risk analysis. He gave us a better understanding of what he expects from us going forward in the semester. The goal is not to complete most every aspect of our project. Instead, he wants us to try out lots of different way to impliment various aspects of the project, and from this experimentation be able to say definitively which strategy we are going to employ and why we want to use it.

6 Website updating and Language Editing 10/12/2012

6.1 Language Editing

Went through documentation checking for grammar. Apparently I missed quite a bit when it came to spelling mistakes. Will look at .tex documents with spellcheck enabled from now on.

6.2 Website Updating

Updated Team Member page of our website. It now has the following blurbs next to each picture:

Griffin:
Griffin is a senior computer engineering and management double major at Bucknell University. He is the Service Chair for the Bucknell IEEE Student chapter and an active participant in Delta Upsilon Fraternaty. Over the summer he worked at the Computer Center at Bucknell University as an Enterpise Systems Developer, developing web pages for clients throughout the university.

Colin:
Colin is a senior electrical engineering major at Bucknell University. He is a member of Tau Beta Pi, the Honors fraternity on Bucknell campus and he is a member of the Bucknell IEEE student chapter. Over the summer he Interned for Blue Belt Technologies, a company that specializes in intelligent orthopedic surgical instrumentation.

Phil:
Phil is a senior computer engineering major at Bucknell University. He is president of Tau Beta Pi, the Honors fraternity on Bucknell campus and is a member of the Bucknell University IEEE student chapter. Over the summer he Interned for Northrop Grumman, Space division of electronic systems on automated bench marking of high performance computers.

7 Classwork on Brainstorming, etc 10/11/2012

7.1 Stages in the Feasibility Stage

There are 5 stages in the next portion of our development process:

- Stage 1: Brainstrom
- Stage 2: Identify Risk
- Stage 3: Prioritize Risks
- Stage 4: Develop Deliverables for each Risk
- Stage 5: Divide and Schedule work

7.2 Brainstorming

There are three major sections to our project:

- Capturing
  - All tasks related to capturing all information written on the whiteboard
- Sending
  - All tasks related to sending and recieving information between devices
- Processing
  - All tasks related to processing the images once they are recieved by the linux machine

Capturing

- Decide on a camera
- Designing/purchasing a stand
- Figure out setup stuff
- Determin min/max distance from board based on camera lense and number of megapixels
- Look into rooting camera (maybe. depends if it can install apps that aren't in the app store)
- Look into making image capturing process automated
- look into designing android app
- how to take periodic images
- how to communicate with camera using button or sensor
- adjust shutter speed and/or ISO to accomodate different light levels. (automatic with flash disabled)

Sending

- Look into communication between android and linux
- Ways to store/send images
- Ways to make sending info reliable
- How to send data automatically
- How to recieve data on linux
- How to automate linux processes
- How to send to/connect to moodle folder.

Processing

- How to remove background noise
- how to stitch in information covered by professor
- how to change brightness/contrast
- look into better ways of processing images
- look into what image processing libraries are available

- maybe look into what programs are available to do these sorts of things for us.
- look into ways to automate actions performed by random programs
- look into ways to do what we want with premade programs and just automate the processes somehow
- What sorts of processing technologies are available to us?

7.3 Identify Risks

There are are 3 main areas that represent the highest risks to our project:

- Image Proessing on the linux system
  - Everything associated with it. How will we do this???
- Deciding on Camera
  - This will define how we will research the image captureing process. There isn't very much that we can do on the capturing side of things before this decision is made.
- Look into how to use camera using application
  - The creation of an application that will automate the image capturing process on the android camera

7.4 Deliverables

Deliverables for Processing:

- Demo code that removes noise
- Demo code identifying professor on image
- Demo code removing professor from image
- Demo code splicing prof-free images together
- Demo code auto-grabbing new images + removing prof, splicing together, etc.
- Demo code of auto-everything

Deliverables for Capturing

- Demo image taken by android camera by our own app
- Demo android camera taking pictures automatically every few seconds
- Demo app setup process such that it can be left to auto=take pictures all period
- Demo app sending photos to linux machine
- Auto=focus
- Manual Zoom during setup.

8 Group Work With Colin To Finish Up Documentation 10/10/2012

Electronic Whiteboards-
Smartboards are full sized, touch sensitive whiteboards. You can project images onto them with a projector and then make edits/additions to them with any pointed object. The touch sensitive board senses where you are writing on the board and adds electronic corrections to the image/document. These devices do not compete as directly with our project as the smartphone apps and the scanners because they are not nearly as portable. They are the size of a standard whiteboard and thus cannot be easily moved between classrooms.

- SMART Board
- Panasonic's Panaboard
- Hitachi's Starboard
- The Promethean Board

8.1 Introduction

The following paragraphs are descriptions of several smartphone apps that contain features wish to emulate in our own project. They in many ways solve the needs of our current clients. We therefore hope to take some of these phone-app features and modify them to better meet the needs of our own clients.

Whiteboard Capture Pro

Source: Beetlebug Software's website
http://www.beetlebugsoftware.com/

This is an iPhone app that takes a picture of a white board and then analyzes it for key content. The user selects objects to remove from the photograph. This leaves only the writing on the board behind. The App then analyzes the writing and removes the background image of the whiteboard itself. This sometimes leaves fuzz or imperfections in the white background, so there is then a slider available to filter out this extra noise/fuzz that shows up in the end product. The resulting image is a pure white background with handwriting on it.These photos can then be saved, cropped, shared, and organized within-app tools.

WBConference

Source: Elecom'e website
http://app.elecom.co.jp/en/wbcap/ios/manual.html

This is an Android app that competes with our product because it is another whiteboard capturing device. WBConference differs from Whiteboard Capture Pro in that it is able to automatically recognize which sections of the board are whiteboard. This then allows it to apply its magnified keystone correction to remove the excess background imagery. In cases that it cannot recognize the board you can zoom in on just the board boundaries manually before capturing the image. The app has contrast adjustment and image rotation as well so you can take images from any orientation without problems.This app has editing features as well so you can add postscripts or speech bubbles to the images. The files can then be saved as PDFs along with any notes you want to add to them.This app has a widget for the home screen for quick image capturing, and you can set up an

email address for quick delivery of the images to an external source.

8.2 CamScanner -Phone PDF Creator

Source: Intsig's Website http://www.intsig.com/en/camscanner.html

This is the most downloaded scanner app on the market. With it you can take photos of any document, whiteboard, etc that you want. You then go through an editing process in which you can select the important portion of the photograph, change the detail level, contrast, light/darkness etc. It will then save your new document in any number of saved folders. You can make notes about each image and these notes will be saved with the image. You can email, print, fax, or transfer via Bluetooth any of the photos. You can also upload your images to google docs, evernote, skydrive, dropbox, or box.net. These documents get saved as PDFs. There are different enhancement modes: No enhance, low and high enhance, gray mode, and B&W Document modes. These different modes will be better depending on the environment or object that youre trying to scan. The B&W mode is particularly helpful when scanning books/papers because it does a better job of removing the background noise. This app allows for batch photo taking and batch photo scanning, so you can take multiple pictures and it will scan them all at the same time.

8.3 Whiteboard Capture Pro

Source: Magnicode's website
http://www.magnicode.com/

This app is a dumbed down version of the previous three. It does the job, it scans and enhances images, it just isnt as well known as the others and thus doesnt have the money/time to invest in extra features. This aside, it does work, it is free, and it does save images as PDFs for later use. You can email these photos to yourself and store them in different photos. You can attach notes to your images and you can enhance the quality of the whiteboard picture with their auto-enhance tool. On the upside, it IS a much smaller program than your avg whiteboard capture app. Over all a smaller lighter free alternative. I installed this app on my phone and I had trouble using it because it kept crashing.

Conclusion

These smart phone apps will be some of the greatest competition to our project because they meet many of our client's needs already. Not only that, they're free applications so our clients wouldnt need to spend money either. The following is a list of features that we should attempt to emulate when designing our own product.

All of these applications contain ways to filter out background noise so that whiteboards appear pure white and text looks crisp and clean. This will be an important aspect of our own product because our image capture device will be subject to a wide variety of lighting situations and will need to be able to adapt to any of them. Another key feature is the ability of these apps to save and send the images via email, google docs, and other online mediums. This will be an important point in our project as well. Another good feature was the ability for some of the apps (CamScanner for example) to correct for image angles. If the board is photographed from an angle, the smartphone apps will compensate so that the final scanned image looks like it was taken straight on.

Desirable features not found in smartphone apps:

- Photo splicing: These apps do not combine images to add in details covered by professor's body.

- Automatic: These apps do not automatically capture images, process them, and then send them away. They instead require user feedback every step of the way.

By adding these features to the functionality currently found in modern apps we hope to create value for our customer.

Cameras we could use in our project

Here are the current top three cameras that we think could help us the most when building our image capturing system.

- Nikon COOLPIX S800c 16 MP Digital Camera
  - http://www.amazon.com/Nikon-COOLPIX-Digital-Optical-3-5-inch/dp/B0090SLKUM
- Samsung Camera EK-GC100 Galaxy Camera
  - http://pdadb.net/index.php?m=specs&id=3813&c=samsung_ek-gc100_galaxy_camera
- Polaroid SC1630 Smart Camera
  - http://www.upi.com/Science_News/2012/01/16/Polaroid-joins-digital-camera-arena/UPI-61851326750025/

We are interested in them because they are cameras running the Android operating system. This means that we could create our own custom application for these devices, greatly simplifying our design process. These cameras would also be useful because they can connect to Bucknell's wifi network. This would allow us to wirelessly transferr information from the cameras to whatever image processing hardware we decide to connect it to. The main drawbacks at the moment with these Android cameras is that two of them haven't been released yet (Samsung and Polaroid). IF they are released in time, they would be the most desireable of the various camera options available.

Details on Learning Disabilaties

Introduction

One of the major motivating factors behind designing our image capturing system is to help meet the needs of students with disabilities. The term "students with disabilities" is a very broad term, however, so we would like to use the following section to help discribe some of the things that mildly disabled students have trouble with at Bucknell, and would therefore need our system to capture information presented on the board for them.
Source:
http://www.sfasu.edu/disabilityservices/facultyandstaff/for_service_providers/note_q_a.asp

Disabilities that students might have that impair their ability to take notes:

- Visual Impairments
  - May be fully blind and need notes translated into Braille
  - May not see well and need large print letters
  - May have trouble copying information from whiteboards, projectors, etc.
  - May have trouble seeing certain colors when framed by a white or black background
- Specific Learning Disabilities
  - Reading Disability
  - Writing Disability

  - Spelling Disability
  - Inability to copy what they see
  - Inability to write what they hear
  - Inability to write legibly
  - Number Reversal problems
- Mobility Impairments
  - Physically unable to write
  - Physically unable to write quickly
  - May be unable to effectively handle a writing impliment
- Partial or Full loss of hearing

This is just a small portion of the many disabilities faced by students in universities around the world. We hope to help them by giving them full access all information presented on boards during lectures. By providing easily accessible, easily modifiable images, we hope to help even the playing field for students with disabilites. Secondary goals of our project will help to make the learning process even easier. Some students get distracted if they see more than one line of text at a time. If we have enough time we will help these students by providing slide bars that will cover portions of the images that students are not currently viewing. This and many other minor features are things that we will accomplish if we have free time after completing our primary objectives.

9 Notes from Client meeting 10/05/2012

Point to git repository on website or it 'never happened.' The only things Thompson knows about are those found on the website.

How image processing is generally don Types of image processing
Important points given during meeting:

- Wireless
- Way to tell system that "this" is a key fram/moment.
  - Instructor marked key moments/frames with a button or gesture or something.
- Generate list of 'it would be nice if...'
- Email about sitelines, optimal viewing angles, aspect ratios, etc.
- Re-organize Related Technologies
- Want: What are we DOING with all information presented in research/documentation
- Want: Paragraph at end of smartphone app summaries, synthasizing/analyzing information presented in summaries
- Microsoft: This project was very close to what we are going to do, that is why we are going into so much depth on it.
- Give information on the whole field of Image processing.
- Give information about students with various disabilities that would benefit from our product
  - 'This is what the students need and why'

Notes on stuff we'll be doing next:

- Figure out what you're doing in the next couple months
- Look at what tasks you could be doing, analyze the risk of each task.
- Arrange everything by risk. Highest risk on top!
- Assign people reduce the risks of each task
  - You can have multiple people working on a single thing. The idea is to reduce the high risk tasks asap so that they don't kill the project later on.
- Assign 3-4 deliverable items to each person to reduce risk
- Can have multiple people per task
- Throw resources at the rediculously risky to get it done, else project fails

10 Group work on Memo 10/03/2012

Worked with Colin and Phil to create the memo for our 10/05/12 meeting.

11 Individual Work on Further Research on Phone Apps 09/20/2012

11.1 APPS

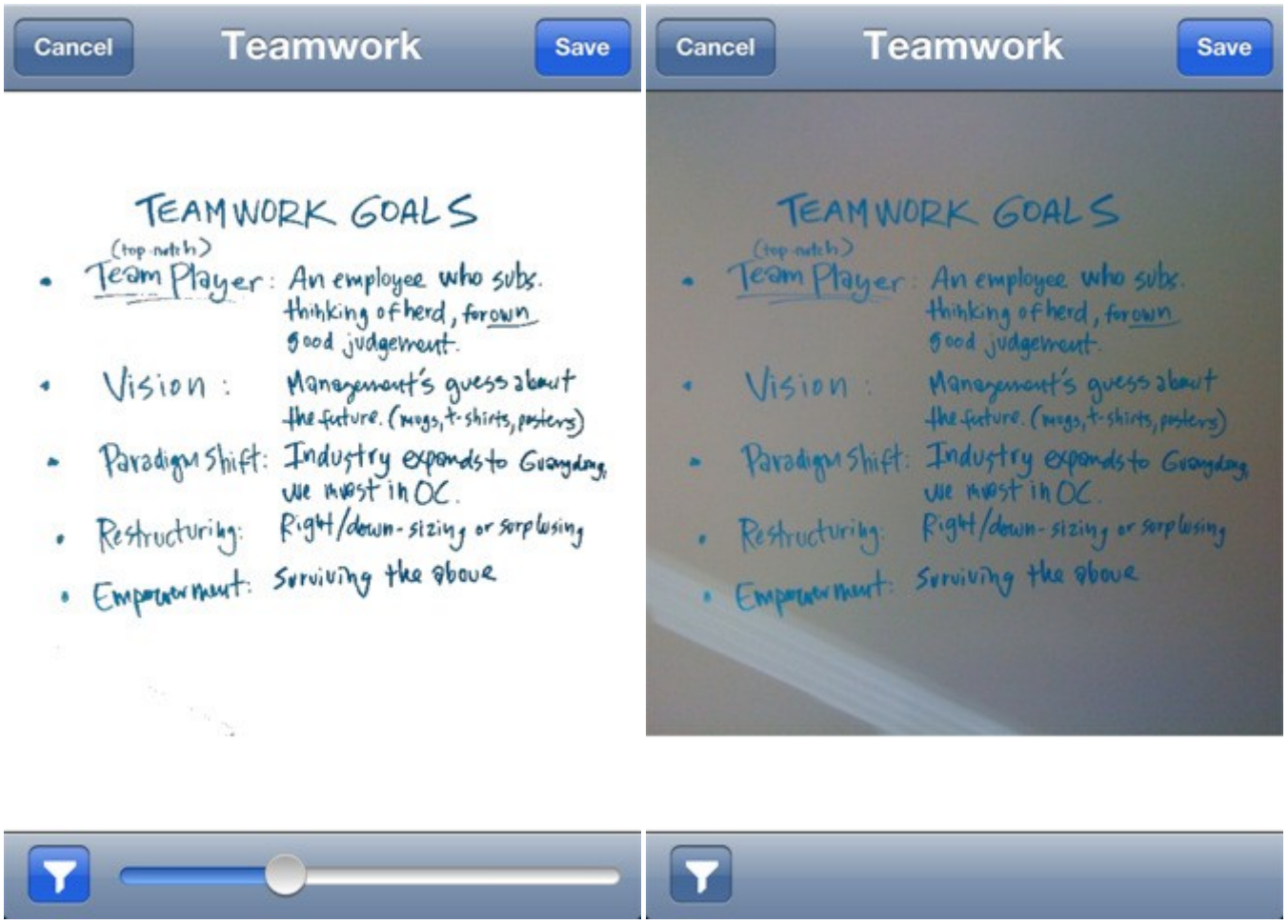
I was looking into android cameras earlier and found two possible candidates. One of them (The Nikon) has been released already, but the Samsung looks like a much better product if we can get it in time.

Nikon COOLPIX S800c 16 MP Digital Camera
Samsung Camera EK-GC100 Galaxy Camera

11.2 Whiteboard Capture Pro

This is an iPhone app that takes a picture of a white board and then analyzes it for key content. The user selects objects to remove from the photograph. This leaves only the writing on the board behind.

The App then analyzes the writing and removes the background image of the whiteboard itself. This sometimes leaves fuzz or imperfections in the white background, so there is then a slider available to filter out this extra noise/fuzz that shows up in the end product. The resulting image is a pure white background with handwriting on it. These photos can then be saved, cropped, shared, and organized within-app tools.



Notice the slider at the bottom of the image on the left. This is the contrast slider that helps remove background noise.

(guesswork) Contrast sliders work by analyzing the transition colors between the white and the eventual blue of the writing. The higher the contrast, the faster the transition must be between pure white and pure blue. If the transition is too slow, the transition pixels are assumed to be noise and removed from the photo. This is useful both in making the handwriting appear crisp and in removing random background smudges. Smudges are of course removed because they dont have the crisp transition periods found in the writing on the board. (Now back to research)

11.3 WBConference

This is an Android app that competes with our product because it is another whiteboard capturing device. WBConference differs from Whiteboard Capture Pro in that it is able to automatically recognize which sections of the board are whiteboard. This then allows it to apply its magnified keystone correction to remove the excess background imagery. In cases that it cannot recognize the board you can zoom in on just the board boundaries manually before capturing the image. The app has contrast adjustment and image rotation as well so you can take images from any orientation without problems.

This app has editing features as well so you can add postscripts or speech bubbles to the images. The files can then be saved as PDFs along with any notes you want to add to them. This app has a widget for the home screen for quick image capturing, and you can set up an email address for quick delivery of the images to an external source.

11.4 CamScanner -Phone PDF Creator

This is the most downloaded 'scanner' app on the market.

With it you can take photos of any document, whiteboard, etc that you want. You then go through an editing process in which you can select the important portion of the photograph, change the detail level, contrast, light/darkness etc. It will then save your new document in any number of saved folders. You can make notes about each image and these notes will be saved with the image. You can email, print, fax, or transfer via Bluetooth any of the photos. You can also upload your images to google docs, evernote, skydrive, dropbox, or box.net.

These documents get saved as PDFs.

There are different enhancement modes: No enhance, low and high enhance, gray mode, and BandW Document modes. These different modes will be better depending on the environment or object that youre trying to scan. The BandW mode is particularly helpful when scanning books/papers because it does a better job of removing the background noise.

CamScanner allows for batch photo taking and batch photo scanning, so you can take multiple pictures and it will scan them all at the same time.

You can password protect your documents and even save different document sizes.

11.5 Whiteboard Snap

This app is a dumbed down version of the previous three. It does the job, it scans and enhances images, it just isnt as well known as the others and thus doesnt have the money/time to invest in extra features.

This aside, it does work, it is free, and it does save images as PDFs for later use. You can email these photos to yourself and store them in different photos. You can attach notes to your images and you can enhance the quality of the whiteboard picture with their auto-enhance tool.
On the upside, it IS a much smaller program than your avg whiteboard capture app. Over all a smaller lighter free alternative.
I installed this app on my phone and I had trouble using it because it kept crashing.

12 Group Meeting with Clients 09/12/2012

12.1 Base System Requirements

- Images must be easy to transfer to the student

  Could be sent via email, through a link inviting them to view a different site, net space, etc.

- Professor must be able to review the images before okay-ing them for distribution.

  Must be able to select different key images if they want.

- Must be able to enlarge/interact with and edit after export
- System should not need to be plugged in
- Set up can be longer the first time as long as you can save the settings so that it doesnt take so long in the future.

  Setup vs. Calibration

  Active time vs inactive time

  It can take longer to set up if it doesnt need constant attention. Inactive time to set up is much better than active time.

  5 min reasonable

- Time stamps of when erasing happens

  Goal 1: End product

  Goal 2: Step by step board

13 Individual Work on Further Research and Website Content 09/12/2012

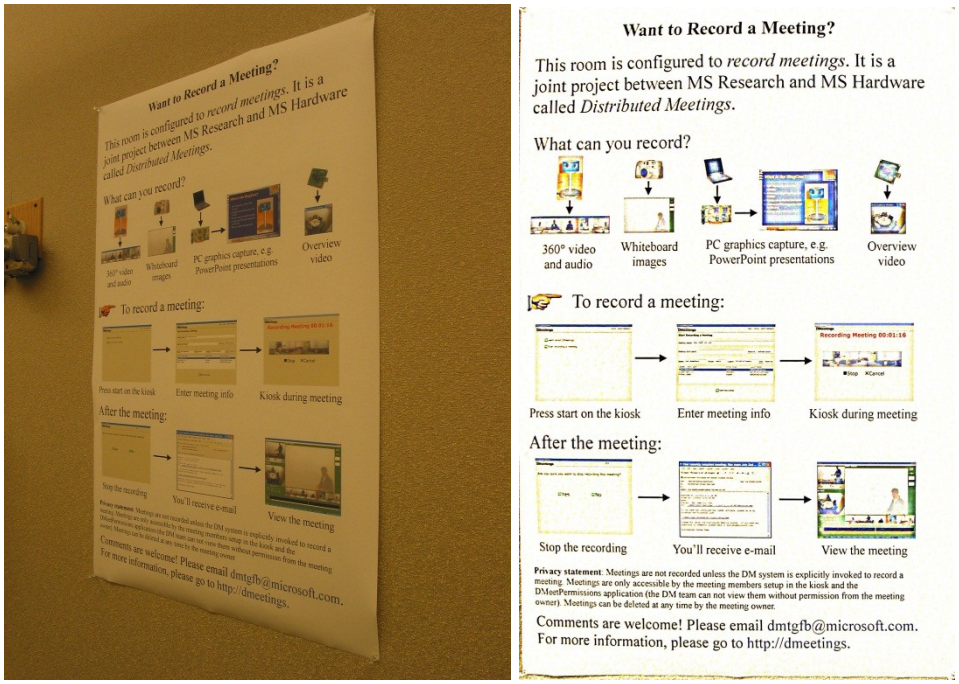
13.1 Website Content

- Added calendars to both the front page and our meetings page.
- Created new ProPANE calendar
- Added Griffin's Calendar and ProPANE's calendar to website calendar

13.2 Further Research

Found a page that seems to have a piece of demo software available to those with access to Microsoft Researchs internal website:
http://research.microsoft.com/en-us/um/people/zhang/WhiteboardIt/
This system takes an image and filters out key information.

The software and technology as a whole is still in its research/development stages. It is a joint project with MS Research and MS Hardware called Distributed Meetings. They have a few technologies going together: A 360 degree video and audio recorder, a Whiteboard image capturing system, (most relevant to us) a PC graphics capture system. Their idea is to record the meeting in several different ways, and then provide easily accessible ways to view all meeting content.



We may wish to contact dmtgfb@microsoft.com to ask for more information on their image processing algorithms later on in the process.

Im not sure how helpful this might be, but here is a link to Ink-Enabled Apps For Tablet PC
http://msdn.microsoft.com/en-us/magazine/cc967278.aspx

http://www.fxpal.com/?p=reboard
http://arxiv.org/abs/0911.0039
The following is a paper that talk about another whiteboard captureing technology called ReBoard:
http://arxiv.org/ftp/arxiv/papers/0911/0911.0039.pdf
http://www.fxpal.com/publications/FXPAL-PR-10-546.pdf

13.3 Additional Apps:

- Whiteboard Capture
- Whiteboard Share
- WBConference
- Whiteboard Snap
- BoardTable

14 09/11/2012

I first uploaded pictures to the website for our personal biographies.



After this I wrote an overview about ProPANE on our front page:
Welcome to the website for the Electrical and Computer Engineering senior design project led by Griffin Dunn, Phil Stahlfeld, and Colin Madigan. ProPANE's goal is to design and implement a system that will automatically capture all information written on a board during class. This system will then present the saved information in a readily accessible manner so that Bucknell can both better meet the needs of students with disabilities and provide professors with a means to easily compare their notes with the actual information presented in a lecture. This project was motivated by Bucknells desire to cheaply meet the needs of their students with disabilities. Hiring professional note takers is an expensive endeavor and finding cheaper alternatives is much more desirable. This project involves the capture of information from a 2D surface. It will likely require image capture and image processing technology.

14.1 Design Constraints

- ProPANE must be fully autonomous. After setup the system should require little to no outside interference. The professor should be able to turn it on and leave it running during class and afterwards return to find a set of images depicting everything that was on the board during class.
- The information must be presented in a format that allows for easy manipulation, zooming, and editing so that students with disabilities can easily view all content that is displayed on the board.
- The system must be discreet. It cannot make loud noises, flashes of light, or create any other forms of distraction during class. Students must be able to concentrate on the lecture not the board capture device.

15 Individual Work on Competing Technologies 09/05/2012

We have three technologies to compete with:

15.1 The Phone App

There are several smartphone apps out there that will scan pictures of white boards and filter out the unnecessary information. These applications range from free to a couple dollars on most app stores.
http://www.beetlebugsoftware.com/ is a good example.

Other notable apps:

- Qipit White
- Genius Scan
- JotNot Scanner Pro
- Whiteboard Capture Pro

However, this IS an issue because it is an area that could possibly pose legal problems. If the resolution is too poor, then the system would be giving ProPANE reliant students a disadvantage. In my opinion, that would be a complete failure of the project.

15.2 Scanners

There are scanners that you can attach to an existing white board. After calibrating these scanners, they track your movements using the combination of the sanner and an electronic pen. These electronic pens have replaceable dry erase tips to draw with and replaceable batteries to keep them charged. Some of them require a projector to display background information and others do not.

Examples:

- MimoCapture
- eBeam System 3
- Interlink FreeBeam

15.2.1 Electronic Whiteboards

Electronic whiteboards are special boards that sense pressure and can display electronic pen interactions with a high degree of accuracy. These displays come in two standard varieties: Those that are electronic displays and those that require a projector to project both the images and any user-inputted writing. Electronic whiteboards tend to be the easiest to use, but they're not very portable because the entire board is required. The trade-off for poor portability is that they can do much more. Multiple people can interact with the board at the same time, and it can be a much more interactive experience.

Examples:

- Smarttechs SMARTboard
- Panasonics Panaboard
- Hitachis Starboard
- The Promethean board

16 Initial Group Meeting 08/30/2012

With Phil Stahlfeld and Colin Madigan

Began working on group tasks:

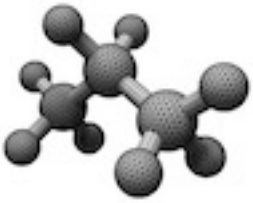
- Team Name
- Team Logo
- Document Template
- Design Specifications

16.1 Team Name

After some discussion we decided that names such as White board scanner and board capture system werent catchy enough. We decided to create an acronym instead so to make our name catchier and thus more memorable. Colin finally came up with our final acronym: ProPANE, short for Professional Portable Automatic Note Extractor. With this agreed upon we moved on to deciding upon our team logo.

16.2 Team Logo

We decided that our logo had to relate to our team name, so with that in mind we searched for images related to the molecular structure of propane. Our favorite image is shown below, and has been adopted as our team logo:



16.3 Document Template

We decided to use LaTEX as our default layout manager for all of our documents. We chose this formatter because it takes care of all the formatting and leaves us with the job of finding and preparing the information, which is the more important part of our job.

16.4 Technical Specifications

As noted in our first deliverable, The goal of this project is to create a system that captures all of the information written on a board during a class in a readily accessible manner. The two driving forces behind solving this problem are: autonomous collection of notes for students with disabilities and providing a means for professors to compare their notes with the actual information presented during a lecture.

We will be meeting with Robert Midkiff and Douglas Gabauer on 09/13/2013 to discuss more detailed specifications for the project.