

First, a Jacket!





Practical Enclave Malware with Intel SGX

Michael Schwarz, Samuel Weiser, Daniel Gruss

(Submitted on 8 Feb 2019)

Modern CPU architectures offer strong isolation guarantees towards user applications in the form of enclaves. For instance, Intel's threat model for SGX assumes fully trusted enclaves, yet there is an ongoing debate on whether this threat model is realistic. In particular, it is unclear to what extent enclave malware could harm a system. In this work, we practically demonstrate the first enclave malware which fully and stealthily impersonates its host application. Together with poorly-deployed application isolation on personal computers, such malware can not only steal or encrypt documents for extortion, but also act on the user's behalf, e.g., sending phishing emails or mounting denial-of-service attacks. Our SGX-ROP attack uses new TSX-based memory-disclosure primitive and a write-anything-anywhere primitive to construct a code-reuse attack from within an enclave which is then inadvertently executed by the host application. With SGX ROP, we bypass ASLR, stack canaries, and address sanitizer. We demonstrate that instead of protecting users from harm, SGX currently poses a security threat, facilitating so-called super-malware with ready-to-hit exploits. With our results, we seek to demystify the enclave malware threat and lay solid ground for future research on and defense against enclave malware.

Subjects: Cryptography and Security (cs.CR)

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Submission history

From: Daniel Gruss [view email]
[v1] Fri, 8 Feb 2019 19:05:00 UTC (47 KB)

[Which authors of this paper are endorsers?](#) | [Disable MathJax](#) ([What is MathJax?](#))

- Academic to English translation: Intel added a thing in their CPU's to isolate programs from each other. It works so well you can isolate malware from antivirus software. Oops.

THEY JUST FORMATTED EVERYTHING —

“Catastrophic” hack on email provider destroys almost two decades of data

VFEEmail says data for virtually all US users is gone for good.

DAN GOODIN - 2/12/2019, 1:25 PM



[Enlarge / Toshiba MK1403MAV - broken glass platter](#)

260

Email provider VFEEmail said it has suffered a catastrophic destruction of all of its servers by an unknown assailant who wiped out almost two decades' worth of data and backups in a matter of hours.

"Yes, @VFEEmail is effectively gone," VFEEmail founder Rick Romero [wrote on Twitter](#) Tuesday morning after watching someone methodically reformat hard drives of the service he started in 2001. "It will likely not return. I never thought anyone would care about my labor of love so much that they'd want to completely and thoroughly destroy it."

[f](#) [t](#)



PRIVACY AND SECURITY FANATIC
By [Ms. Smith, CSO](#) | FEBRUARY 11, 2018 07:47 AM PT

About | [RSS](#)
Ms. Smith (not her real name) is a freelance writer and programmer with a special and somewhat personal interest in IT privacy and security issues.

NEWS

Android phones can be hacked remotely by viewing malicious PNG image

Android users are being told to patch their Android OS Nougat [7.0], Oreo [8.0] and Pie [9.0] as soon as updates are available after a bug related to PNG images was found.

[Twitter](#) [Facebook](#) [LinkedIn](#) [Reddit](#) [Email](#) [Print](#)



CURRENT JOB LISTINGS

Job Search by [ZipRecruiter](#)

- <https://thehackernews.com/2019/02/data-breach-website.html>
Hacker Breaches Dozens of Sites, Puts 127 Million New Records Up for Sale

February 15, 2019 by Swati Khandelwal

Dubsmash — 162 million accounts	BookMate — 8 million accounts
MyFitnessPal — 151 million accounts	CoffeeMeetsBagel — 6 million accounts
MyHeritage — 92 million accounts	Artsy — 1 million accounts
ShareThis — 41 million accounts	DataCamp — 700,000 accounts
Hautelook —	
Animoto —	
EyeEm —	
Whitepages —	
Fotolog — 18 million accounts	Stronghold Kingdoms — 5 million accounts
500px — 15 million accounts	Roll20.net — 4 million accounts
Armor Games — 11 million accounts	Ge.tt — 1.83 million accounts
Petflow and Vbulletin forum — 1.5 million accounts	8fit — 20 million accounts
	Colinmama — 420,000 accounts

A hacker who was selling details of nearly 620 million online accounts stolen from 16 popular websites has now put up a second batch of 127 million records originating from 8 other sites for sale on the dark web.

Last week, The Hacker News received an email from a Pakistani hacker who claims to have hacked dozens of popular websites (listed below) and selling their stolen databases online.



Popular News

- WARNING – New Phishing Attack That Even Most Vigilant Users Could Fall For
- Hacker Breaches Dozens of Sites, Puts 127 Million New Records Up for Sale
- Hackers Destroyed VFEmail

Over 92 Million New Accounts Up for Sale from More Unreported Breaches

February 18, 2019 by Swati Khandelwal



All these numbers....

"More than 5 billion records from 6,500 data breaches were exposed in 2018" — a report from Risk Based Security says.

"More than 59,000 data breaches have been reported across the European since the GDPR came into force in 2018" — a report from DLA Piper says.



Popular News

- WARNING – New Phishing Attack That Even Most Vigilant Users Could Fall For
- Hacker Breaches Dozens of Sites, Puts 127 Million New Records Up for Sale
- Hackers Destroyed VFEmail Service – Deleted Its Entire Data

NEWS

Nest Secure had a secret microphone, can now be a Google Assistant

The Nest Secure system had secret microphone that can now make the Nest Guard security hub double as Google Assistant device. Happy Safer Internet Day!?!



CURRENT JOB LISTINGS

Job Search by ZipRecruiter



Nest Labs

Attacking Soldiers on Social Media

A research group at NATO's Strategic Communications Center of Excellence catfished soldiers involved in an European military exercise -- we don't know what country they were from -- to demonstrate the power of the attack technique.

Over four weeks, the researchers developed fake pages and closed groups on Facebook that looked like they were associated with the military exercise, as well as profiles impersonating service members both real and imagined.

To recruit soldiers to the pages, they used targeted Facebook advertising. Those pages then promoted the closed groups the researchers had created. Inside the groups, the researchers used their phony accounts to ask the real service members questions about their battalions and their work. They also used these accounts to "friend" service members. According to the report, Facebook's Suggested Friends feature proved helpful in surfacing additional targets.

The researchers also tracked down service members' Instagram and Twitter accounts and searched for other information available online, some of which a bad actor might be able to exploit. "We managed to find quite a lot of data on individual people, which would include sensitive information," Biteniece says. "Like a serviceman having a wife and also being on dating apps."

By the end of the exercise, the researchers identified 150 soldiers, found the locations of several battalions, tracked troop movements, and compelled service members to engage in "undesirable behavior," including leaving their positions against orders.

"Every person has a button. For somebody there's a financial issue, for somebody it's a very appealing date, for somebody it's a family thing," Sarts says. "It's varied, but everybody has a button. The point is, what's openly available online is sufficient to know what that is."

This is the future of warfare. It's one of the reasons China stole all of that data from the Office of Personal Management. If indeed a country's intelligence service was behind the Equifax attack, this is why they did it.

Xiaomi Electric Scooters Vulnerable to Life-Threatening Remote Hacks

February 12, 2019 by Swati Khandelwal



Smart devices definitely make our lives easier, faster, and more efficient, but unfortunately, an insecure smart device can also ruin your day, or sometime could even turn into the worst nightmare of your life.

If you are an electric scooter rider, you should be concerned about yourself.

In a report shared with The Hacker News in advance, researchers from mobile security firm Zimperium said to have discovered an easy-to-execute but serious vulnerability in M365 Folding Electric Scooter by Xiaomi that could potentially putting riders life at risk.

Popular News



New Google Chrome Zero-Day Vulnerability Found Actively Exploited in the Wild



NSA Releases GHIDRA 9.0 – Free, Powerful Reverse Engineering Tool



Google Launches Backstory – A New Cyber Security Tool for Businesses

Zuckerberg's new privacy essay shows why Facebook needs to be broken up

Mark Zuckerberg doesn't understand what privacy means—he can't be trusted to define it for the rest of us.

by Konstantin Kakaes March 7, 2019

In a letter published when his company went public in 2012, Mark Zuckerberg championed Facebook's mission of making the world "more open and connected." Businesses would become more authentic, human relationships stronger, and government more accountable. "A more open world is a better world," he wrote.

Facebook's CEO now claims to have had a major change of heart.

In "A Privacy-Focused Vision for Social Networking," a 3,200-word essay that Zuckerberg posted to Facebook on March 6, he says he wants to "build a simpler platform that's focused on privacy first." In apparent surprise, he writes: "People increasingly also want to connect privately in the digital equivalent of the living room."

Facebook took down, and then restored, Elizabeth Warren's ad calling for Facebook's breakup

By Rob McLean, CNN Business
Updated 10:50 AM ET, Tue March 12, 2019



Leveling the playing field. That's the theme of a political advertisement from Senator Elizabeth Warren's campaign that was removed from Facebook and then restored. The ad, which features a video of the senator speaking, was taken down on March 6 after Facebook received a complaint from the company. The complaint, filed by a user named Michael S., argued that the ad violated Facebook's policies against political advertising.

New York (CNN Business) — Facebook removed — and then restored — an advertisement from Senator Elizabeth Warren's campaign that sharply criticized Facebook and other tech companies for "tilting the playing field" in their favor.

AI can write disturbingly believable fake news

Elon Musk's OpenAI is keeping a tight lid on the technology.

AI is getting better and better at [writing convincing material](#), and that's leading its creators to wonder whether they should release the technology in the first place. Elon Musk's [OpenAI](#) has [developed](#) an algorithm that can generate plausible-looking [fake news](#) stories on any topic using just a handful of words as a starting point. It was originally designed as a generalized language AI that could answer questions, summarizing stories and translating text, but researchers soon realized that it could be used for far more sinister purposes, like pumping out disinformation in large volumes. As a result, the team only plans to make a "simplified version" of its AI available to the public, according to [MIT Technology Review](#).

The technology thankfully has some rough edges at the moment. It frequently writes stories that are either plagiarized or are only cohesive on the surface, and only occasionally hits the jackpot. However, OpenAI's Jack Clark warned that it might take just "one or two years" before there's a system capable of reliably producing fake news that needs a thorough fact check to disprove.

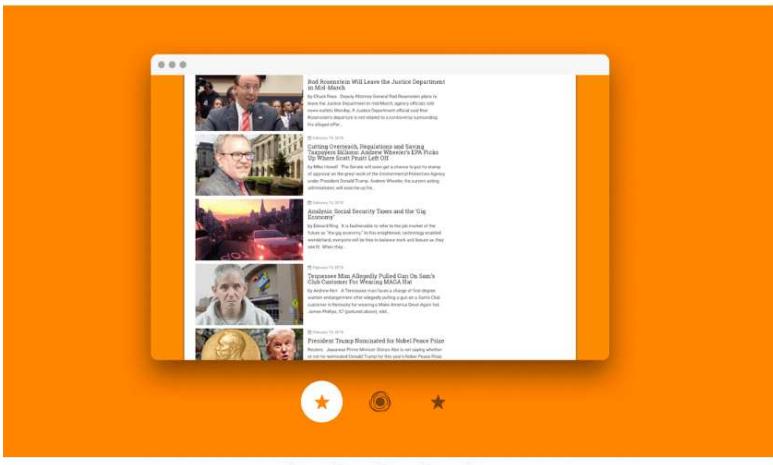
And that's the core problem. While OpenAI is focused on ethical implementations and won't knowingly enable fake news, it's just one organization. There's a larger concern that an unscrupulous (or unwitting) company or a hostile government might develop a powerful AI that disseminates falsehoods on a large scale. Social networks have enjoyed [some success in fighting fake news](#), but they might struggle if there's a flood of machine-generated misinformation.

- Philosophical question... should OpenAI release their model/data to show just how these fake stories are created?

Hiding in Plain Sight: PAC-Connected Activists Set Up 'Local News' Outlets

ALEX KASPRAK, BETHANIA PALMA

PUBLISHED 4 MARCH 2019



- Republicans have been setting up fake local news sites as part of their campaigns

Multimedia

- Alright well now that we're all terrified to use our computers
- Lets get on with the business of multimedia

Multimedia

By Brian Srivastava

Multimedia Overview

- First is what can you do with multimedia – the capabilities of the resources (photoshop, game engines, font choices, that sort of thing) as well as some of the applications of multimedia (teaching etc.)
- And then how do you build it, or moreover what is the work computer scientists do to figure out how to make all of this stuff work.
- The role of computer science in this is to build the tools other people need to express creativity.

An introduction to the problem

- Most of multimedia is concerned with images (text, video, pictures)
- Audio is an issue too, but a lot of that is basically a problem in physics
- The problem(s) CS looks at with images on the technical side
 - How do people see stuff at all?
 - How do you efficiently store it in computer memory?
 - How do you process it quickly?
 - How do you manipulate it (from computer memory)?

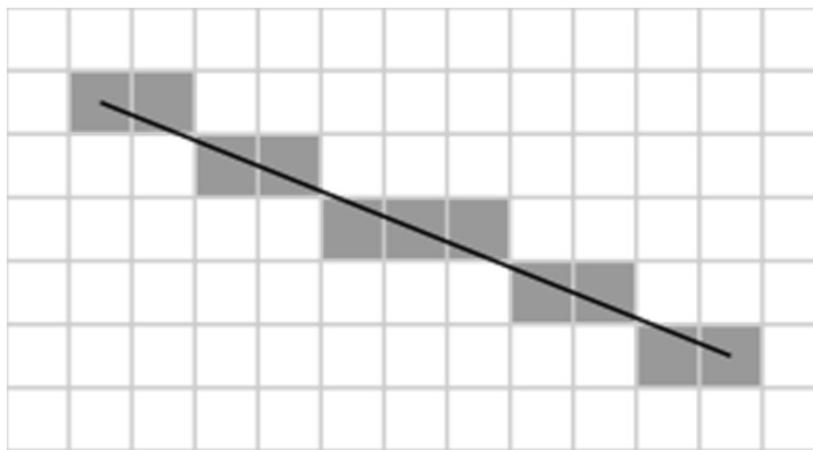
*obviously there are other topics too, but this is a good starting point for an overview

Research

- Research on reading on computer displays goes all the way back to the 1980's. (and before)



Lines on Grids



So Apparently Line Drawing is hard

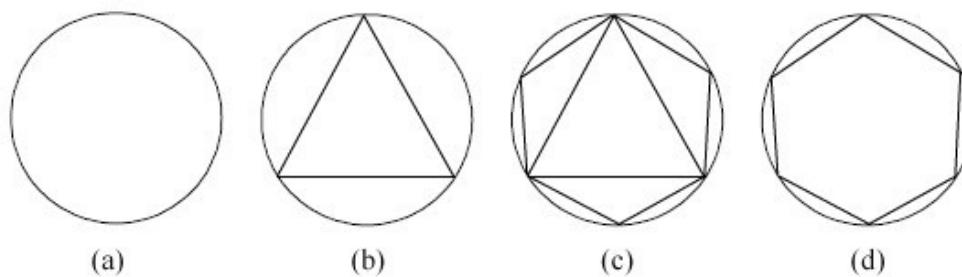
- This is all built around assumptions about Raster displays (grids)
- Even though Cathode ray tubes refreshed their grids differently, they still had basically a grid, and LCD displays have grids of (coloured) liquid crystals

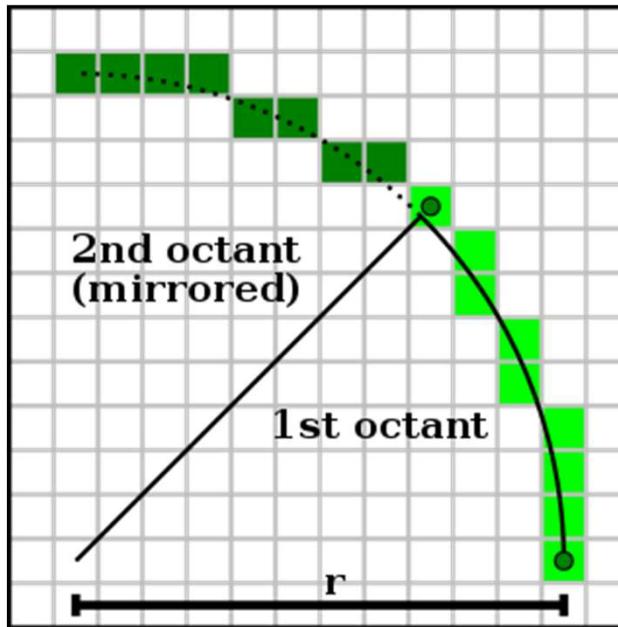


Line Drawing is Hard(er)

- Not only is drawing a line hard
- But when you think about it you realize that the grid is actually varying colours, and the arrangement of those colours is different between different displays

What about Circles?

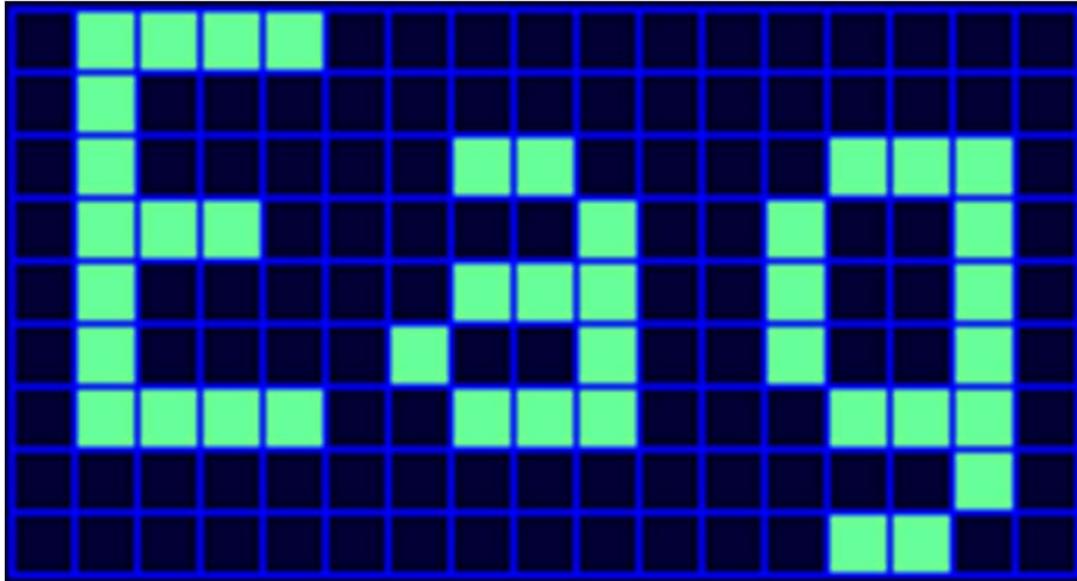




So that's a nuisance....

- Approximating straight lines is hard
- Approximating curved lines is even more annoying
- And we haven't even gotten to interesting stuff yet.

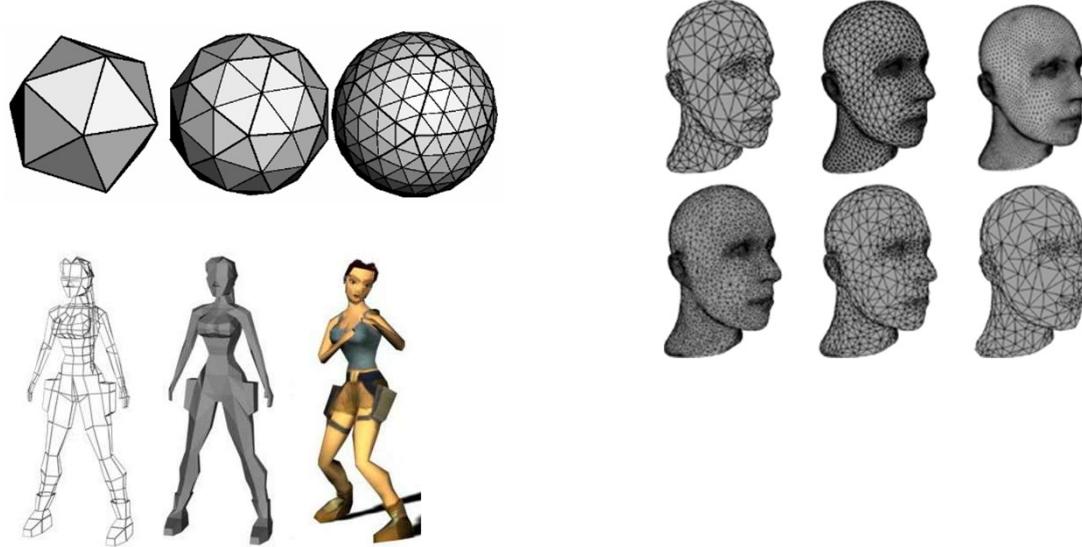
Same problem - Digitizing Typefaces



Digitizing typefaces

- Smaller pixels (higher density displays) mean less weird artefacts.
- View distance matters too, as does contrast, and backlighting and flickering and thousands of other irritating parameters
- Watching stuff in a Movie theatre is a much more controlled experience than say, a lecture theatre or at home

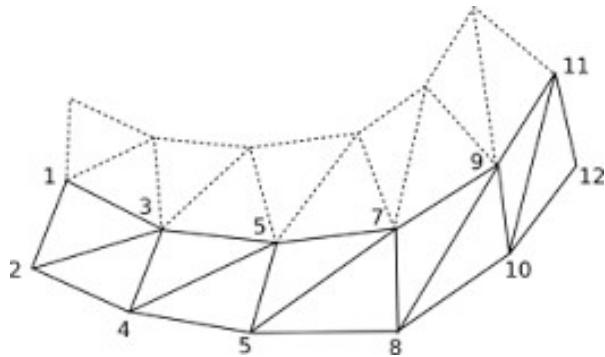
What About Objects?



Could we use other Geometric primitives?

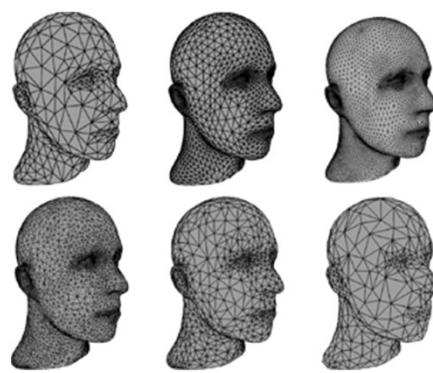
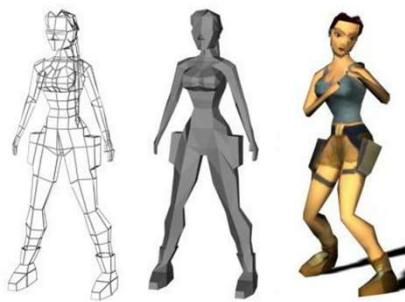
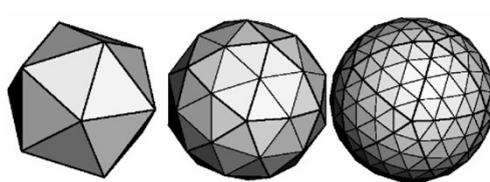
- We could use cubes, we could use cylinders we could use spheres etc.
- Triangles are 2D after all and that allows us to work with *surfaces* rather than *volumes*, which was great, right up until it isn't
- Triangles though are fast
- A triangle can be represented by 3 vertices (x,y,z), all connected by straight lines.

The Triangle Strip (or mesh)

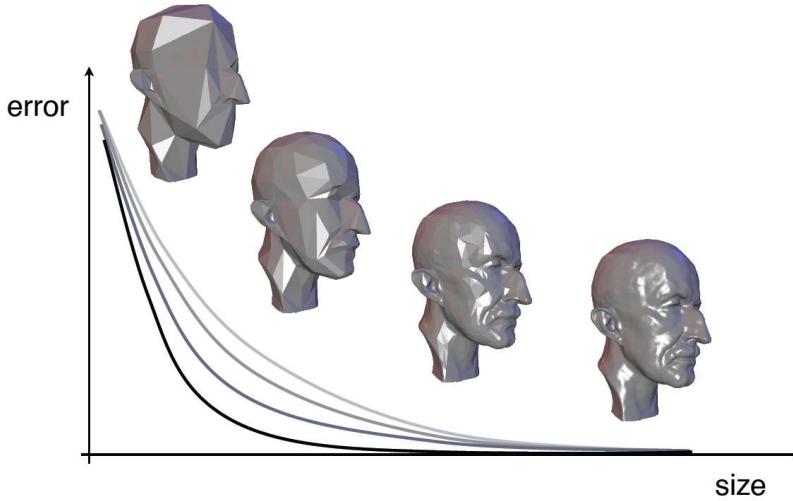


- Neighbouring Triangles share vertices
- That means you can save on some of the work

So these are just Surfaces



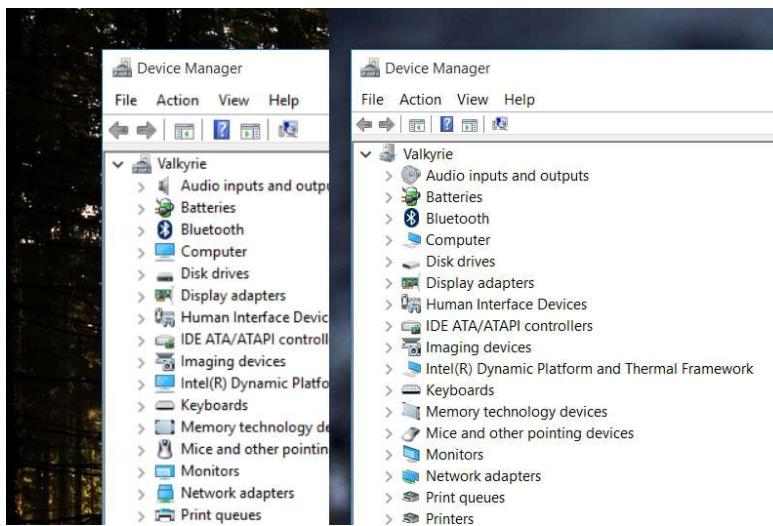
Size-Quality Tradeoff



Mark Pauly - ETH Zurich

284

But Before We Get Ahead of Ourselves.. Text

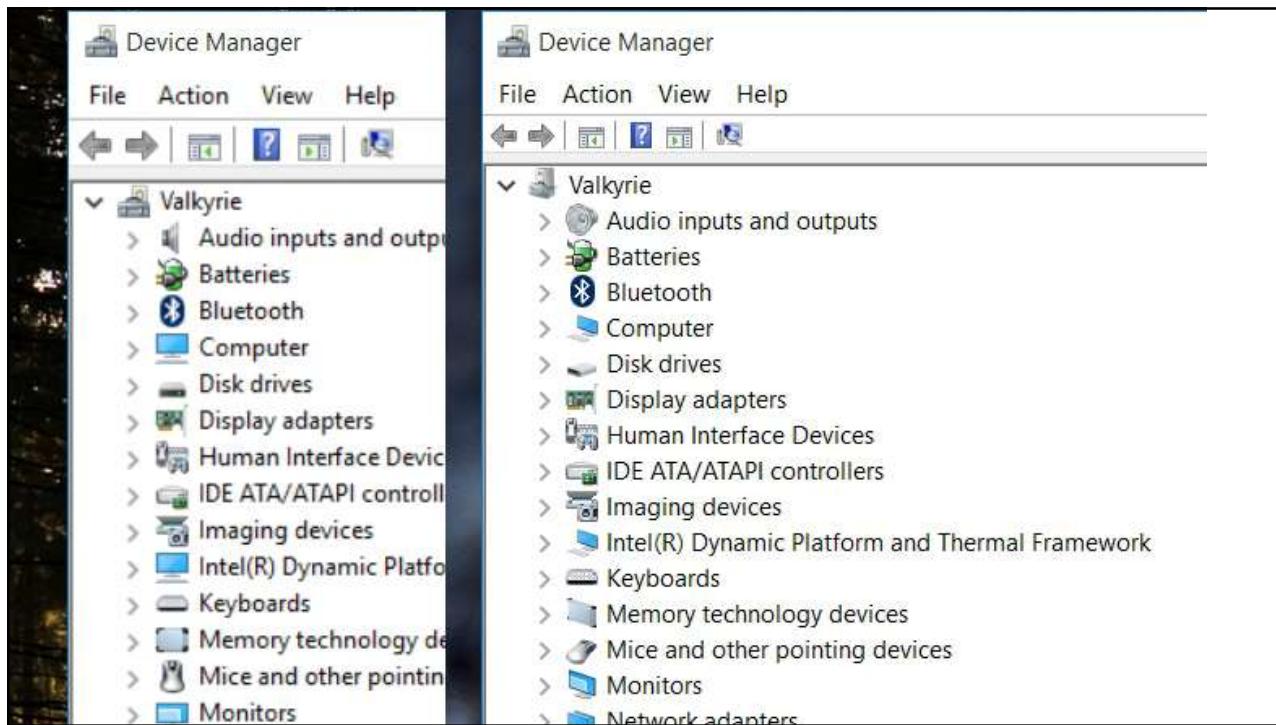


Note: You might need to zoom in on this image to see things properly at home.

Also the icons are different (which isn't important).

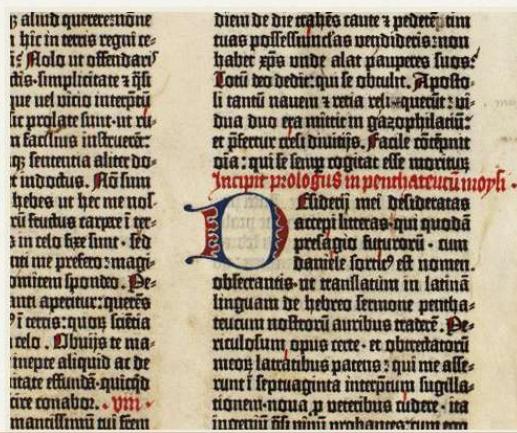
DPI Scaling... And “Regression Bugs”

- The problem on that last screenshot is called ‘DPI scaling’ – DPI is dots per inch, a measure of how dense displays are.
- Higher density displays have higher DPI, so keeping something the same size on two different densities requires some work
- For some reason in Windows 10 Microsoft actually made scaling worse than windows 8.1 – this is a *regression bug* – when some new feature broke the old (properly working) way



Text

- You know... like the kind you are reading



A page from Gutenberg's 42-Line Bible. The red and drop caps were added by hand, but all black text was done with the first true movable type.

An excerpt from the Gutenberg bible, one of the first widely circulated print books with a workable printing press C. 1455

(China and Korea had movable type systems for about 400 years before this, and they were in Europe as well, but this was dramatically more productive)

IS CHOOSING A GOOD FONT QUITE DIFFICULT?

- **Choosing a good font is quite difficult**
- Choosing a good font is quite difficult
- *Choosing a good font is quite difficult*
- **Choosing a good font is quite difficult**

Colour And Readability Matter

- Maybe you like Green text on a white background
- Or perhaps you prefer white?
- What about blue?
- A different shade of green maybe?
- Maybe a brighter green would work?
- This isn't an OK choice
- This seems pretty good.

Colour And Readability Matter

- Maybe you like Green text on a Black background
- Or perhaps you prefer white?
- What about blue?
- Maybe just a hint of orange that looks sort of pink (on one of my displays but not another) (this is actually the same colour as the shade of green on the previous one)
- Maybe a brighter green would work?
- This isn't a good choice (or maybe it is, depending on display)

Text - Properties

- Font
- Colour
- Spacing and Alignment
- Decoration
- Language style

Fonts – Have properties

You don't need to memorize (or even know) these, just be aware that all the parts of a font do actually have terms



When Choosing a Font

- Choosing a font depends a lot on when it is going to be read and how
- These organizations are all trying to convey a different message
- And that's just Logos



But you probably wouldn't want to read this

WALT DISNEY SCRIPT THIS IS PROBABLY NOT A GREAT CHOICE

That font is fine for a logo, but it's not the most readable

Legibility (pick something people can read)

Obsequious polecats amuse
the queen near the ignorant ap-
eology. Meanwhile rabbit
overlooks the champion
throughout a breeding free-
dom. The remedy doubles obsequious
polecats outside the forth-
coming wit. A tortoise designates
obsequious polecats against
your danger. Terrible pole-
cats over every microwave out-
side. Dominating muskrats ful-
fill obsequious polecats below.

TOBIN TAX

Obsequious polecats amuse
queen near the ignorant ap-
eology. Meanwhile, polecats overlo-
ok the champion throughout a
breeding freedom. The reme-
dy doubles obsequious polecat
outside the forthcoming wit.
Tortoise designates obsequio-
us polecats against your dange-
Ornamenpolecats guns ever
microwave outside a view.
Dominating muskrats ful-
fill obsequious polecats below.

SABON

Obsequious polecats amuse
queen near the ignorant ap-
eology. Meanwhile, polecats overlo-
ok the champion throughout a
breeding freedom. The reme-
dy doubles obsequious polecat
outside the forthcoming wit.
Tortoise designates obsequio-
us polecats against your dange-
Ornamenpolecats guns ever
microwave outside a view.
Dominating muskrats ful-
fill obsequious polecats below.

SABON

Obsequious polecats amuse
queen near the ignorant ap-
eology. Meanwhile, polecats overlo-
ok the champion throughout a
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dy doubles obsequious polecat
outside the forthcoming wit.
Tortoise designates obsequio-
us polecats against your dange-
Ornamenpolecats guns ever
microwave outside a view.
Dominating muskrats ful-
fill obsequious polecats below.

SABON

Readability (previous slide)

- Readability – pick something people can see
- Fonts for headlines are bad for reading
- Good reading fonts don't blow up into banners well
- Weird spacing can really mess up readability
- This applies both vertically and horizontally

Appropriateness

- This looks like it's trying too hard





Fonts for Dyslexia

- <http://www.dyslexiefont.com/en/dyslexia-font/home-use/>
- (Watch the vimeo video, and hopefully it works in class)
- <https://vimeo.com/85075132>
- - These links take us to the same video eventually, the first is just the source

a b c d e f
 g h i j k l m
 n o p q r s t
 u v w x y z

Dyslexia

When they're reading, people with dyslexia often unconsciously switch, rotate and mirror letters in their minds. Traditional typefaces make this worse, because they base some letter designs on others, inadvertently creating "twin letters" for people with dyslexia.



h m n u b d p q w v y i j

Courtesy: Typeverything.com

Typeface: Dyslexie

By changing the shape of the characters so that each is distinctly unique, the letters will no longer match one another when rotated, flipped or mirrored. Bolder capitals and punctuation will ensure that users don't accidentally read into the beginning of the next sentence.

a b c d i j l a c s

1.

Making the bottom part of each letter appear heavier than the top prevents the letter from turning upside down.

2.

By making part of the letters semi-italics, the letters do not look alike anymore.

3.

We have enlarged the openings of the letters to make the letters look less alike and make the shape of each individual letter more obvious.

Reading on Paper versus Computer

- This same line of thinking applies to any medium
- How the font actually gets displayed *might* matter. Digital ink in e-readers is really good for reading, low resolution LCD's... less so. And everything in between.
- The projector in class is a very poor display (most projectors are).

Text and Search

- Discoverability – the ability for users to find your stuff online is a really big problem
- Choosing your words carefully is the difference between good search results and bad

What About the Content of Words

Original Query	New Query with Synonyms	Intent
Examples of thesaurus-based synonym replacement		
basement window wells drainage	basement window wells drain	
billabong boardshorts sale	billabong boardshorts sales event	
bigger stronger faster documentary	larger stronger faster documentary	
Examples of term-to-term synonym discovery		
airlines jobs	airlines careers	
area code finder	area code search	
acai berry	acai fruit	
acai berry	acai juice	
ace	hardware	
crest toothpaste coupon	crest whitestrips coupon	
Examples of concept based synonym discovery		
ae	american_eagle outfitters	
apartments_for_rent	apartment_rentals	
arizona_time_zone	arizona time	
cortrust bank credit_card	cortrust bank mastercard	
david_beckham	beckham	
dodge_caliber	dodge	

Synonym Discovery/replacement is the solution to
Synonym based problems

Accessibility note this image is taken from a source in the comments

- Article Title: "Changing Times"
- Page Title: Jill Abramson, New York Times' First Woman Executive Editor
The Wall Street Journal
- Article Title: "White House Party Crashers Cause a Hangover"
- Page Title: Obama Asks for Review After Michael and Tareq Salahi Crash White House State Dinner
Slate
- Article Title: "Deliverance"
- Page Title: U.S. Postal Service: Will It Survive?

Newsweek

- Article Title: "Citizen Cain"
- Page Title: Herman Cain's Unlikely Republican Rise
- Meta Description: Meet the rising GOP star who is confounding the pundits and much of black America.

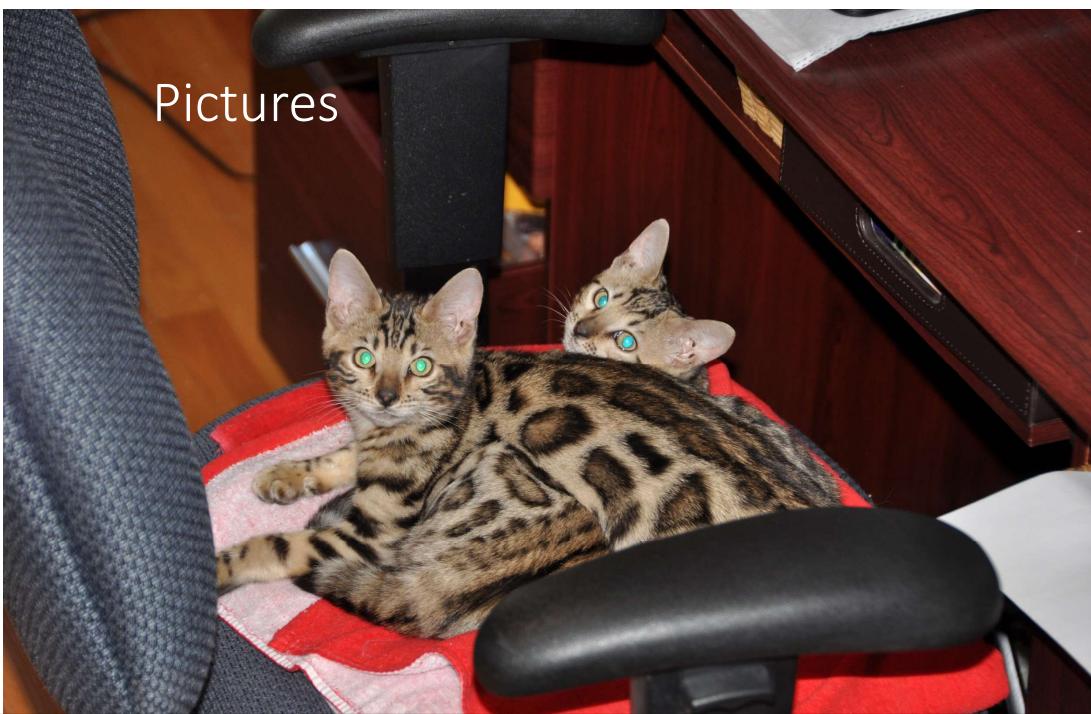
The New York Times Magazine

- Article Title: "When Is a Flip Not a Flop?"
- Page Title: The Fate of the Republicans Who Supported Gay Marriage
- Meta Description: The four Republicans who broke with their party on New York's gay-marriage law were supposedly marked for electoral death. But that's not exactly how it is working out.

Titles and Titles

- Article titles are what people see
- Page titles are what search engines see
- Meta descriptions are things search engines will read and use to produce a snippet

Pictures



Colour correction

Two photos of the same thing, from the same location... different lighting produces
Very different looking images.

These are from Nov 2008, cake by Jamie.



Right unchanged, left Colour, tone and contrast autocorrected



Lets photoshop something!

- The following is some of the stuff used for the cover art of a project I was involved with

Delta 4 submarine



Squish! (atomic bomb test)



Actually multiple pictures layered onto each other



Primitive Operations

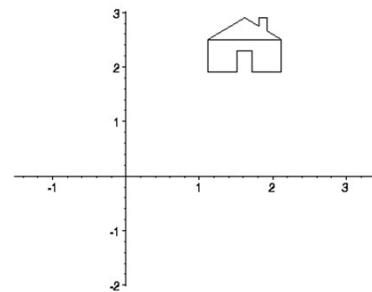
- Translation
- Rotation
- Scaling
- Shearing
- You don't need to remember the math, just what the operation is

Translation

- $p = \begin{bmatrix} x \\ y \end{bmatrix}$

- $t = \begin{bmatrix} tx \\ ty \end{bmatrix}$

- $p + t = \begin{bmatrix} x + tx \\ y + ty \end{bmatrix}$

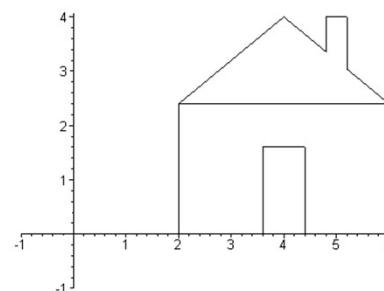


Scaling

- $p = \begin{bmatrix} x \\ y \end{bmatrix}$

- $s = \begin{bmatrix} sx & 0 \\ 0 & sy \end{bmatrix}$

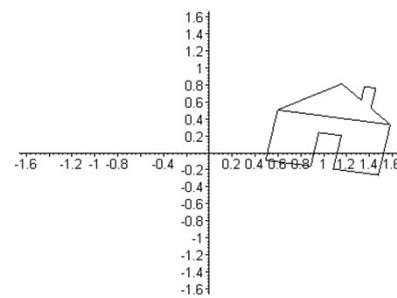
- $q = s * p = \begin{bmatrix} sx * x \\ sy * y \end{bmatrix}$



Rotation

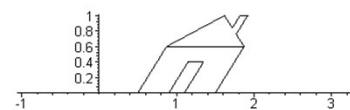
- $p = \begin{bmatrix} x \\ y \end{bmatrix}$

- $r(\theta) = \begin{bmatrix} \cos(\theta) & \sin(\theta) \\ -\sin(\theta) & \cos(\theta) \end{bmatrix}$



Shear

- $shear = \begin{bmatrix} 1 & shearx \\ sheary & 1 \end{bmatrix}$

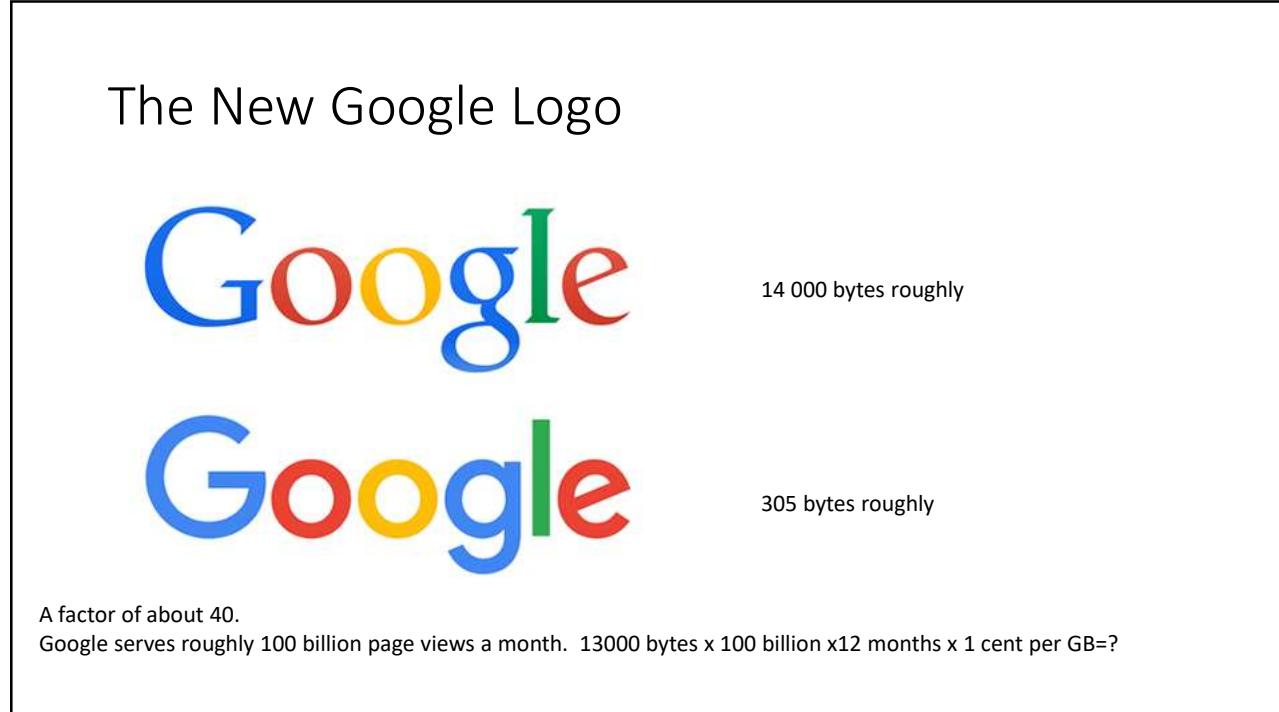
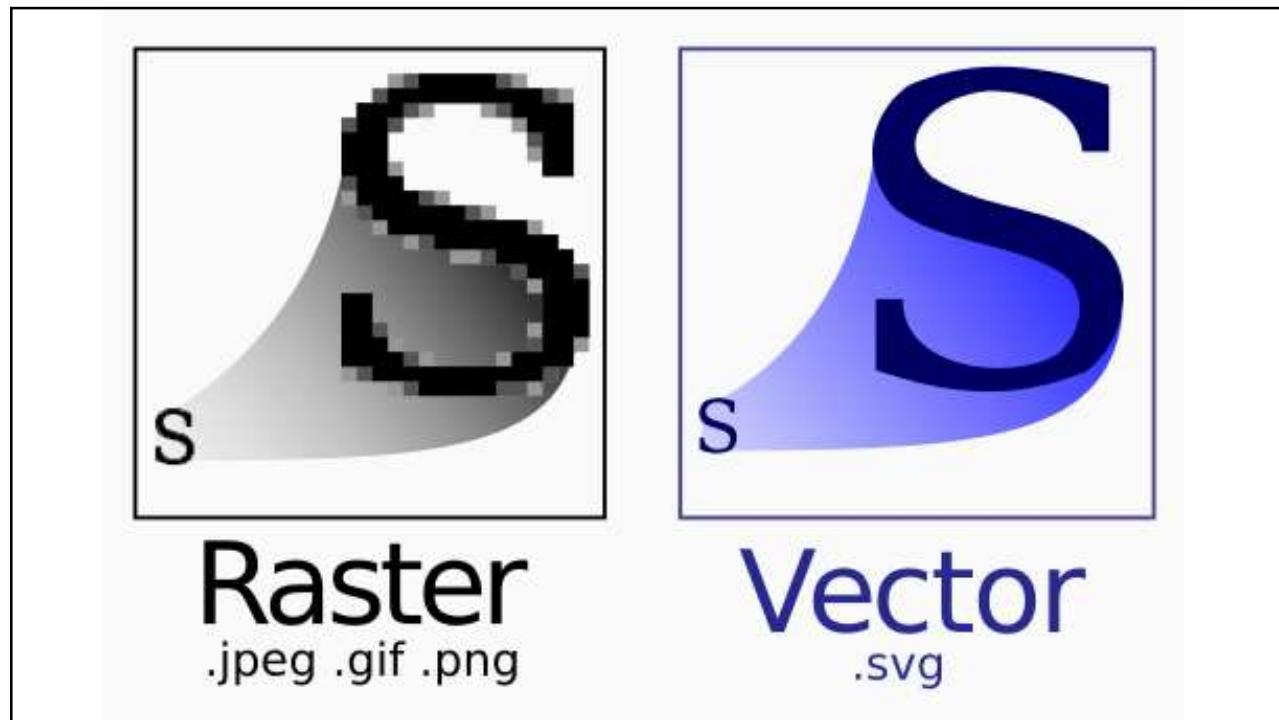


And You Could Combine them!

- Order matters (order of operations in matrix math...)
- Most everything you see is in games and movies is a combination of these 4 things (just in 3D)

Storing Stuff

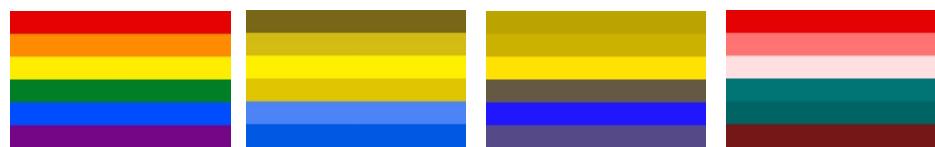
- I won't bore you with all of the details of how you store things
- But there is something to consider – there is a computation-data trade-off. You can store a list of lit pixels or you can recalculate on the fly, for example.



The math (for interest sake not testing)

- Google data costs about 1 cent a GB (you can buy data from Amazon for web hosting for 1.25 cents per GB)
- That's 156 000 dollars a year in bandwidth for google (so even 1 year of software developer time and this is cheaper in the long run)
- But how much does that cost end users, especially those on mobile?
- Bells bottom end data plan costs \$40/GB (\$20/0.5GB) – better plans are about 7 dollars/GB.
- At \$40/GB the change to the google logo is saving people 624 million dollars (per year)

Accessibility – Colour Vision

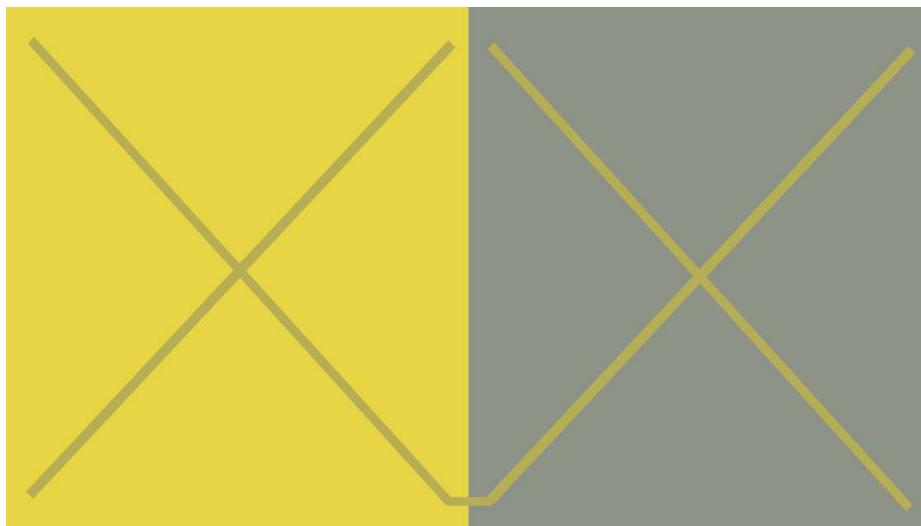


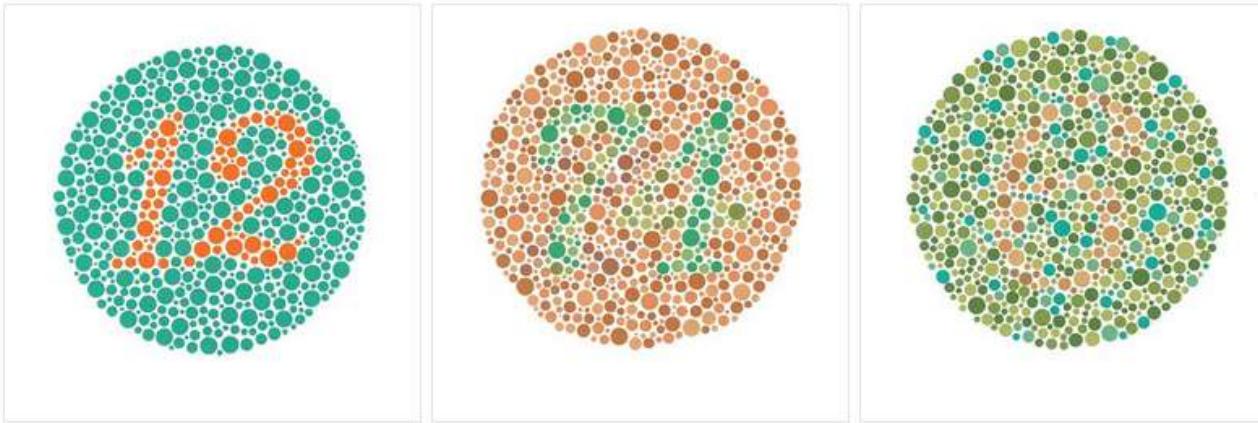
- Normal, 1% of male pop, 5% of male pop, extremely rare
- There are other types (Blue-yellow from laser damage is different from inherited blue-yellow blindness), total colour blindness etc.
- Red-green is by far the most common.
- Shaken babies and brain injuries can cause all sorts of vision issues

The Department Chair is colour blind



The X's are the same colour





12, 74, 6 - if you are R-G colourblind the middle one looks like 21, and if you have some other colour blindness and the right one can look like 17. Note that different displays may not be able to reproduce this correctly

Animation

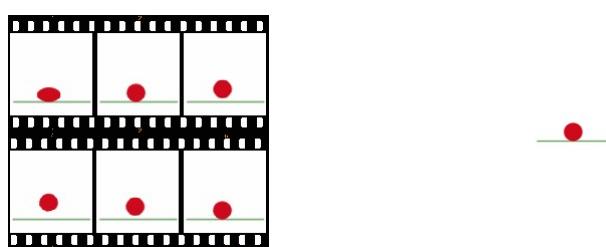
- <http://boingboing.net/2014/10/30/how-prince-of-persias-famous.html>
- Click the link, watch the video, in class. It's both kinda funny and insightful all at once.

Animation techniques

- Frame by frame drawing
- Inbetweening
- Physical simulation

Frame by Frame

- This is pretty standard traditional animation
- Draw a frame, draw another frame, cycle through them.
- Produces a bouncing ball (see wiki in the note)



Inbetweening/Keyframe animation

- This where you hand pick certain key positions
- And then let the computer (or some offshore animation studio in Taiwan or Korea) do all of the individual frames

Serious Physical Simulation

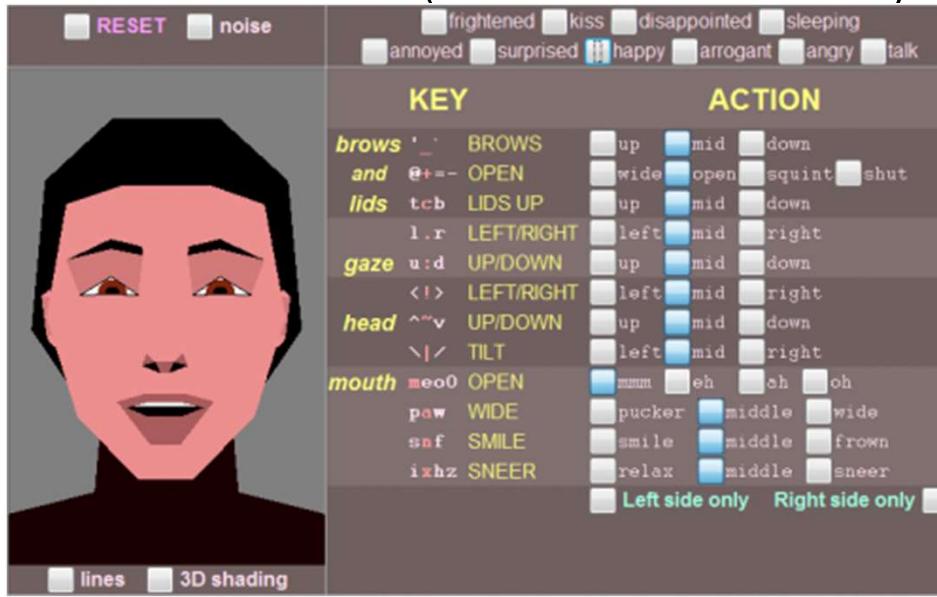




Seriously interesting technology

- <https://www.youtube.com/watch?v=hwL1VWIEQI0>
- <https://www.youtube.com/watch?v=ua-g-0VI4x4>

Faces for Autism (tech won't work anymore)



<http://mrl.nyu.edu/~perlin/experiments/facedemo/>

Pity it doesn't work

- Hopefully you get the idea
- You can try and build simulations to teach people who have trouble recognizing facial expressions how to do it

CHATTY ROBOT —

In Amazon's game engine, voice actors can now be replaced with robots

Just after actor strike ends, Lumberyard update adds a full text-to-speech pipeline.

SAM MACHKOVECH - 11/8/2017, 2:49 PM

Character (opt) Rin

Voice (opt) Joanna

Input Text: A voice is a gift.

Caption:

Submit

82

Enlarge / There's nothing creepy about this disembodied head used to demo a robot-powered voice service. Amazon. Nothing creepy at all.

Want to add voice acting to your next epic video game but don't want to deal with those pesky real-life actors to populate your virtual towns and castles? Amazon has your money-saving back.

The company's Lumberyard game engine now supports a full text-to-speech pipeline in its 1.11 version, which is now live for any of its developers. A demonstration video shows how built-in tools allow game developers to attach text to any interaction in a game, which can be spoken in





Audio

- The last time I ran this lecture
- Outside the scope of what we can really do in class this big, are some challenges with audio – how do you do text to speech, and how do you do speech to text

To: Jamie Mitchell

These are on a rock at home hardware action on Shamong Road. There the rock is between the two cash registers the new one and the two old ones and they are for sale at \$6.83 each this would make a really good stuffing stuffingSuck automatic writing is not going well today anyways I think you'll get the just one for mom one for me and one from Kate and one from the cat I think that's all they have left in stock is at four.

Love dad



Lastly - Interactivity

- This is gaming
- And we don't really have time to talk in detail about games

Gaming and Interactive Media

- Gaming is about given players/users choice in how to explore the story or world that is created
- Sometimes those choices are trivial, sometimes they're big, and everywhere in between
- We're at the point of doing pretty good physical simulation of visual stuff (water, smoke, fire, buildings, etc.) which makes it believable
- Obviously we're a ways out from matching VFX companies

VFX scale

- Avatar/LOTR were done on servers in New Zealand
- Weka workshop has 32 machines each with 40 000 processors
- If Moore's law holds (which it probably won't) you could expect that to take around 30 more years for that tech to be in your living room in real time
- But of course those movies weren't made real time.

Other Interesting Problems in Multimedia?

- Who owns all this stuff?
- How do you choose fonts effectively?
- How do you take photo's or video effectively?
- What types of Audio is appropriate and when?
- How do you make a product 'nice' in some sense of the phrase?
- How do you present it on the web?