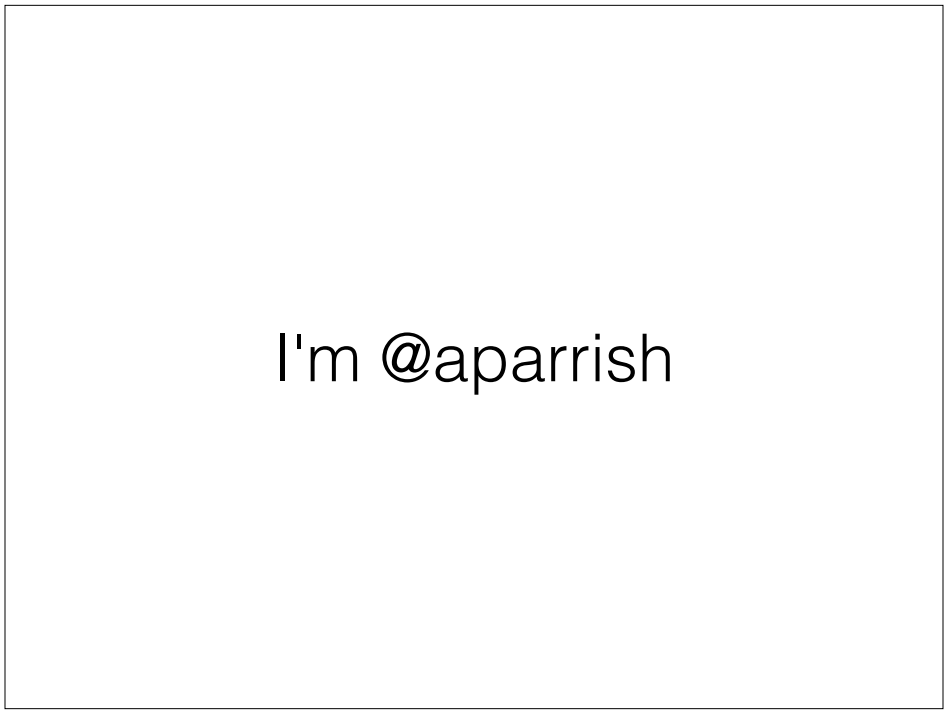
Scrabble sucks!

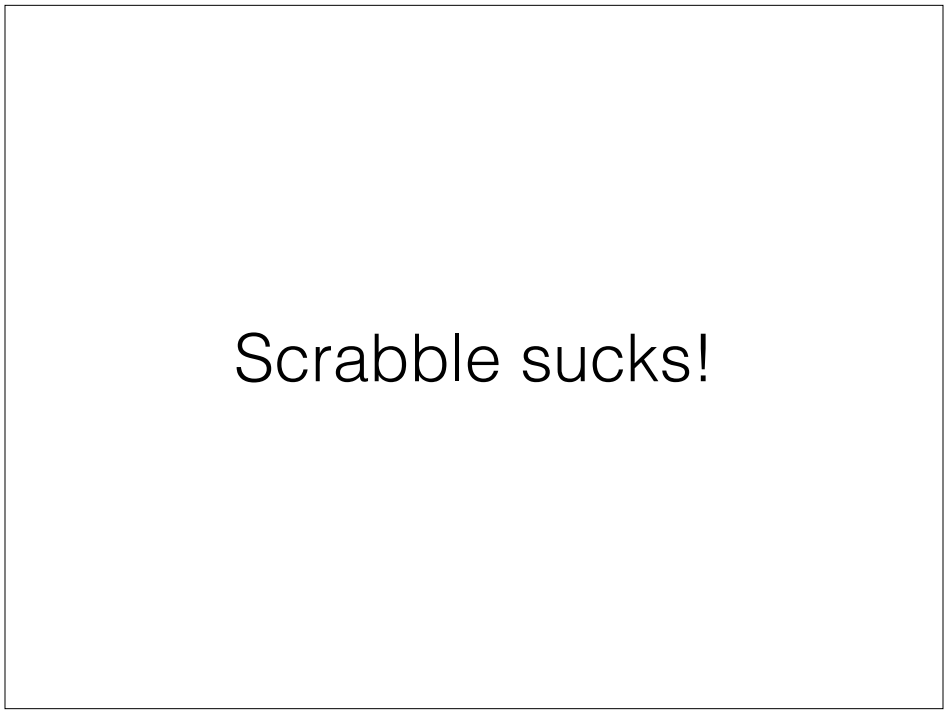
Toward higher-order word games

!!Con 18 May 2014.

For the purposes of this talk, I'm going to assume you know what scrabble is. If not, I give you permission to google it on your phone real quick or something. I'm going to assume you know what google is.



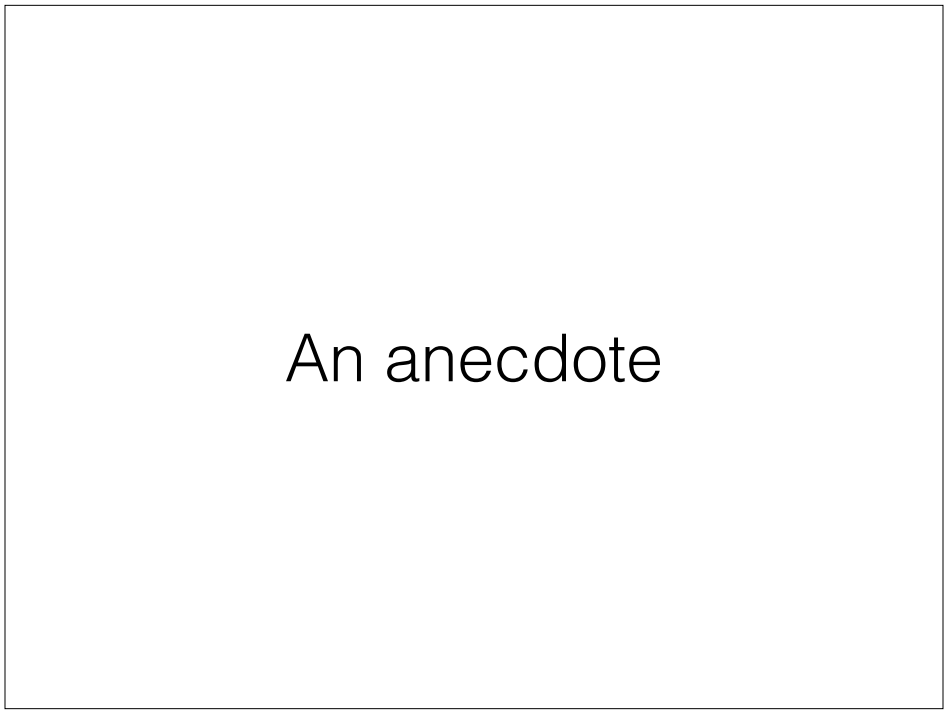
This is me. I'm a computer programmer, experimental poet and game designer.



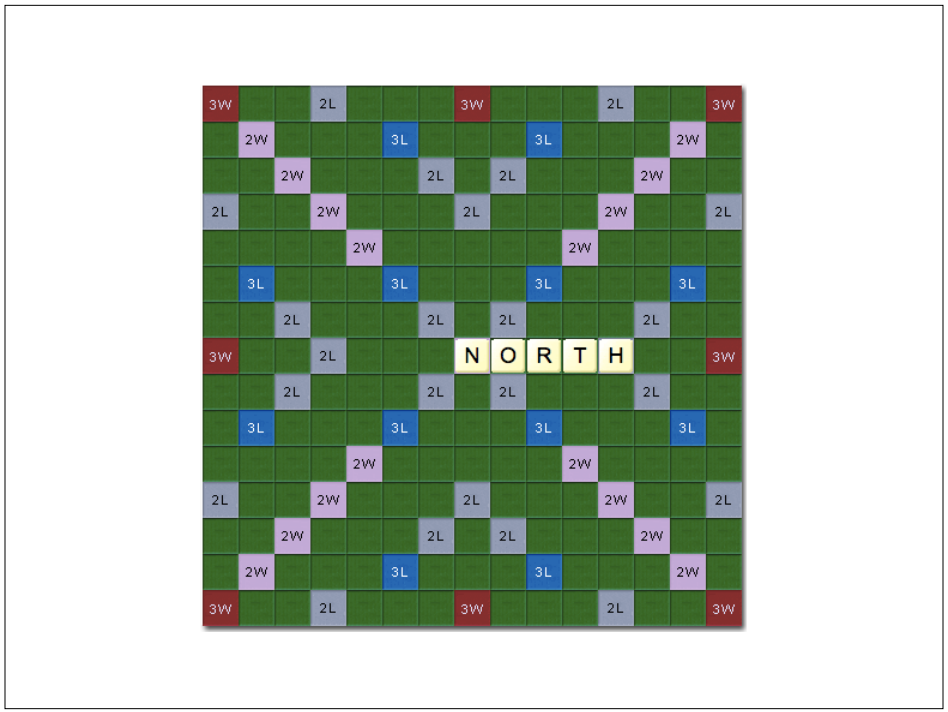
Now, a lot of people have fun playing scrabble and there's an amazing competitive culture surrounding it. So something must be good about it and I don't want to detract from that! So I want to revise the title of this talk to a bit to something more like...

I make word games that differ from Scrabble in several important particulars!!

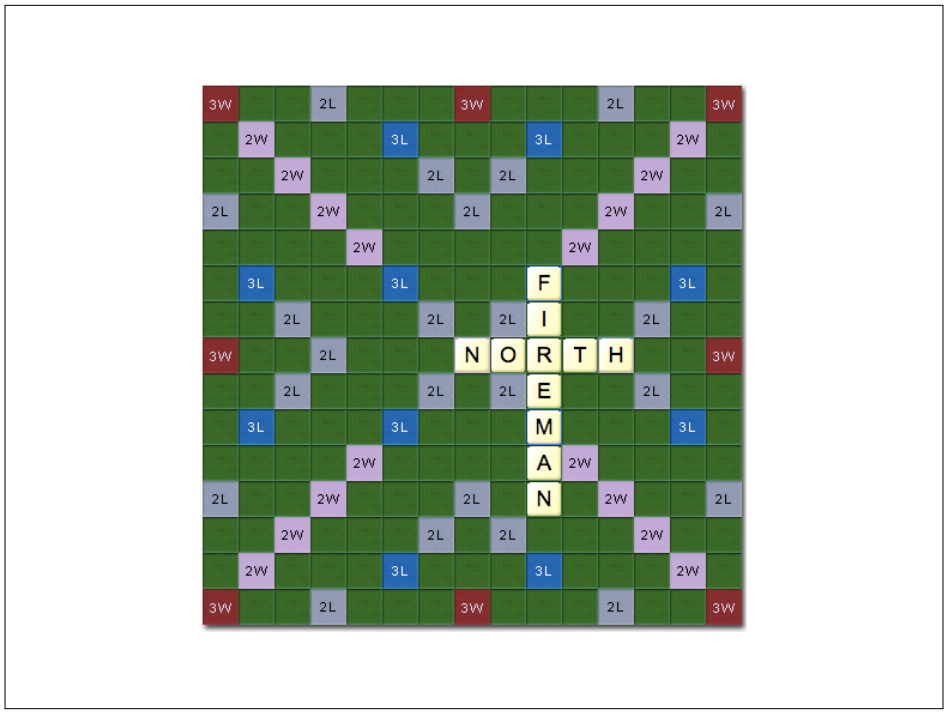
...this one. What I'm going to talk about in this talk is what I think is wrong with Scrabble and some of the games I've designed that work differently and (I hope) better. Along the way there will be some computer programming!



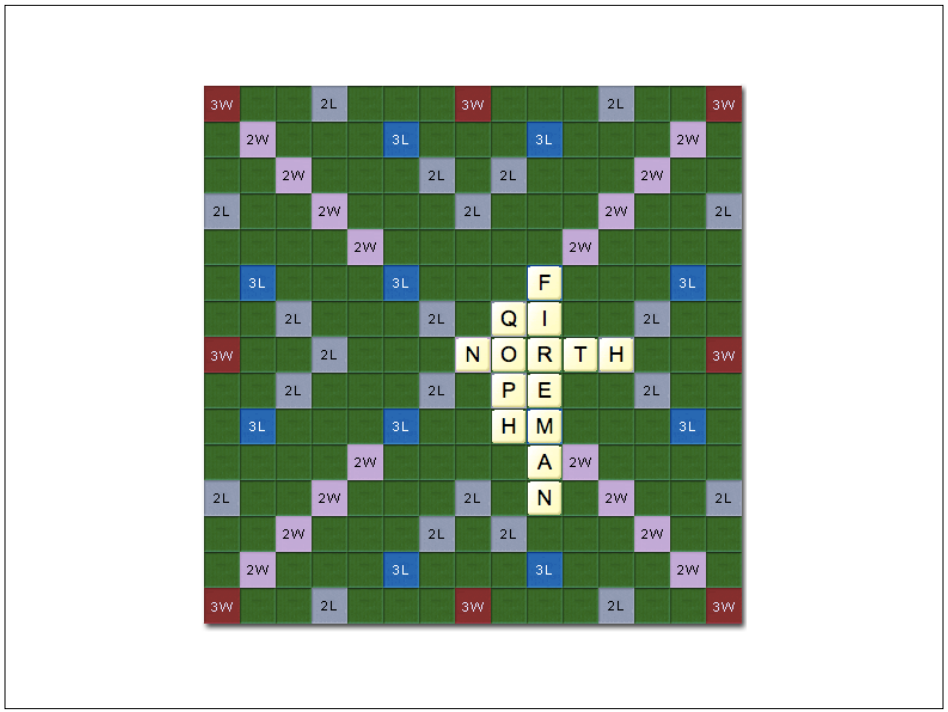
So what evil did Scrabble visit on me to make me hate it so much? Once I was in Utah visiting my family over the holidays and we decided to play a board game. Someone suggested scrabble and I was like, okay. This is essentially how the game went:



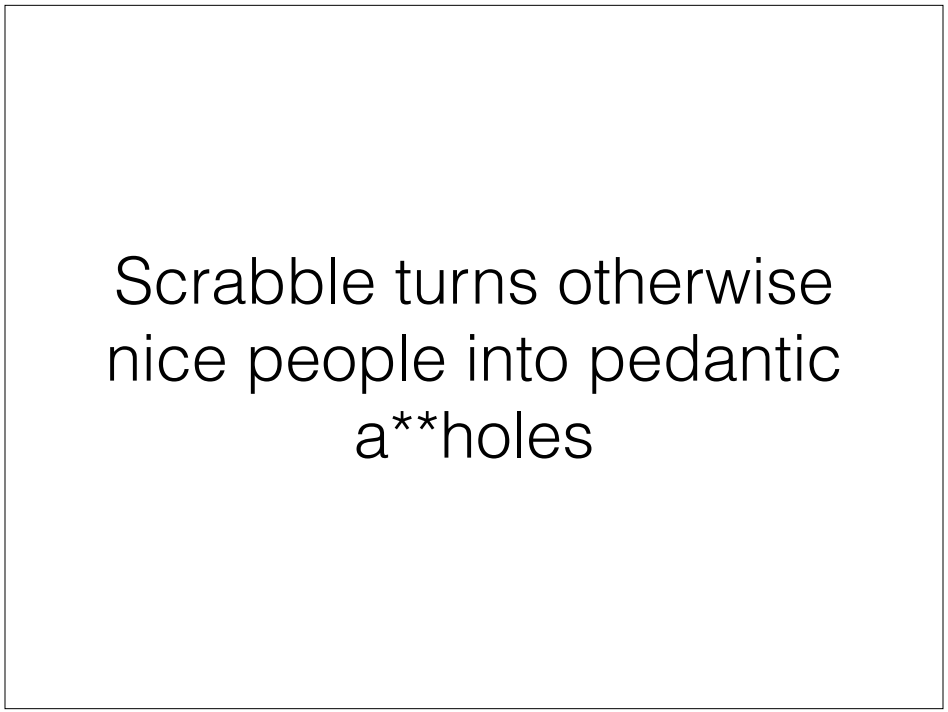
First my mom played "north." A perfectly good play, worth 24 points.



Then my little sister played "fireman" for 26 points. And then it's my turn to play and I look at my rack and my eyes light up and I don't WANT to be an insufferable smart-ass, but what can I do? so I play...



QOPH. And "qi" and "pe" and "hm." It's a pretty good move, perfectly legal Scrabble, and it's worth 66 points... but is it worth the contention and strife caused by playing not one but FOUR weird words in one turn? This move had a deleterious effect on our fun. Everyone thought I was engaging in ostentatious brain-showboating. AND I KIND OF WAS. It wasn't fun for anyone and eventually we decided to play something else. So here's why I don't like scrabble:



A nicer way to phrase this would be: competitive Scrabble play requires a lot of arcane knowledge. You have to memorize a lot of words, both tiny and large. So when you're playing with people who haven't memorized all this hermetic vocabulary, it can lead to hurt feelings—and hurt feelings are no fun! It's worth mentioning that other games aren't like this—if I was better than someone in my family at soccer or street fighter, they probably wouldn't think I was being a smart-ass.

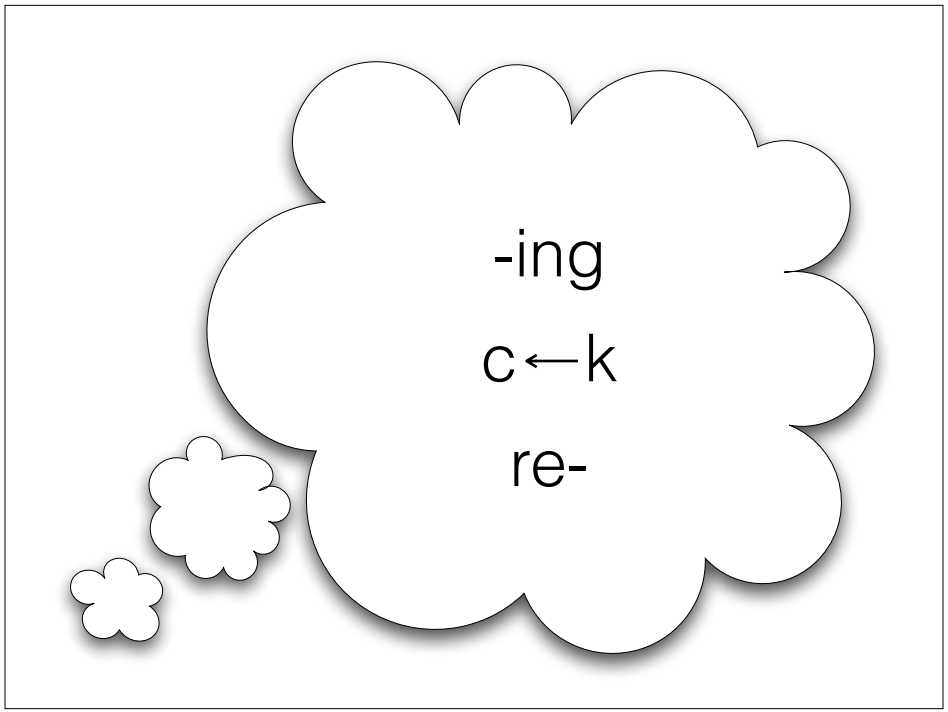
It's easy to chalk these problems up to the culture of Scrabble, or game balance issues, or simply the inability of certain individuals (ahem, me) to keep their smartassery in check for more than thirty seconds at a time. But I think there are actual structural problems with the game worth mentioning. Here's one:

Unigram frequency

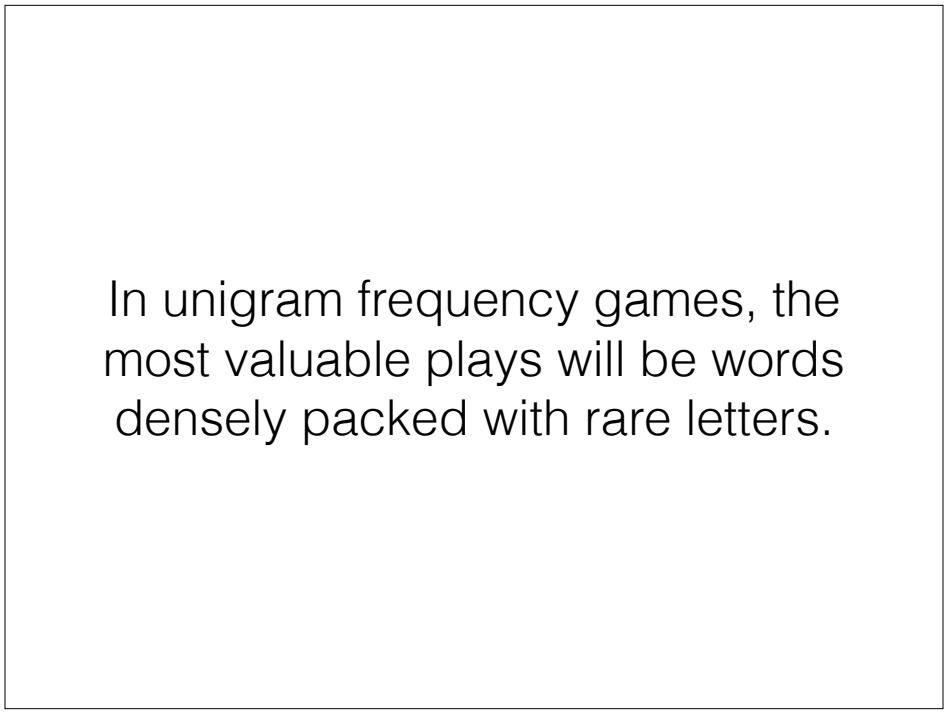
- The "moving parts" of the game are individual letters
- Commonality and value of letters based on (some model of) letter frequency in English
- Letters drawn at random

Scrabble is based on what I'm going to call "unigram frequency"—by which I mean the "moving parts" of the game are individual letters, whose value and commonality are determined by the frequency of those letters in the English language. Letters are put into play by drawing them randomly, one at a time.

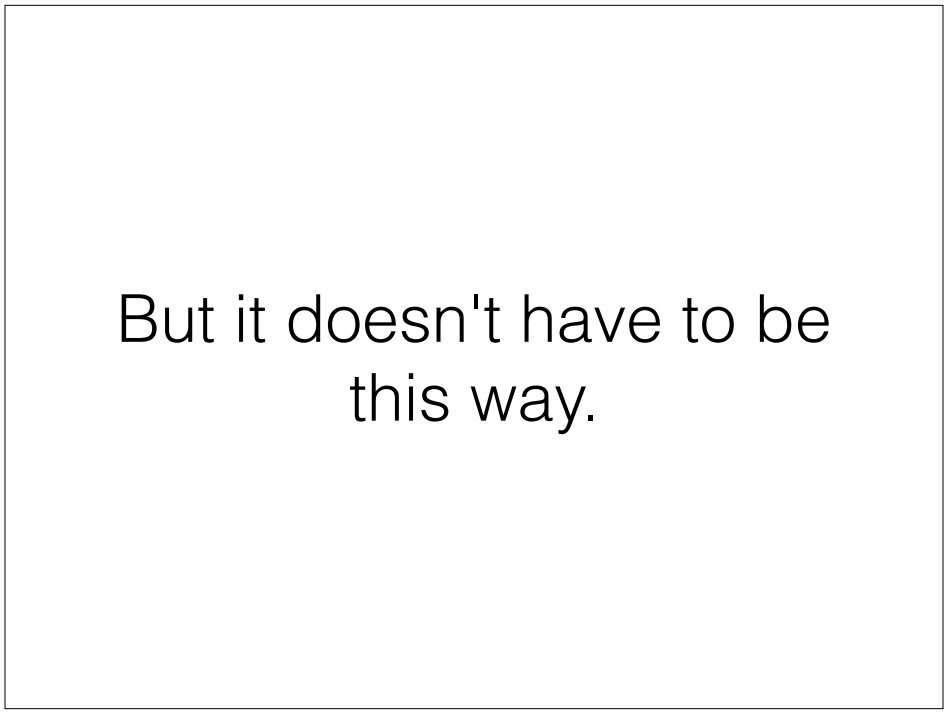
There are advantages to this model! Letter frequency is super intuitive—everyone understands that E is a really common letter, but Z isn't. And this model is familiar and successful enough that many many word games are based on it.



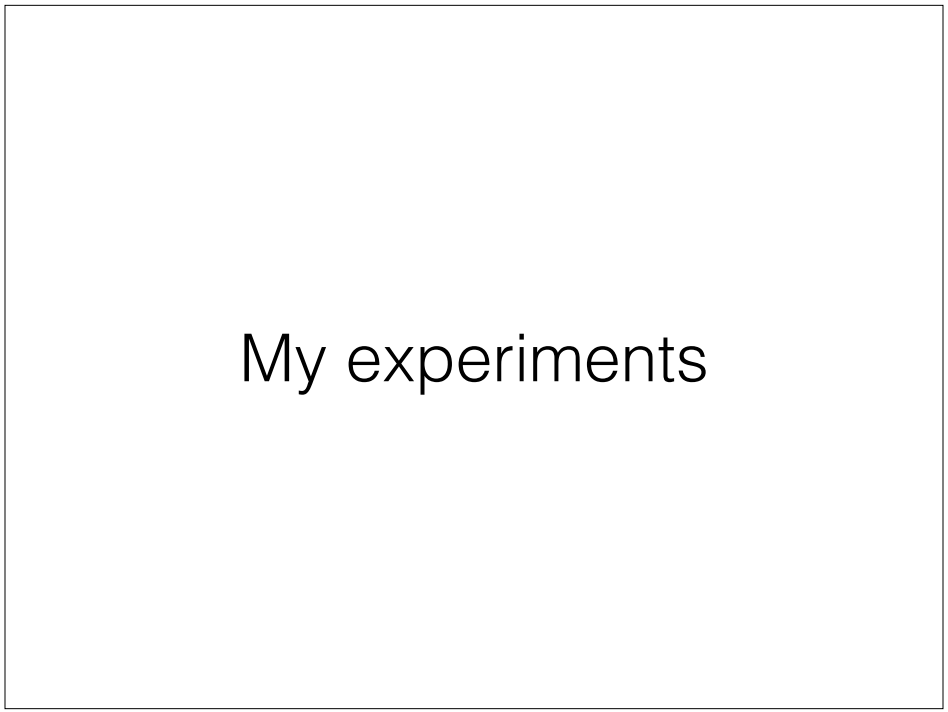
HOWEVER, our intuitive understanding of how words are put together doesn't stop at just knowing which letters are the most frequent. We also know things like... -ing occurs at the ends of words a lot, and the letter 'k' is often preceded by 'c', and re- is something you can put in front of verbs to make new verbs. Scrabble doesn't model or reward any of that knowledge at all. Like I said, it mostly rewards the memorization of specific vocabulary.



So, my hunch/hypothesis: if valuable letters are associated with higher scores, and there are fewer valuable letters, and those letters are drawn at random, the most valuable plays will be shorter words with rarer letters. And short words with rare letters tend to be those smart-ass vocabulary test words we were talking about earlier. They're the smart-ass vocabulary words that make it so your family won't play board games with you anymore.



I don't think people should have to memorize long lists of words, or have extensive vocabularies, in order to enjoy and be competitive at word games. As a linguist and a poet I am sensitive to the fact that *everyone* is a fluent speaker of their own language. Everyone has intuition about how the words of their language are put together, and you know, everyone *wants* to play and have fun with that knowledge without being made to feel unintelligent. It breaks my heart that someone would come away from any word game thinking that they weren't a smart and creative person. That sucks!



So over the past few years, I've been making word games that DON'T use unigram frequency as their model, in an attempt to escape the arcane hermetic vocabulary problem that plagues scrabble. Here are some of those experiments.

Rewordable

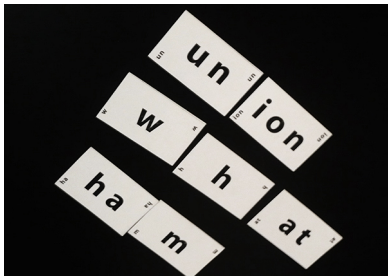
Card game for 2+ players

Co-designed with Adam Simon and Tim Szetela

Based on the most common unigrams, bigrams and trigrams in English

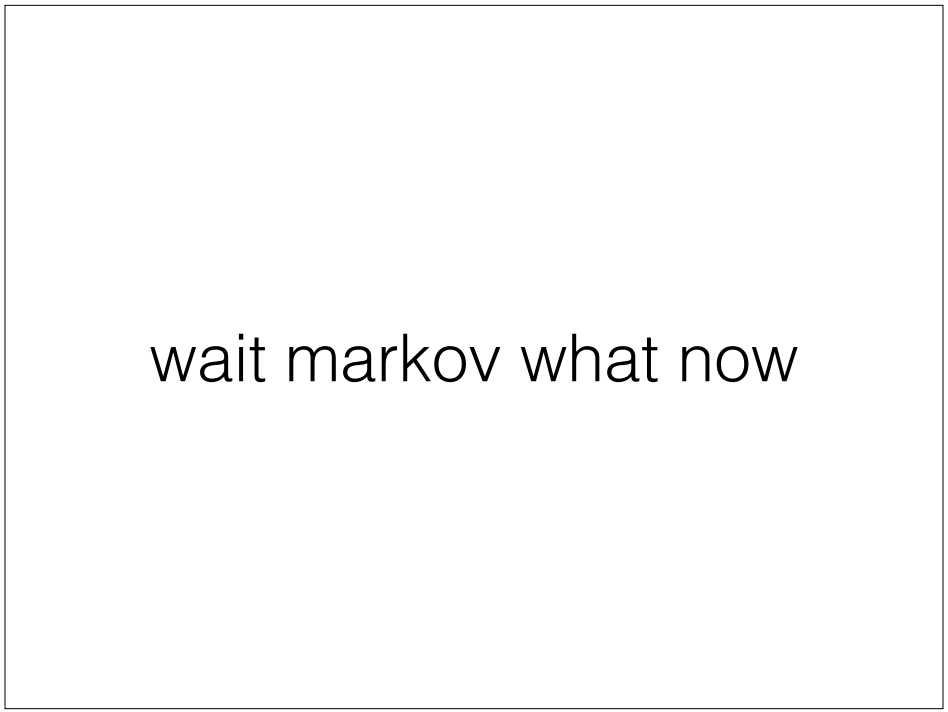
Cards freely available at rewordable.com

The first experiment is... what happens if you just change the unit from unigrams to higher order n-grams? Rewordable is a game I designed a few years ago with my friends Adam and Tim with this in mind. It's a card game played with a deck of 160 cards, each of which has a unigram, bigram or trigram on it. ("Bigram" and "trigram" just mean groupings of two or three letters, respectively.) The bigrams and trigrams were selected because they're the most frequent of their kind in English words—sequences like "ing" or "er."

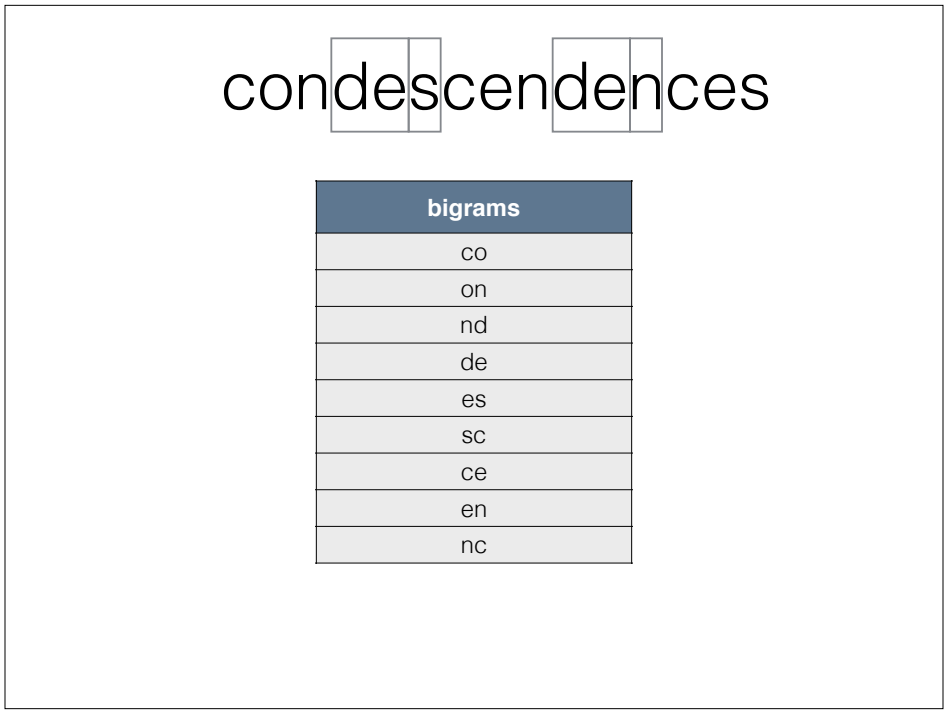


The idea is that players will be able to form longer, more satisfying words, because the sequences of letters on the cards themselves are longer. Here are some action shots. We're still working on getting the rules just right but I think by and large it accomplishes the goal of encouraging fluent word creation without the frustrations of scrabble. LOOK FOR A KICKSTARTER SOON.

The second experiment I want to talk about is Characterror, a video game I made. you play as the little "ship" there on the right, which is trailing letters. You "fire" the letters into one of the "slots" there on the left. when you've made a word that you're satisfied with, you can "score" it, clearing the slot. The idea is to build the longest words you can. The "trick" of this game is that the list of letters trailing the ship aren't random, or selected merely by their unigram frequency—they're generated with a Markov chain. Essentially: using a statistical model of english words, the game determines which letters are most likely to help you form a word, based on the letters already in play on the board.



QUICK ASIDE: how markov chains work.



bigrams
co
on
nd
de
es
sc
ce
en
nc

I'm talking to a room full of math wizards who know this better than me, pardon the inexact language, but this is how I think about it and how I explain it to students. Let's take a corpus consisting of a single string—the word "condescendences"—and make a list of all unique bigrams in that word (all sequences of two letters). A Markov chain looks at each of these n-grams and then records which letters FOLLOW those n-grams. Take the bigram "de" for example—a markov chain analysis would tell us that half the time (in our corpus of one word) it's followed by 's' and half the time followed by 'n'.

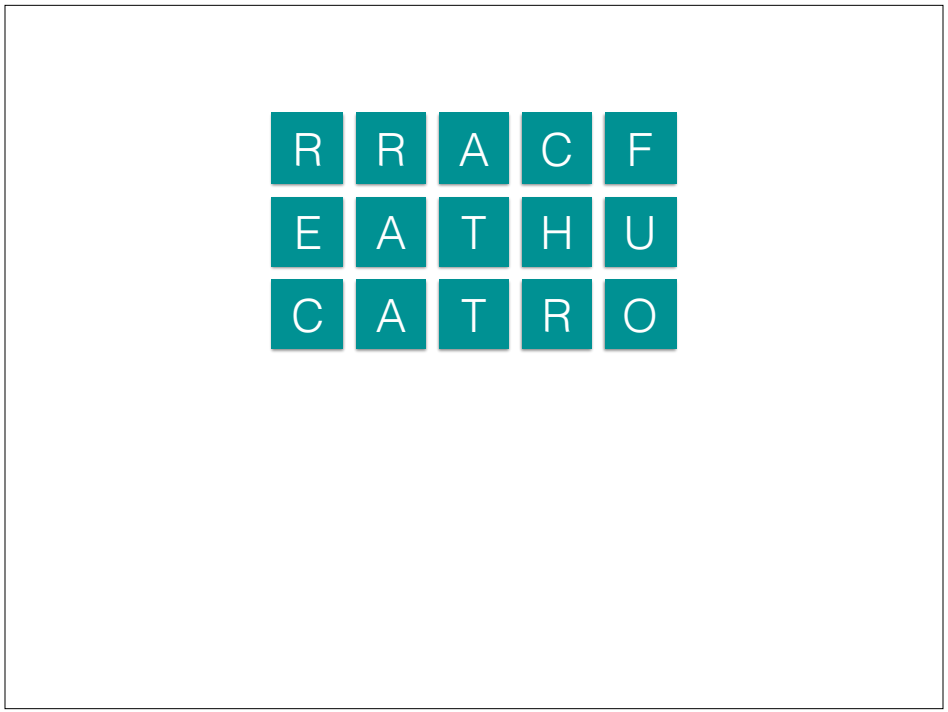
condescendences

bigrams	next letter?
co	n (1.0)
on	d (1.0)
nd	e (1.0)
de	s (0.5), n (0.5)
es	c (0.5), EOL (0.5)
sc	e (1.0)
ce	n (0.5), s (0.5)
en	d (0.5), c (0.5)
nc	e (1.0)

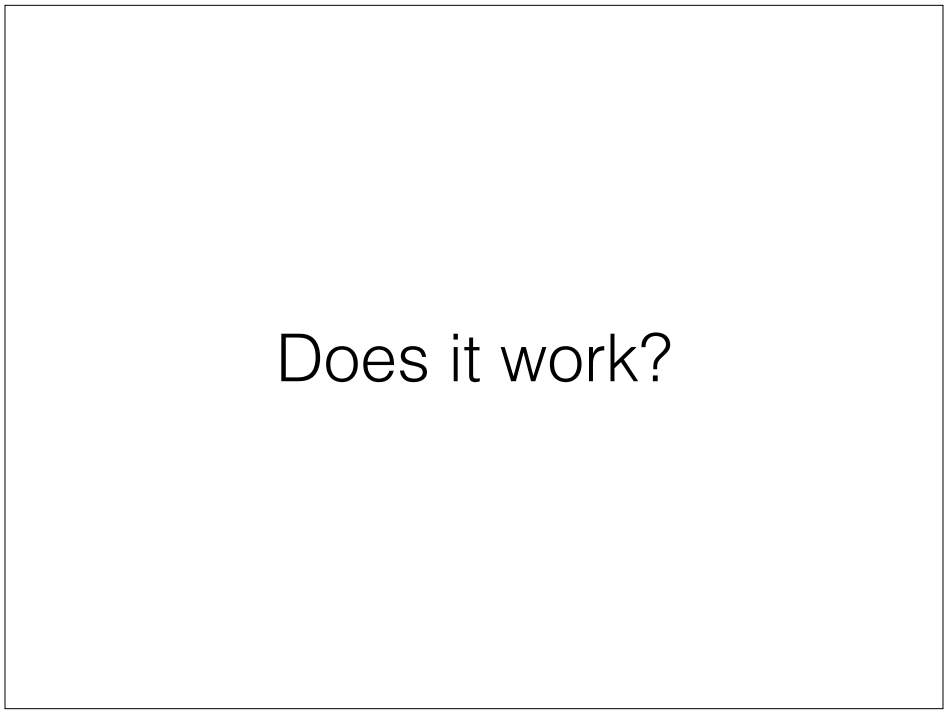
Here's that process but applied to the entire string, giving us a table with probabilities. We can use this data to make predictions: given an n-gram, what letter is most likely to follow? Markov chains are famously used for generating amusing nonsense text—if we make predictions recursively, using the previous prediction as input for the next prediction, we can come up with new sequences of letters that statistically resemble but are not identical to the original source text, like the word...

CON den DES sen SES ses...this is a word "generated" from a bigram Markov chain of the word "condescendences." Now if we had a Markov chain probability table of not just a single word but ALL words in the english language, we could make word games that take into account which letters are already in play, and supply players with letters likely to lead to more common, longer words. That's what's happening in Characterror.

Lexcavator is another video game I made. It's a cross between Boggle and Mr. Driller—you find and select words to clear them from the board, allowing your at-symbol to progress further into the game. To ensure that the words you find are interesting and fun, the board is generated with Markov chains! In two dimensions!



Here's a simplified diagram of how lexcavator board generation works. It starts with a few rows of random letters (weighted by english frequency), just to prime the process. Then for each cell in the next row, we randomly select a column of letters connected straight up or diagonally and populate that cell with a letter randomly selected from our Markov chain.

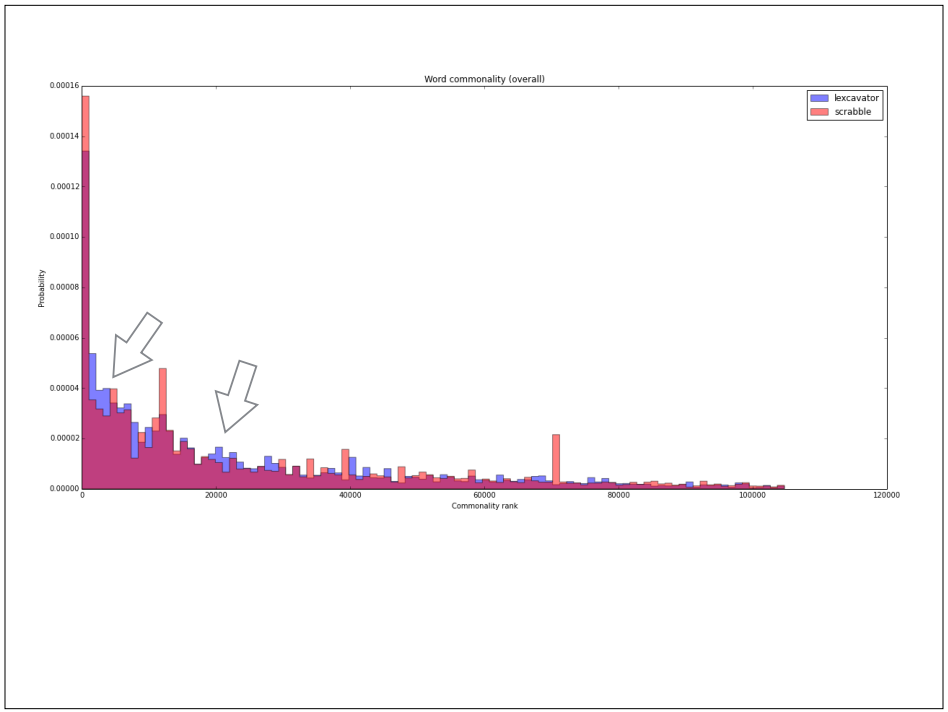


So then the question arises... do any of these techniques actually make the games better, according to the criteria I set out earlier? Well, to find this out...

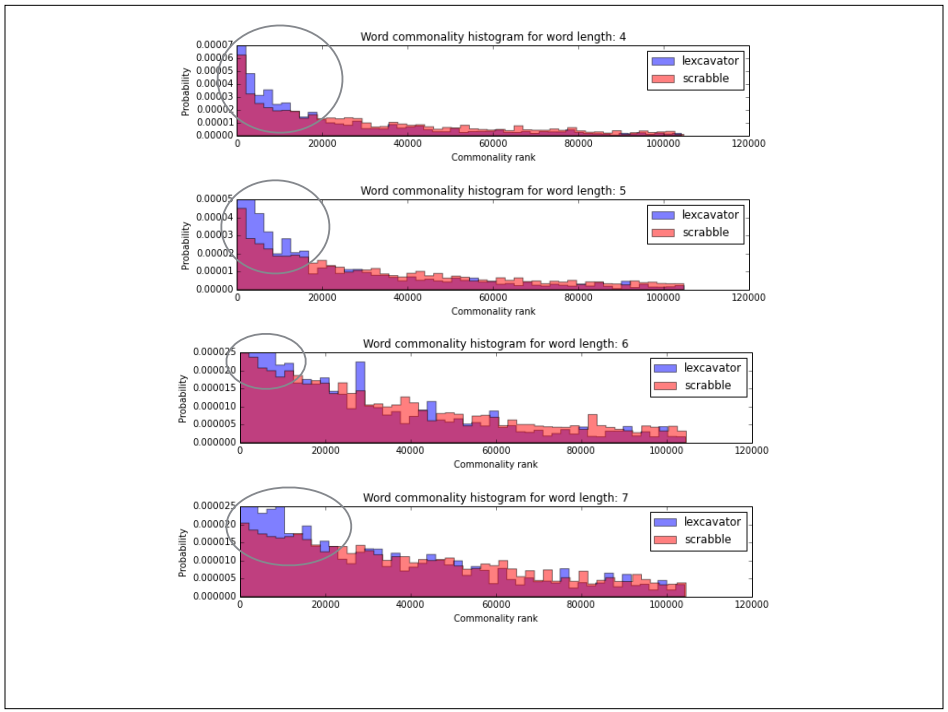
Corpus analysis

- ~15000 games downloaded from cross-tables.com, an archive of Scrabble game transcripts, containing a total corpus of ~670k words played
- ~620k words played in online sessions of Lexcavator, dumped from MongoDB

I collected a corpus of Scrabble games and a corpus of Lexcavator games and compared the two, graphing how often more "common" words were played in each game. I have no good reason to assume that the cross-tables data is representative of all Scrabble ever, but it seems like a reasonable place to start.



This is a scrabble word commonality histogram overlaid by Lexcavator word frequency histogram. The "word commonality" is judged by how frequent a particular word is in the English language—e.g., "the" is rank #1, "hippocampus" is rank #32766—the graph shows how the commonality of words in both games is distributed, with higher commonality on the left. You can immediately see that in both games, more common words occur more frequently. But you can see some spots where Lexcavator and Scrabble have a different "curve"—



—the pattern is more evident when I graphed word commonality histograms individually by word length. The areas of solid blue are where Lexcavator's words are distributed, and the areas of solid red are where Scrabble's words are concentrated. You can see that Lexcavator's words are more bunched up toward the left of the graph, and Scrabble's are more evenly distributed across the entire range. So Lexcavator does indeed encourage people to form more common words. Success!

Thanks!

http://twitter.com/aparrish

http://www.decontextualize.com/

http://www.lexcavator.com/

http://www.rewordable.com/

A big thank you to the organizers of the conference for everything. It's been a privilege and a pleasure to participate.