Making WordSleuth Fun

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Introduction

* The overall goal of this project: to create a database of messages expressing specific social cues

* Applications:
  * Testing cognitive science models
  * Machine learning algorithms
    * Automatic extraction of tone from existing text
    * Word-processors giving “tips” on tone
    * Programs to help people who struggle with tone-detection

Introduction

* Existing corpora were examined
  * Too small
  * Only focused on one type of social information

* Machine learning algorithms need a particularly large amount of data

How to Gather Enough Data?

* Newer method of data collection: game-with-a-purpose (GWAP)
  * Made popular by Louis von Ahn (2006)
* Easier to gather more data per person
* Easier to convince more people to participate
* The game can be created in a way to reward *quality* data

* Many people already familiar with web-based games, and spend lots of time with them
  * Want to tap into this resource by building a GWAP

What is Social Information?

* Social tone information is something humans are better at than computers
  * This is the gap we'd like to close

* Example: "Get over here, boy."
* Any human reader may observe that the sentence is:
  * Persuasive / commanding in nature
  * Directed towards someone of lower social standing
  * Disdainful, entitled tone

Our GWAP - WordSleuth

In our GWAP, WordSleuth, there are two types of play:

1. People are given a social tag (such as “persuading”) and a picture, then asked to create a message for the picture that conveys that social information
2. People are given a message and the picture used to create it, then asked to guess which social tag it was originally created with

Our GWAP - WordSleuth

Some benefits of this structure:

* Will get a variety of opinions on what key words or language structure makes a message reflect a tag
* Can analyze tag ambiguity through “guesses” results
* Can pull out sentences that are the clearest examples of their tag

Our GWAP - WordSleuth

* The nature of a GWAP makes it easy to tweak parameters
  * A single social tag may be adjusted to be more prominent
  * New tags may be added
  * Old ones retired
  * Hardcoded quality limits imposed through “taboo words”
  * Messages can be required to be a certain length

Our GWAP - WordSleuth

* Player-based quality control
  * How many people agree that a message matches its tag
  * Poor quality sentences can also be flagged (as of v3)
* System will grow as the number of players does

Offline WordSleuth

* Pearl and Steyvers (2010) ran a small-scale test with an offline version of WordSleuth

* Demonstrated the potential usefulness of this type of data
  * Analyzed which social tags humans most frequently confuse
  * Trained a machine learning classifier that performed decently

Online WordSleuth

* My focus: how can we get people to play?
  * We won't get enough data otherwise

* Goals:
  * Make the game function properly online
  * Make the game stable for large numbers of people
  * Add new features to increase enjoyment

WordSleuth – Functionality

* Basic game flow did not work right online
  * Was re-implemented with help of another student
* Some features had to be re-worked / added
  * Retrieving forgotten passwords
  * Editing user account information
  * Making the layout work with any size image prompt
  * Not accepting messages that contain taboo words
  * Allowing punctuation in messages

WordSleuth – Stability

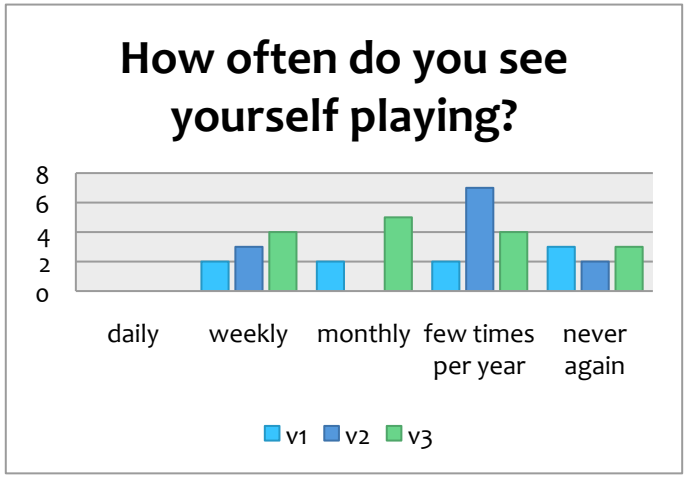
* Most important issue – data storage
* Originally data was kept in text files
  * Very difficult to understand and alter
  * Cannot scale
* Solution: implemented a MySQL database
  * Five initial tables with data on: social tags, members, created messages, guesses made, and the pictures used as prompts
* Substantial code had to be rewritten

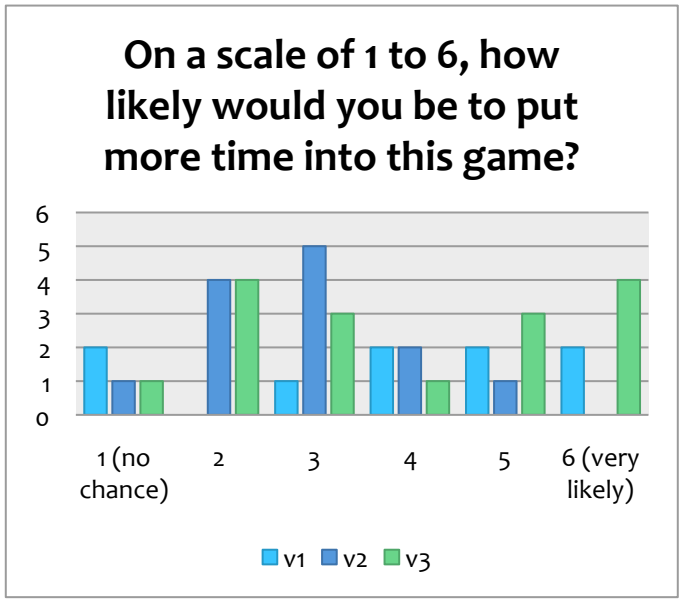
WordSleuth v1 – Beta Test

* This first version of WordSleuth was released to a select group of friends, family, and linguistic research students

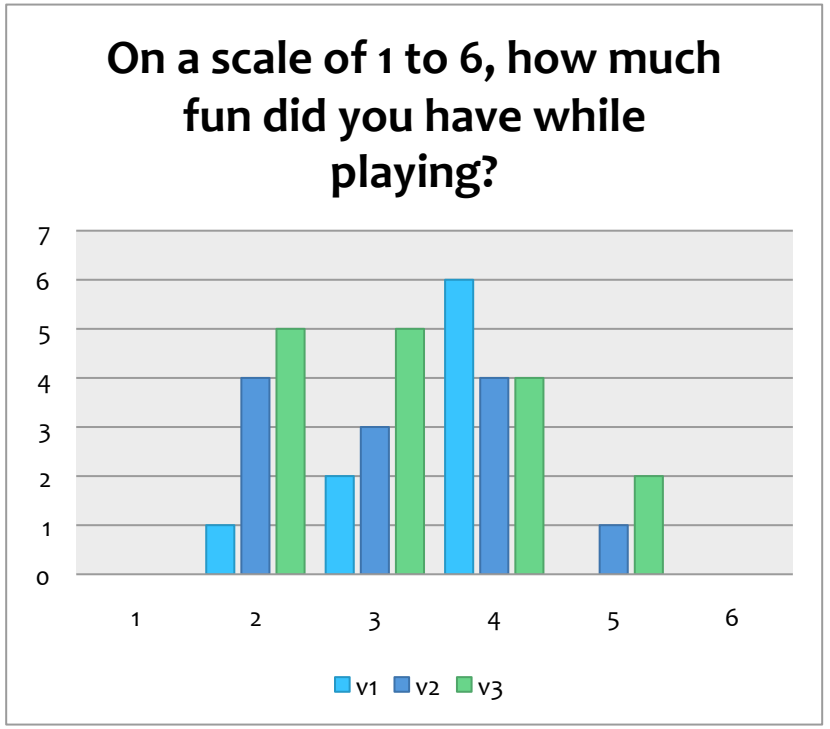
* They were asked to play 30+ minutes on each mode, and to fill out a survey

WordSleuth v1 – Survey Results





V1 average: 3.88



V1 average: 3.55

WordSleuth v1 – Survey Results

* 9 people took the survey
* Likely positive bias due to the select nature of participants
* The game was not found very fun
* The most common answer to “How often do you see yourself playing?” was “never again!”

* Two goals from here
  1. Improve numeric results
  2. Address specific problems / suggestions noted in free-form survey questions

WordSleuth v2 – Overview

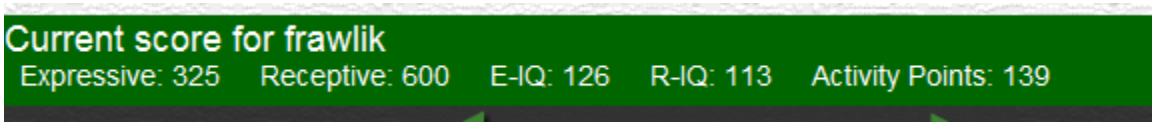
* Von Ahn (2008): "People play [GWAPs] not because they are personally interested in solving an instance of computation problem but because they wish to be entertained."

* Four new features were added towards the goal of entertainment:
  * A new score (activity points)
  * Unlockable features
  * Difficulty levels
  * High score tables

WordSleuth v2 – Activity Points

* Original version had four score types
  * Expressive Score/IQ, Receptive Score/IQ
* Problem was: expressive points based on other people
* Instant feedback is an important motivator

* Activity points are a count of actions a user has taken
  * Total number of guesses + total number of creations
* At least have some instant feedback for creating, now



WordSleuth v2 – Activity Points

* Survey results supported this addition
  * “Creating sentences doesn’t seem rewarding. They haven’t been tagged … so that score hasn’t moved since I created this account.”
  * “Creating sentences gets old after a while.”

WordSleuth v2 – Activity Points

* Many existing games use instant feedback

* Example: Chess Tempo (online game)
* Point of game is to solve chess puzzles
* After each puzzle, your rank and the puzzle's ranks are both immediately adjusted based on how you did

WordSleuth v2 – Unlockable Features

* Activity points also now unlock new variations in gameplay

* Unlockable features give users small goals to achieve
  * “Create” mode must now be unlocked
  * Can also unlock difficulty levels: easy, medium, hard

* Forces user to stagger play of different parts of the game

WordSleuth v2 – Unlockable Features

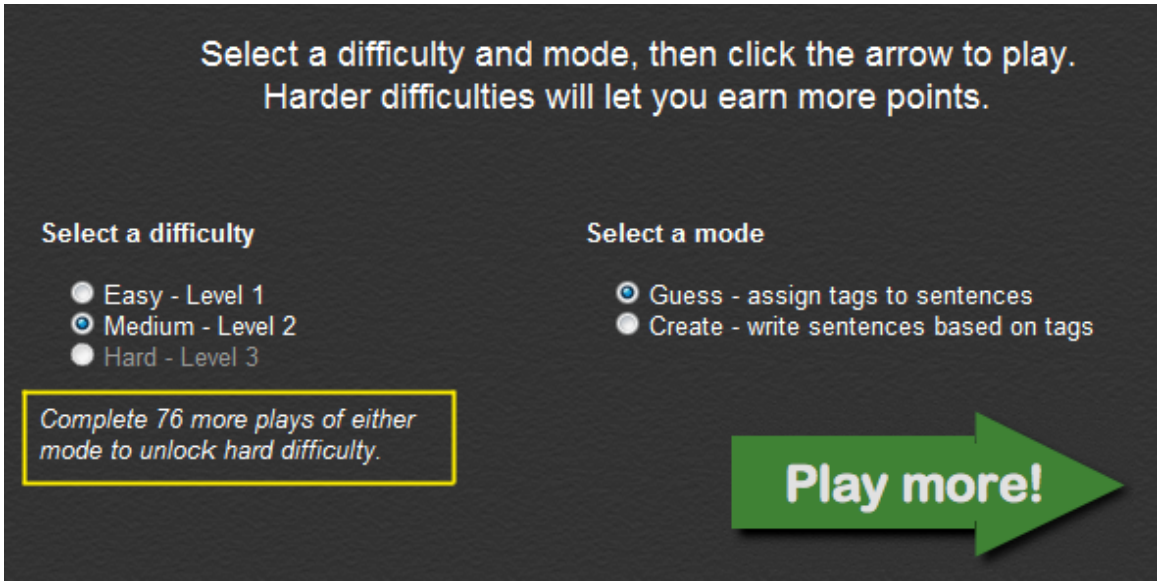
* Unlockable create mode increases data integrity
* Some users did not know what we wanted from them
  * Sometimes gave definitions, or general statements
* Users must now guess 15 messages before they can create
  * Are forced to see examples
  * Increases quality of their subsequent creations

WordSleuth v2 – Unlockable Features

* Research supports this addition
* Malone (1980) wrote a paper on what makes learning fun

* Unlockable features taps into 2/3 categories he discusses
  * **Challenge:** users want an obvious and compelling goal
  * **Curiosity:** users want to know what harder difficulties are like

WordSleuth v2 – Unlockable Features



WordSleuth v2 – Unlockable Features

* Many existing games have unlockable content
  * Picross (puzzle game) – can unlock harder difficulties after completing a certain amount of easier ones
  * Harvest Moon (farming game) – new crops, animals, and people to marry are unlocked as you progress
  * Soul Calibur, Super Smash Brothers (fighting games) – can unlock new fighters when you accomplish certain tasks

WordSleuth v2 – Difficulty Levels

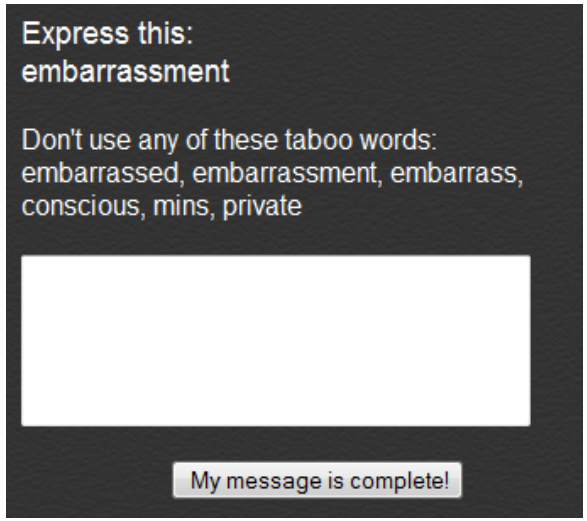
* Difficulty levels allow users to perform harder tasks for greater rewards
* Levels are easy, medium, hard

* For guessing, difficulty is based on how many people guess a message correctly

WordSleuth v2 – Difficulty Levels

* For creating, difficulty is adjusted through taboo words

* Two taboo word lists:
  * Static list contains words no message should ever have
  * Dynamic list contains words commonly associated with particular tags



WordSleuth v2 – Difficulty Levels

* All harder modes provide the user with more points
  * Easy 15, Medium 30, Hard 45

* Difficulties do not affect:
  * **Activity points** (because they are supposed to be a cohesive count of actions)
  * **IQ** (because it is based currently on accuracy alone)

WordSleuth v2 – Difficulty Levels

* Research supports this addition
* Malone's paper (1980) on what makes learning fun

* Difficulty levels relate to the challenge category
* Allows the user to select how much of an "uncertain outcome" they desire

WordSleuth v2 – Difficulty Levels

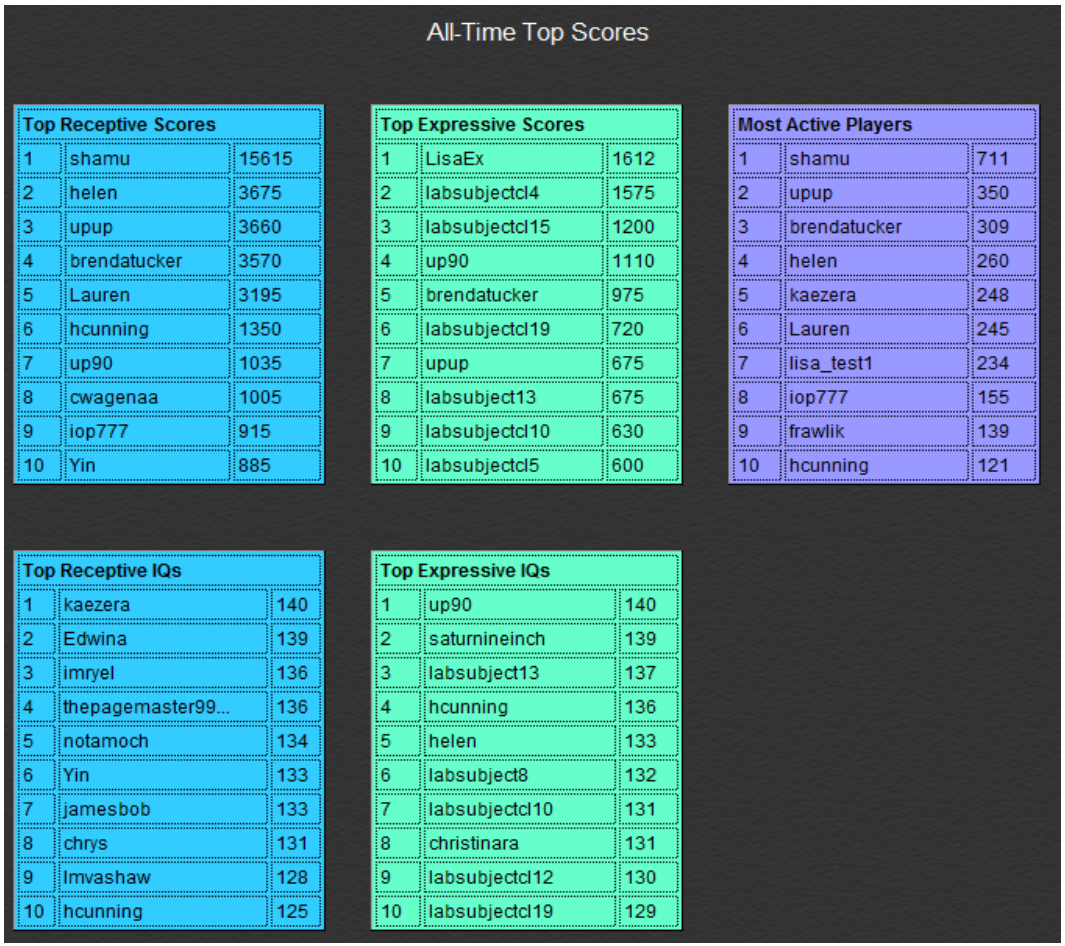
* Many existing games have difficulty levels
  * Mass Effect (roleplaying game) – users can choose "Casual," "Normal," or "Veteran" (and later unlock "Hardcore" and "Insanity")
  * Many shooter games provide similar basic structure
  * World of Warcraft (MMORPG) – provides two versions of much of its end game content, "regular" and "hard mode"

WordSleuth v2 – High Score Tables

* High score tables relate to both goal-driven and socially-driven motivations

* Five high score tables were introduced in v2 (correspond to 5 existing scores)

WordSleuth v2 – High Score Tables



All-Time Top Scores

Top Receptive Scores		
1	shamu	15615
2	helen	3675
3	upup	3660
4	brendatucker	3570
5	Lauren	3195
6	hcunning	1350
7	up90	1035
8	cwagenaa	1005
9	iop777	915
10	Yin	885

Top Expressive Scores		
1	LisaEx	1612
2	labsubjectcl4	1575
3	labsubjectcl15	1200
4	up90	1110
5	brendatucker	975
6	labsubjectcl19	720
7	upup	675
8	labsubject13	675
9	labsubjectcl10	630
10	labsubjectcl5	600

Most Active Players		
1	shamu	711
2	upup	350
3	brendatucker	309
4	helen	260
5	kaezera	248
6	Lauren	245
7	lisa_test1	234
8	iop777	155
9	frawlik	139
10	hcunning	121

Top Receptive IQs		
1	kaezera	140
2	Edwina	139
3	imryel	136
4	thepagemaster99...	136
5	notamoch	134
6	Yin	133
7	jamesbob	133
8	chrys	131
9	lmvashaw	128
10	hcunning	125

Top Expressive IQs		
1	up90	140
2	saturnineinch	139
3	labsubject13	137
4	hcunning	136
5	helen	133
6	labsubject8	132
7	labsubjectcl10	131
8	christinara	131
9	labsubjectcl12	130
10	labsubjectcl19	129

WordSleuth v2 – High Score Tables

* Research supports this addition

* Peter Vorderer (2011) calls the player versus player concept “social competition”
* Argues that doing well can cause a user to have increased self esteem, causing positive feelings towards the game

* High score tables allow the user to directly see how they compare to other people

WordSleuth v2 – High Score Tables

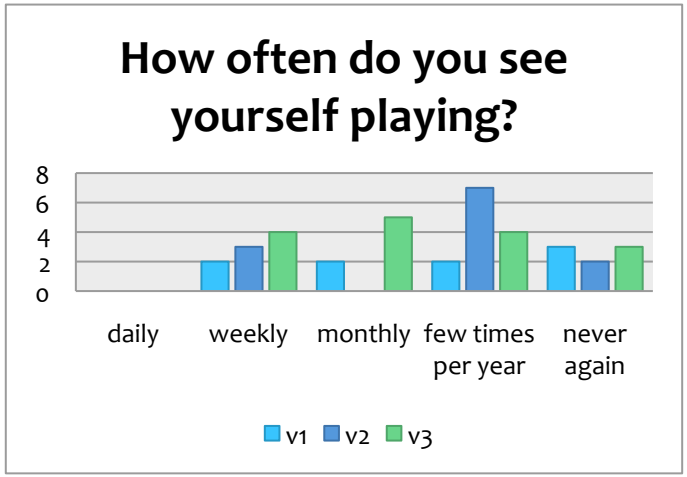
* Many existing games rely heavily on high score tables
  * Arcade games is the classic example
  * Bejeweled Blitz on Facebook – the game is centered around being the highest scorer out of your friends, reset every week
  * Audiosurf from Steam – levels are created from a user's songs, each song has a high score table

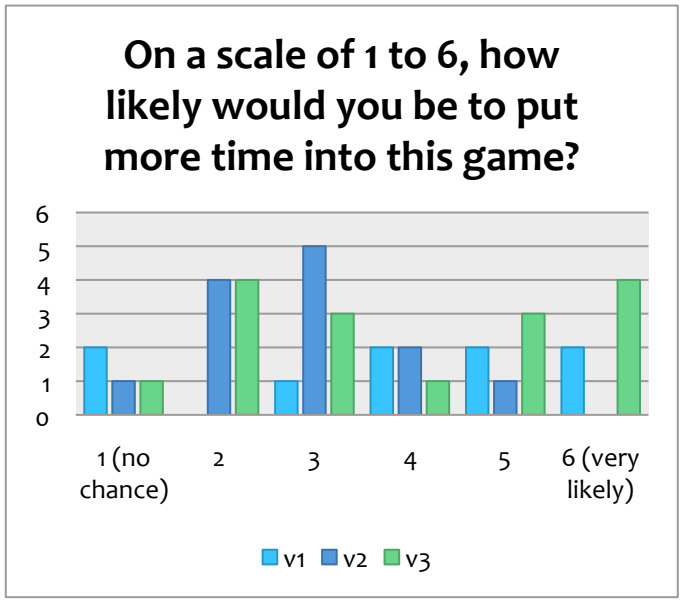
WordSleuth v2 – Beta Test

* This second version of WordSleuth was also released to a select group of people
* However, this group was broader in scope

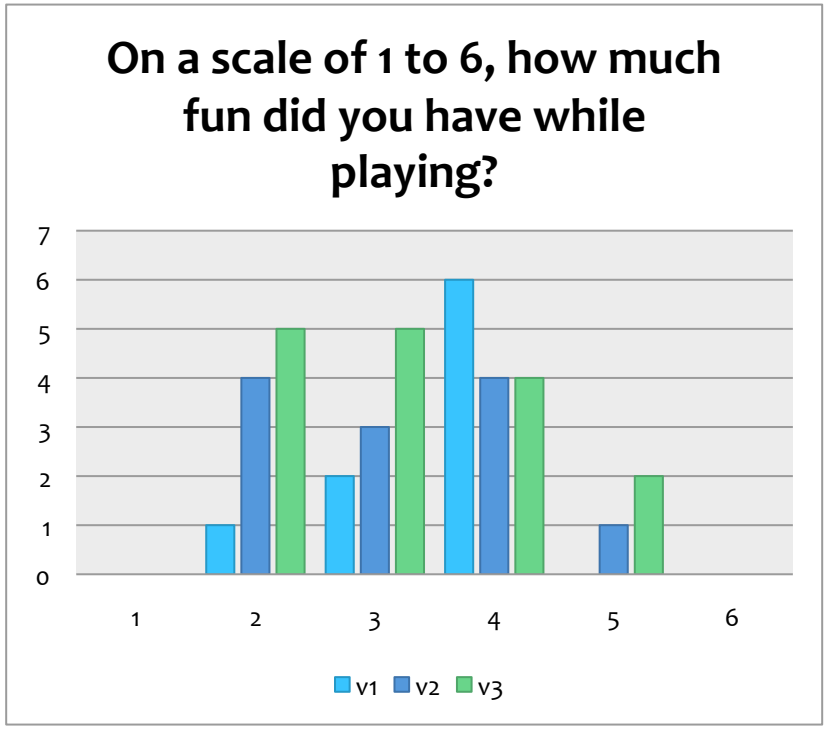
* Players were asked to:
  * Play 15+ minutes on each mode, and to fill out a survey
  * Create new accounts if they had played previously, to experience the new beginner game

WordSleuth v2 – Survey Results





V1 average: 3.88
V2 average: 2.83



V1 average: 3.55
V2 average: 3.16

WordSleuth v2 – Survey Results

* 12 people took the survey
  * 6 had played v1, 6 had not
* Less of a positive bias this time

* The most common answer to "How often do you see yourself playing?" is now "a few times per year"

* Same two goals
  1. Improve numeric results
  2. Address specific problems / suggestions noted in free-form survey questions

WordSleuth v2 – Survey Results

* Comments support belief that v2 was an improvement

* Noted favorite differences were:
  * “High score tables are neat.”
  * “I loved the activity points count!”
  * “Activity points leading to new levels.”
  * “Things to unlock were my favorite.”

WordSleuth v3 – Overview

* For v3, we wanted to add
  * Features to reduce frustration at ambiguous tags
    * Skipping messages
    * Flagging messages
    * Clarifying create message page
  * More features to increase enjoyment
    * Achievements
    * Profile pages

WordSleuth v3 – Ambiguous Tags

* “What part of the game did you enjoy least?”
  * “The most frustrating part of the game is when I got the answer wrong for what I still believe should have been the correct answer.
  * “Some of the sentences with the answer just didn’t make sense. Deception was a big one: not sure people know what that means.”
  * “Stupid people that upload sentences that have nothing to do with the tone they were given.”

WordSleuth v3 – Ambiguous Tags

* 57% of all responses to that question, in first and second surveys combined, touched on this issue

* Addressed in multiple ways
  * Letting people skip messages
  * Tweaking the create message process
  * Letting people flag messages

WordSleuth v3 – Ambiguous Tags

Skipping Messages

* Users may click a link to skip a message they don't like
* Technically not new functionality
  * Made the process transparent, however

* This allows people to avoid the problem, but does not really solve it

WordSleuth v3 – Ambiguous Tags

Modifying Create Message Process

* Addresses the cause directly
* Create page was changed to show all tags, not just the one the user needs to create for
* They are also advised to avoid ambiguity

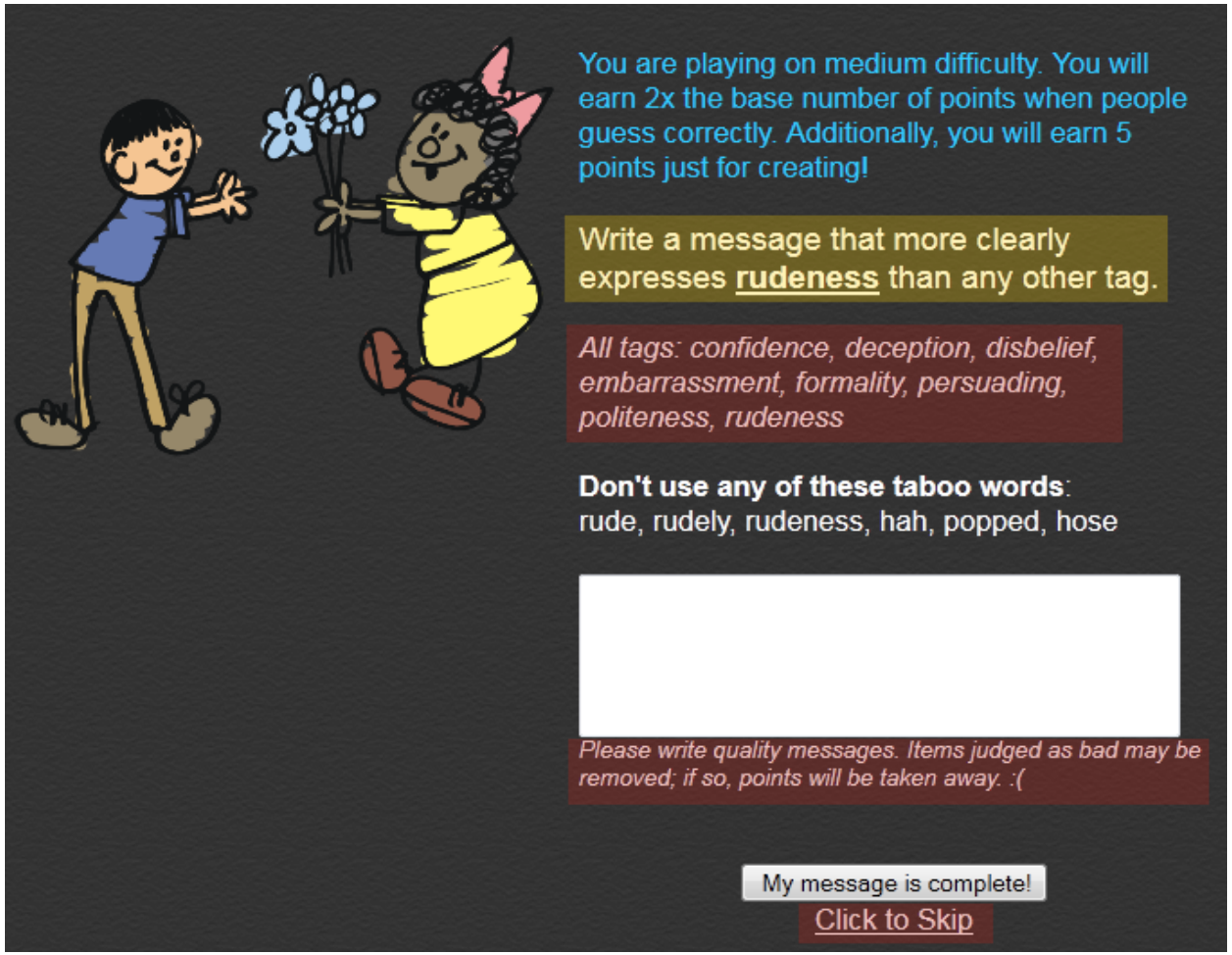
* Suggested by survey comment:
  * “I think that when creating a caption, the user should be able to view all 8 possible tags … This way they can make sure that their caption is most like the one they are aiming for …”

WordSleuth v3 – Ambiguous Tags

Flagging messages

* Addresses the effect of the issue directly
* Users are encouraged to flag bad messages
* A bad message:
  * Is nonsensical or very poorly spelled
  * Gives away the tag in an explicit fashion
  * Very strongly does not match the given tag
* Messages with enough flags are marked in the database

WordSleuth v3 – Ambiguous Tags



WordSleuth v3 – Achievements

* Achievements are ribbons earned for reaching some goal
  * May be trivial (guess 25 messages) or very difficult (guess 100 messages in a row correctly)
* Gives users non-gameplay affecting goals to pursue
* Gives users very hard goals they can optionally pursue

WordSleuth v3 – Achievements

* Research supports this addition

* Mikael Jakobsson (2011) argues that adding achievements is actually adding a second game atop the original one
  * "…achievements provide a [strong] sense of optional unfinishedness."
  * "I can convince myself that further engagement with the game is reasonable … because the achievement scaffolding stretches further and provides a direction"

WordSleuth v3 – Achievements

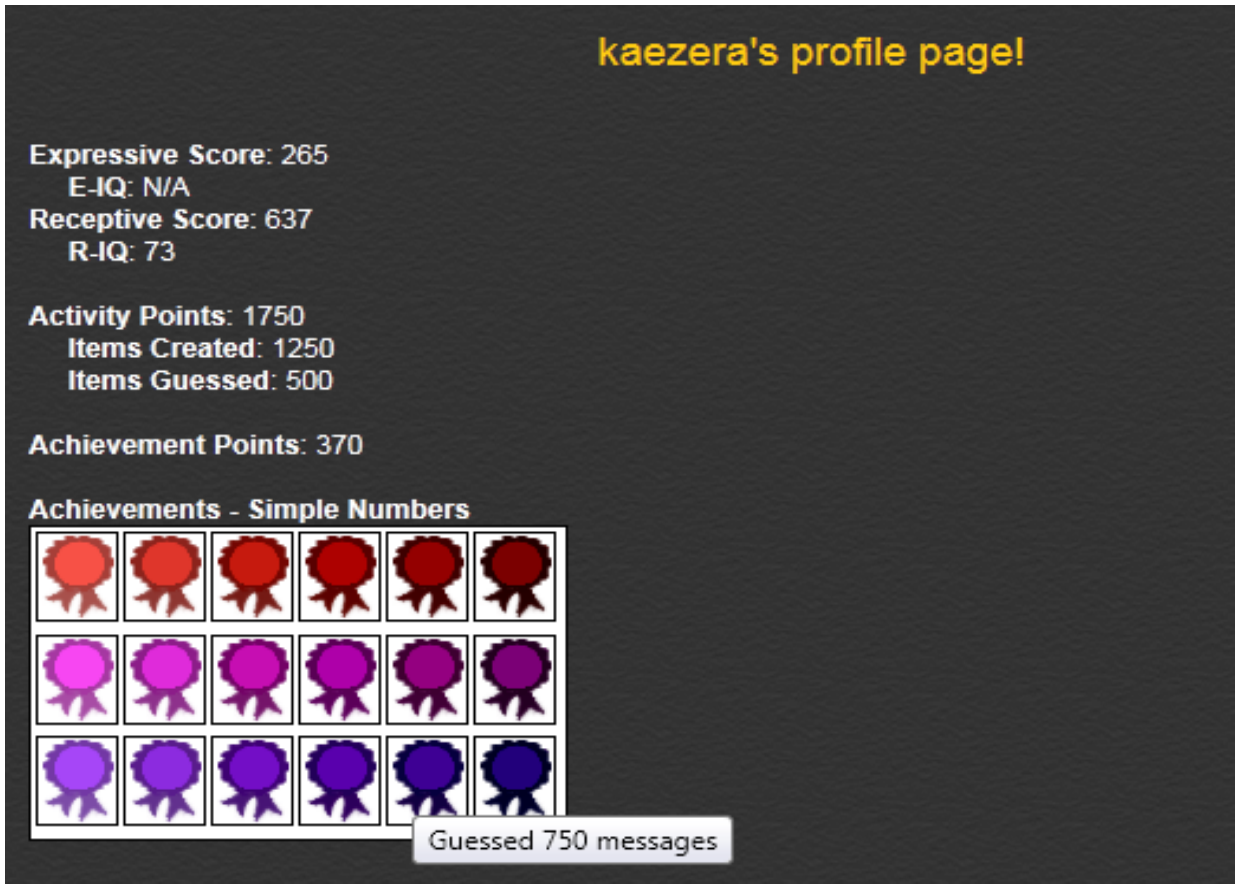
* Many existing games have strong achievement systems
  * Xbox360 achievement system is what Jakobsson wrote on
  * Farmville on Facebook – rewards diligent play with ribbons and occasionally little banners for your farm
  * World of Warcraft – added achievements two expansions ago with the release of The Wrath of the Lich King

WordSleuth v3 – Profile Pages

* Profile pages were added in v3
  * All known scores
  * How many messages have been guessed / created
  * Visible representation of achievement ribbons

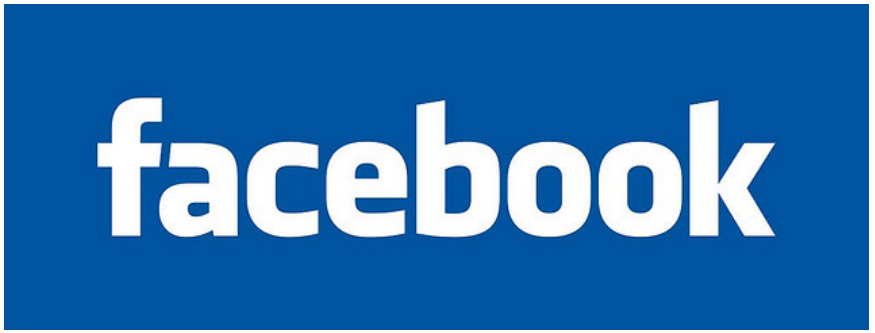
* Improves the community aspect of WordSleuth
* An easy way for users to view their achievements

WordSleuth v3 – Profile Pages



WordSleuth v3 – Profile Pages

* Ties in to Vorderer's "social competition" drive
  * Users can easily see what any given user has achieved
* People feel more attached to a website when they have a page that is "theirs"
* In fact, this is the entire foundation for a website as popular as Facebook!

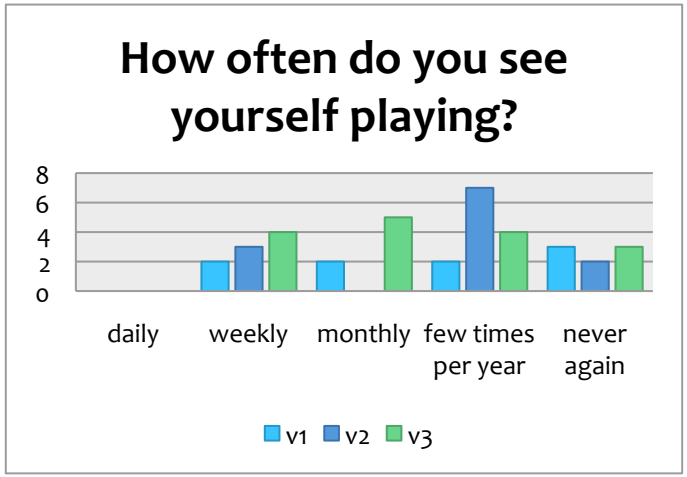


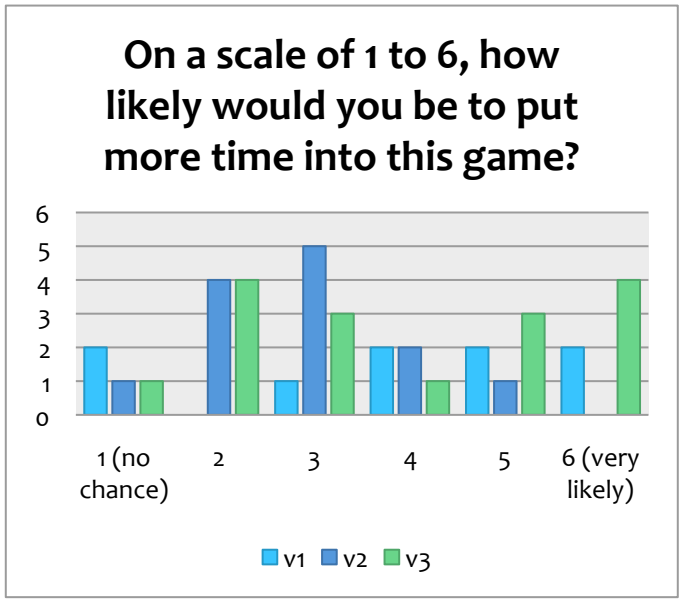
WordSleuth v3 – Beta Test

* Third version of WordSleuth was released to a general audience
  * Link was added to the CoLa lab website
  * Advertised through the CHP newsletter

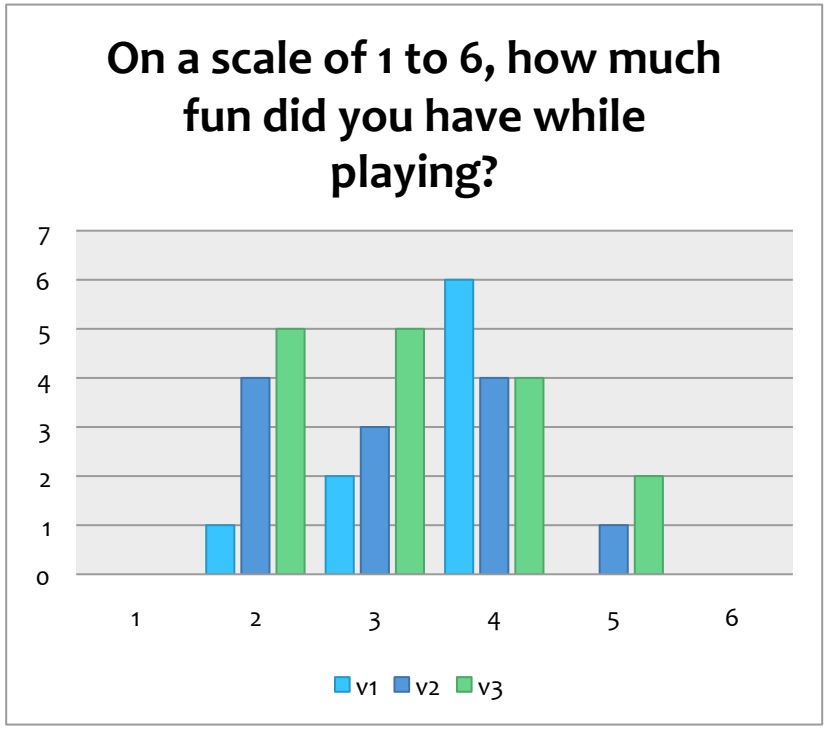
* Players were asked to:
  * Play 15+ minutes on each mode, and to fill out a survey
  * Create new accounts if they had played previously, to experience the new beginner game

WordSleuth v2 – Survey Results





V1 average: 3.88
V2 average: 2.83
V3 average: 3.81



V1 average: 3.55
V2 average: 3.16
V3 average: 3.18

WordSleuth v3 – Survey Results

* 17 responses
  * 6 played v2, 11 had not
* Comments support belief that v3 was an improvement
* Some comments were:
  * “I like the new flagging feature the best, although the achievements are also really cool.”
  * “Achievements are awesome. Flagging is very nice. Good choices.”
  * “Unlocking an achievement was awesome. Then I clicked my name and saw it there and it was GLORIOUS.”

WordSleuth v3 – Survey Results

* Interesting backlash against skipping from some people
  * “Skipping a question is weird. Why not skip everything that you aren’t 100% certain on?”
  * “I think having the skip feature defeats the purpose to see what others think of the clues.”
  * “least [favorite feature] SKIP”

WordSleuth v4+ – Future Extensions

* Some features to implement in future versions
  * Basic social networking
    * Being able to add friends, message people, compare profiles
  * Present users with trivia related to their guesses / creations
  * More visual rewards for playing
  * Maybe some fantasy/story-mode elements
  * Adding more high score tables
  * Adding more achievements
  * Having the IQ scores account for question difficulties

Conclusion

* The amount of data generated makes this method of collection seem successful so far

* WordSleuth has been played for about 6 months
  * Much of this was in a limited, beta tested capacity
* 56 seed members are now 171 total members
  * Some of this is users creating duplicate accounts for testing
* 2,873 seed guesses are now 8,569 total guesses
* 1,060 seed messages are now 2,191 total messages

Conclusion

* We believe that the addition of these new features has had a substantial affect on the speed of data gathering
* With this rapidly growing amount of data, our applications seem more plausible and not so idealistic

* Practical and theoretical applications:
  * Testing cognitive science models
  * Machine learning algorithms
    * Automatic extraction of tone from existing text
    * Word-processors giving “tips” on tone
    * Programs to help people who struggle with tone-detection

Thank you!