Dr. Boozehead, or How I Learned to Stop Worrying and Get Drunk: Design Principles and Analysis of Drinking Games in the Silicon Age

Kelvin M. Liu-Huang
Carnegie Mellon University
kmliu@cmu.edu

Emily J. Simon
Carnegie Mellon University
ejsimon@andrew.cmu.edu

Abstract

From beer pong to beer bong, drinking games have a storied past, seated at the intersection of sublimating puritanical repression [1] and the great ape's boundless curiosity. Animals utilize play to express themselves and practice behaviors. For humans, play is so important that rules of play are codified into games. Yet, scientific study of human games and game design has been greatly underrepresented, and even more so for drinking games. In the present study we sought to distill the essential principles of those traditions, which lie at the intersection of interactive gaming and indulging in poisonous fluids. Through careful field analysis and repetitive study, we propose that concrete prerequisites, mental requirements, and social abetment are all fundamental attributes of a successful drinking game. To evaluate our design principles, we designed three novel drinking games, beer baseball, soccer shots, and beer nim. We also evaluate the popular drinking game, beer pong, as a benchmark. Comparing our innovations to the benchmark, we demonstrate the effectiveness of applying our design principles, showing that beer baseball and beer pong knock it out of the park, while beer nim (our straw man) eats dirt.

1. Introduction

Animals evolved play to communicate and manipulate [2][3]; learn aggressive, predatory, and foraging behaviors [4]; and improve cognitive function [5]. To the great ape, play is so important that rules of play are codified into numerous philosophies called “games.” Popular games are standardized internationally, generously funded, vicariously enjoyed by large fractions of the population, and game elders typically receive the highest salaries at learning institutions [6]. Furthermore, games (as well as all other activities) are often integrated with ingestion of poisonous liquids to stimulate social interaction and enjoyment. In many ways, these “drinking games” may be regarded as paragon forms of play because they achieve so many different objectives of play.

Despite the importance of such games and the complexities of game design, very little formal study and scientific discourse have been devoted to game design. Ordinary tabletop games require delicate balance of tool complexity, rule complexity, computational complexity, game-to-game variance, audience appeal, and mechanical and narrative harmony.

The design of drinking games requires arguably even more sensitivity. Between the innately chaotic environment of parties, the need to facilitate communication, and judicious application of refreshments [1], drinking games embody the highest achievements of human design gathered from the likes of Chess, Go, or Ping Pong. Yet the design and study of drinking games is even lower in the pecking order than ordinary games. Even fewer serious examinations have been made of drinking game design [1][a][8]. Popular with men and women fond of classical languages, drinking games have historically been typecast as intellectually and socially inferior. At the risk of resorting to platitudes, we know that correlation does not imply causation [9], so this alone should not be an indictment of the noble pastime of drinking games.

2. Design Principles

A fecund party is a palpable maelstrom of active, bass/brainless, clumsy, dance, and entropy. Look

for these symptoms using the simple acronym, ABCDE. A drinking game should satisfy all the principles of game design, as well as judiciously accounting for these party properties.

2.1. Easy to organize (ABCDE)

Due to spontaneity and inattentiveness (A), a drinking game must require minimal planning, simple setup, and little infrastructure. Due to heavy bass (B), brainlessness (B), and entropy (E), mobilizing players and organizing a game must be simple. Props (if used) should be low cost and ubiquitous, or at least portable. There should be few and simple rules to explain due to (A) as well as interjection from the hard bassline (B). Due to brainlessness (B), clumsiness (C), and entropy (E), the drinking game should be low risk. Messes and injuries are sure to dampen a thriving party. Above all, the drinking game needs to be technically feasible given the specific parameters of the party. Space for a large game can depreciate due to dancing (D) and entropy (E). Too much bass (B) might also drown out the speaking portion of some would-be drinking games.

2.2. Social (NP, P=NP, KEG)

Parties must facilitate social interaction to avoid noncompliant prairie-dogs (NP), individuals who wallflower, stand alone, or look around perplexed. In general, we don't want players not playing (P=NP). A drinking game readily serves this need by providing a platform for players to communicate [1]. Meanwhile the game itself cannot require too much focus, so as to allow informal conversation. To facilitate social networking, a drinking game ideally allows players to join or leave as they please. We introduce a metric for this fungibility called the KEG (keep entering/exiting games) norm. Though some partygoers may wish to linger on one game, the option to devote only an aliquot of time is vital. Therefore we must always remember the KEG!

2.3. Appropriate difficulty (NP-complete)

The computational complexity of such critically acclaimed board games as Agricola and 7 Wonders tend to be unpalatable for a drinking environment. Other forms of play, such as football, hunting, and monster truck driving, carry a level of risk and finesse that should not be expected of inebriated patrons, due to brainlessness (B) and clumsiness (C). That is not to say that refreshments do not go well with a titillating round of Elder Dragon Highlander, but rather, the choice of drinking game depends heavily on the mood and flavor of the party.

Because intoxication impairs judgment (B), a drinking game has an ideal runtime complexity between O(0) and that of ordinary games, inclusive. As with ordinary games, the level of difficulty needs to carefully chosen, commensurate to the mood and audience. The game is boring if too easy and either boring or draining if too hard. That optimal level just happens to be lower than for ordinary games. More importantly, a drinking game should have a runspace complexity much less than that of ordinary games because impaired memory capacity is one of the first symptoms of intoxication (B). We must avoid a game that is completely not playable (NP-complete).

2.4. Low cost, high reward (PING PONG)

Given the whimsical yet effusive milieu (A) of a party, patrons should not feel too physically, mentally, or emotionally drained after a single game. Therefore we propose the following heuristics to optimally calibrate the primary investment energy gift (or PING) against the principle output and gain (PONG). (1) A single game should not occupy an unreasonably large aliquot of the party time. (2) Players should not have to learn unreasonable skills. (3) Players should receive maximum fun output in exchange for participation input.

Points (1) and (2) requires a reduction in the activation energy for playing the game due to inattentiveness (A) and brainlessness (B). This disqualifies widely lauded games such as Settlers of Catan with the Cities and Knights expansion, Warhammer 40,000, and Dungeons and Dragons. These games may offer high payoff in

the currency of intrigue and imagination, but prove unfeasible for the passing tourist without dedicating hours or weeks preparing and learning the strategy. Unless the social norms of partying undergo a dramatic paradigm shift to accommodate pre-party strategy sessions and avatar development, drinking games will remain limited to simple setup and rules.

To satisfy point (3), players cannot be excessively focused on winning or losing (since only a fraction of players can win each game). Point (3) comes attached with the caveat that anyone who does not find the game "fun" will be ceremonially denominated as "excretory celebrants." It thus follows that any reasonable partier should find the game entertaining and exciting in a manner linearly related to BAC.

2.5. Drinking is integral (DUI)

We all like games, from corn hole to cricket to Chrono Trigger, and we all like drinking, but drinking games stand alone. While drinking can be performed alongside almost any activity, games that are not designed with drinking in mind often fail to synergize logistically and thematically. Therefore we propose the Drinking is Utterly Indispensable principle (the DUI principle). A drinking game must be unable to progress without players taking their apportioned drinks [1].

For example, while Twister surely makes a fun party game, drinking is at best encouraged but not mandatory. In contrast, flip cup cannot progress until the beverage has been downed (or players start flipping full cups whereupon the game surreptitiously transforms into Stand on a Sticky Wet Floor). Secondly, drinking games are reserved for parties. If one were to play them sober, they would be reduced to "games for people with poor fine motor dexterity" due to (C), or alternatively, "stupidly easy games" due to (B). Third, winning and losing, and increasing inebriation by proxy, should not make the game less fun [1]. In fact, a good drinking game ripens with age as the party progresses!

3. Examples

3.1. Beer Pong

Few drinking games are as popular and time-honored [1] as beer pong, also known as Beirut [10]. Beer pong is often considered the progenitor of the shooting into cups (SIC) drinking games archetype. Thus due to natural selection, one would expect beer pong to be a highly optimized drinking game which satisfies many of our design principles.

With regards to feasibility, beer pong requires virtually no planning (just selecting two or four players), ubiquitous resources (red solo cups and ping pong balls), and little maintenance. However, the full rule set can be quite cumbersome and vary dramatically with the east and west coast populations. Furthermore, the large number of cups poses a high risk of a pathogenic state known as a "party foul."

Socially speaking, players can freely apply KEG if they can find a substitute, or even take "celebrity shots." Watching balls land in cups can be as exciting for the players as the crowd. The strategy is simple enough for any patron to enjoy. In fact it may be too simple. We estimate an O(0) runtime complexity for determining the optimal strategy. Beer pong satisfies low-cost, high-reward in many ways. Little preparation and time are necessary. Games can often be decided by the last cup, providing excitement until the last moment.

Drinking is heavily integrated into beer pong, both thematically and mechanically. The cups both hold and are stabilized by the beverage. However this historical methodology has been hotly contested by hygiene scientists. Furthermore, inebriation conveniently amplifies the dexterity challenge. However, one potential issue is that the loser drinks more, becoming less dexterous, which positively feeds back to losing even more.

As we can see, aside from the risk of party foul, excessive simplicity, and potential positive feedback, beer pong is virtually a paragon of design principles. So can we do better? We will demonstrate that improvement is in fact possible.

3.3. Beer Nim

We designed a game entitled beer nim, which is exactly equivalent to the classical game, nim, played with beer cups instead of stones [11]. A number of red solo cups filled with an arbitrary quantity of beverage are arranged into three groups. Players take turns drinking a number of cups (instead of removing a number of stones). The player to drink the last cup wins.

Beer nim requires little planning, simple setup, little maintenance, relatively few and simple rules, and low risk of party foul. However it fails to adhere to, and even actively opposes, virtually all other design principles. Socially, beer nim can only be played with two players, facilitates little conversation because it requires so much thinking, and requires a great deal of attention. It does, however, allow the crowd to vicariously play the game mentally. In terms of difficulty, the runtime complexity of beer nim is technically O(t), though the constant is much larger than the other games discussed. Furthermore, the runspace complexity is significantly larger and left as an exercise to the reader. This is more problematic due to impaired memory constraint.

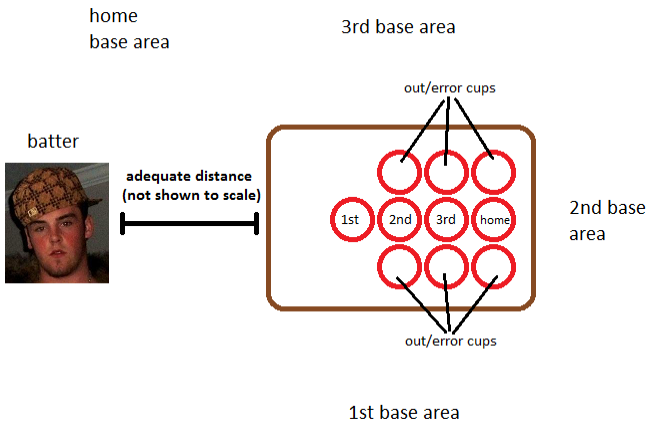
Based on utter failure to satisfy most of the design principles, we must conclude that beer nim is a terrible innovation. Therefore we can use beer nim as a lower bound benchmark.

3.2. Beer Baseball

In preparation for an Olympics themed house party, Gisolfi and Liu-Huang developed a sports-themed drinking game, beer baseball. We describe beer baseball's rules below and compare its funness and adherence to design principles against beer pong, the benchmark.

3.2.1. Setup

- 2 teams of 4+ players (do not have to be the same size)
- Small table
- Line 4 "base" cups moving away from the shooter
- Put 6 additional "out" cups, one on each side of second, third, and home base



3.2.2. Gameplay

- Teams take turns "batting" and "fielding"
- Batting:
  - Players on the batting team take turns trying to shoot the ping pong ball into base cups
  - During her turn, a batter can keep shooting until she makes a base cup or gets out
  - Outs:
    - If the batter misses the cups, he gets a "strike"
    - If a batter gets three strikes, he is out.
    - If the batter ever makes an out cup, he is immediately out regardless of the number of strikes
    - After three outs, the inning ends, and the teams switch batting and fielding roles
  - If the batter makes a base cup, he takes that base by moving to that side of the table (1st base = right side, 2nd = opposite, 3rd = left, home = he goes all the way around)
  - Whenever a batter returns home, each fielder must take a drink
- Fielding:
  - Whenever a batter takes a base, a fielder can choose to make a play
    - If so, she tries to shoot for the same base cup made by the batter
    - If she makes it, the batter is out
    - If she hits an out cup, it is an error, and all the batters advance an extra base
    - If she misses or hits any other cup, nothing happens and she does not get another try

3.2.3. Alternate rules

1. At the start of fielding, each fielder chooses a base and is the only one who can defend that base (requires teams of 4+).
2. If a fielder hits a different base cup than the one made by the batter, it is a "foul." Nothing happens for a foul; the batter does not get a strike.
3. Whenever the batter misses the cups *but does hit* (anything on) the table, players on the batting and fielding team may both race to retrieve the ball and touch it to the table. If a fielder succeeds, it is a strike. If a batter succeeds, it is a "ball." If a batter gets two balls, that batter walks to first base for free.

3.2.4. Analysis

Just like beer pong, beer baseball is also a SIC (shooting into cups) game. As such, beer baseball shares the same desirable properties in terms of setup, low-cost high-reward, and integration of drinking. However, beer baseball is more engaging. Players on both the batting team and fielding team have a role to play at all times. Using alternate rule 3, it is even possible to engage all players during each shot. Furthermore, there is nontrivial strategy involved in deciding when to field. Therefore we estimate that the runtime complexity of beer baseball is O(t) with the duration of the game. Having nonzero strategy means the crowd can also engage in discussion and mock strategizing. Considering these points, we believe beer baseball satisfies more design principles than beer pong, and is likely to be a better game.

3.4. Soccer Shots

3.4.1. Setup

- 2 teams (teams must be same size) of 1-3 players (can accommodate even more players, but the table may get crowded)
- Large table
- A ping pong ball
- Two empty six-pack cartons (or some other way to mark the goal)

3.4.2. Gameplay

- Players run around the table using the index and middle fingers of one hand of their choice
- The objective is to flick the ping pong ball into the opposing team's goal
- Whenever a team scores, the opposing team members must each drink a shot
- No flying: either the index or middle finger must be in contact with the table at all times
- No sliding: you may only move by running along the table using index and middle finger
- Players cannot touch the ball with anything besides the index finger, middle finger, and back of hand of the chosen hand
- If a player breaks a rule, he must drink a shot

3.4.3. Analysis

Among all the games described, soccer shots boasts the easiest setup, requiring only a table, ping pong ball, and two readily available markers (such as a six-pack carton). It is also easy to organize in all other respects, with simple setup and few rules. Socially, soccer inherently requires communication and engages the audience. While soccer shots is easier than soccer, it still requires strategy with respect to formation and coordination. Therefore we estimate that soccer shots has a runtime complexity of O(t). Drinking is not integral because the game is identical without beverage, though "shots" *is* in the name.

4. Discussion

We sought to codify the core principles common to drinking games. Through close analysis and repeated playthrough of the aforementioned games, we found that the proposed principles are indispensable for a successful drinking game. Through creativity and adherence to the principles, we also designed a drinking game, beer baseball, which satisfies more design principles than even the highly regarded beer pong, our benchmark. While more testing is required, theory suggests that beer baseball is better than beer pong.

5. Acknowledgements

The authors would like to thank Junxing Wang for inspiration and numerous discussions on game design; Nick Gisolfi for helping to compile and prune the list of core principles, and for extensive play testing; and Zachary Batts for extensive play testing.

References

[1] Brice, M. (25 January 2015). “I went to a drinking game jam and this is what I did.” *www.mattiebrice.com*.

[2] Horowitz A. (2004). “Dog minds and dog play.” In M. Bekoff (Ed.), *Encyclopedia of Animal Behavior*. Greenwood Publishing Group, Westport, CT, 835-838.

[3] Horowitz, A. (2009). “Domestic dogs (Canis familiaris) use visual attention cues when play signaling.” *Journal of Veterinary Behavior: Clinical Applications and Research*, 4, 53-54.

[4] Berghänel, A.; Schülke, O.; Ostner, J. (2015). "Locomotor play drives motor skill acquisition at the expense of growth: A life history trade-off". *Science advances* 1 (7): 1–8. doi: 10.1126/sciadv.1500451

[5] Robin M Henig (17 February 2008). "Taking Play Seriously". *The New York Times*.

[6] Fisher-Baum, R. (9 May 2013). “Infographic: Is Your State's Highest-Paid Employee A Coach? (Probably).” *Deadspin*.

[7] Tom Murphy VII. "New results in k/n Power-Hours." In *Proceedings of SIGBOVIK 2014* (2014).

[8] g_squidman (2016). “Any Tips for Designing a Good Drinking Game?” *Reddit*.

[9] “Correlation does not imply causation” *Wikipedia*.

[10] “Beer Pong.” *Wikipedia*.

[11] “Nim.” *Wikipedia*.