

GDC
12
CHINA

How Games Think

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I have been making games since I was a child. I am of the generation that can be truly said to have grown up with videogames. I started out playing videogames when I was seven or eight, with Pong. I saw the first Space Invaders machines in the local pizza parlor, and begged my father for quarters. I attended computer clubs where we swapped games on old floppies. I dialed up to BBSes using modems you had to cradle on an old phone.

> Games are culture now



> In other words, we spend less time
on the things that once shaped our
cultures.

Most of the other kids my age didn't grow up with this. They grew up with television. They played sports. I was a nerd. In a very real sense, I am a child of the videogaming era. It has shaped who I am, just as it has shaped all the children who came after me. But the time that I spent on video games was time that I did not spend on sports, time I did not spend on dances, time I did not spend worrying about clothes.

We have limited time. Time we spend on one thing is time we do not spend on another.



> More young people see game art than this art.

Today, I am not unique. Kids who grow up today are all game players. The percentage of children exposed to video games in countries and regions where the standard of living is high enough rises rapidly to close to 100%. This has profound implications for what experiences they have before they were an adult.

There weren't as many games when I was a kid. So I still studied art history.

> More young people know
the stories of games
than know the great
writers.



I grew up a reader. I learned to read when I was very young, and have never stopped. I read dozens of books every year. I read fiction and non-fiction. I read comics and I read literature. I read science fiction and I read the news. Lately, I have found myself, like many others, turning to the Internet rather than to books when I have a brief moment to read.

Now, statistics show that the amount of reading that we do today is actually rising, thanks to the Internet. But it's not in the same ways and the same places. And I would venture to say that young people today spend more hours immersed in the stories of their favorite videogames than they do in the classics of literature.

> More young people every year hear the music of games, rather than the music of their people.



I could go on. Games are now culturally important, not necessarily in the sense that they contribute to the quality of the cultural conversation, but in the sense that they take up a larger and larger portion of the time spent on media.

> As culture changes...

> We in this room are shapers of
culture.

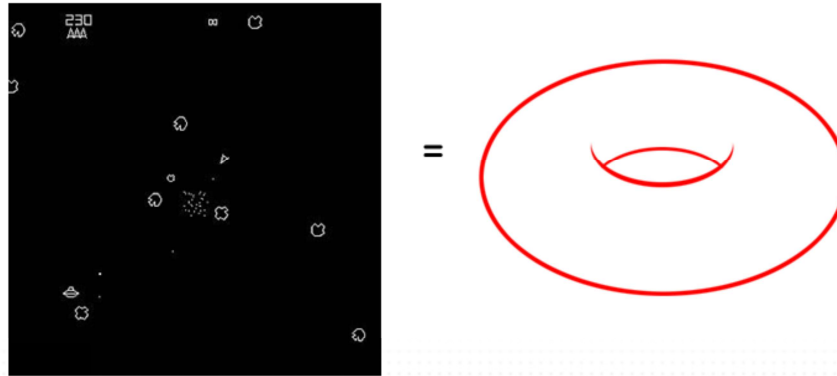
> We have a special kind of power.

Many of us here in this room are not used to thinking of ourselves this way. Many of us make games as a business. It is a way to make a living, to put food on the table. Some make games, not because they are passionate about games as a medium, but because it was a hot startup sector.

No doubt, there were once businessmen who thought that poetry was a hot startup sector too, and did that – perhaps even well! – because it was a good way to make a living.

But I am here to say to you all that we are shapers of culture, whether it is our intent or not. We have a kind of power that in the past has been reserved for artists: the writers, the musicians, the philosophers, the playwrights and filmmakers.

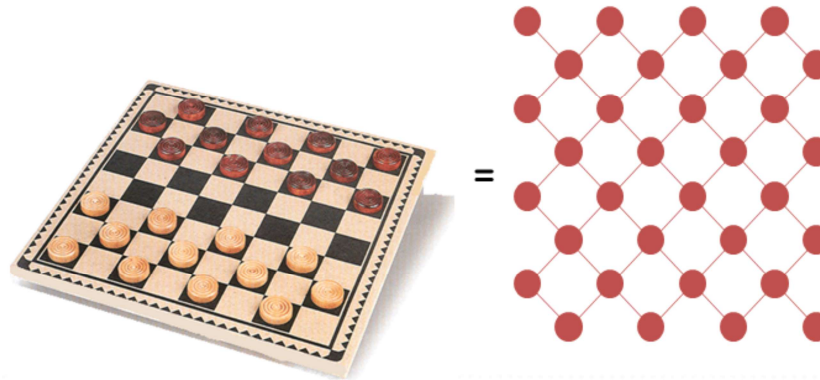
> Games are not what they look like
on the surface.



It is not the same kind of power as we have seen in the past. You see, games do not convey meaning in the same ways that stories do. Stories have themes and morals, but above all what stories do is teach empathy. Stories cause mirror neurons to fire – they create emotional responses in us that mirror the emotions that characters feel in the storyline.

But when we look at games, we see that the story on the surface often has very little relationship to the actual shape of the game. Games routinely cover up the structure that sits underneath – they cover it up with pretty art and music, and yes, even storylines. But games are inherently stories, not at all. Many classic games have shapes very different than what they seem to.

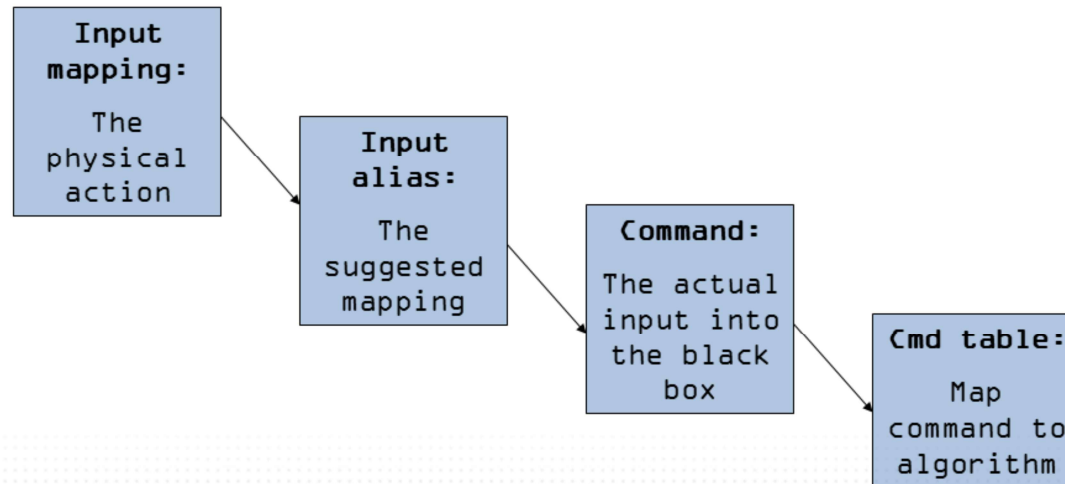
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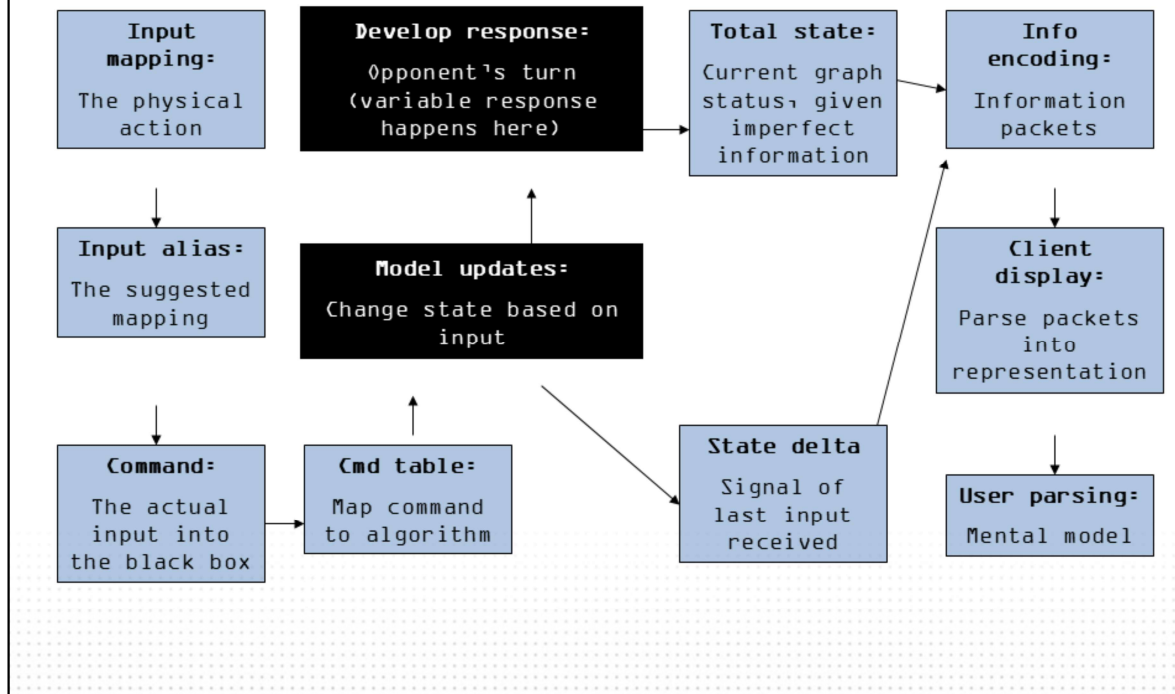
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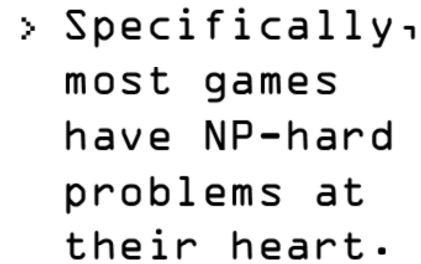
> Games are not their controls.



These days, everyone is looking to touch interfaces as a new way to think about games. But all board games have always used touch interfaces. Games are not their interface. They exist more like mathematical structures, divorced from representation.



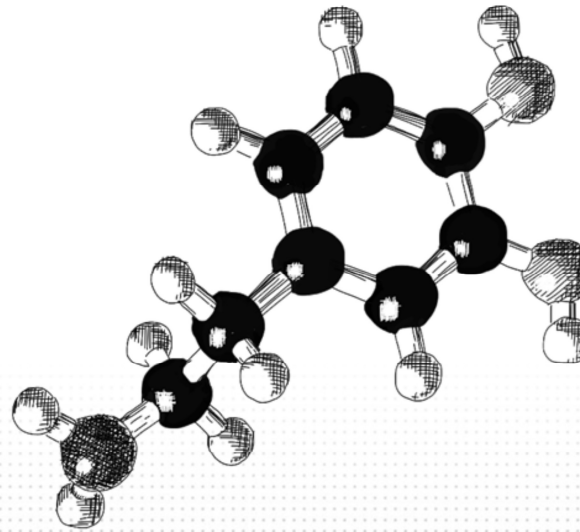
In fact, games are more like an algorithm than anything else. You see the current state of a complex system. You build a mental model of that system reacts to input. You select an input and attempt to execute it correctly. The system updates its internal simulation, and you are presented with feedback from the system as to how you did. The game then also makes a decision of its own, how to respond to the action you took. Based on that, you update your mental model of how the game thinks.



This means games are primarily about solving complex math problems. To be precise, they are about dealing with *complex* problems, problems that the brain perceives as being in the NP complexity class. These are classes of problems that are not really amenable to being solved via a computer. They don't lend themselves to being solved by pure logic; instead, they do best when solved via heuristics or flashes of intuition.

> “Everything” is math

> But the ways in which art, music,
or writing trigger brain
neurochemistry are different.

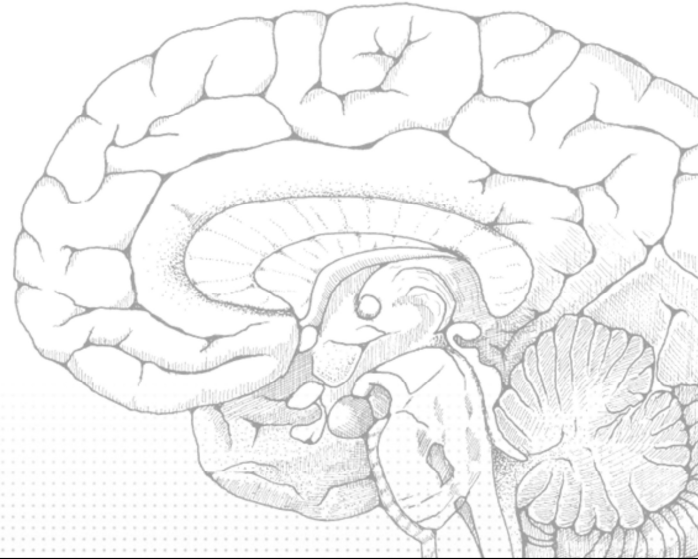


We end up experiencing fun as we figure out the patterns behind the system, and elaborate on our mental model. Most specifically, it causes a release of dopamine, a molecule that enhances focus on learning, that is a reward for curiosity, and that causes us to feel pleasure.

Other media do not orient themselves solely around enjoyment and analysis. In fact, we can see a very specific range of emotions that tend to be triggered by games, and the most common and fundamental of them, particularly in single-player games, tend to be around frustration and triumph, around gloating when you defeat your enemy, around pride in mentorship. These are not at all the same sorts of emotions that are triggered by media designed to create empathy.

Recently studies have emerged showing that in fact, the neural pathways for empathy and analysis are mutually exclusive. The more analytical you are being when approaching a problem, the less empathic you will be, as you “get distance” and “take a step back.”

> All our experiences change our brains.



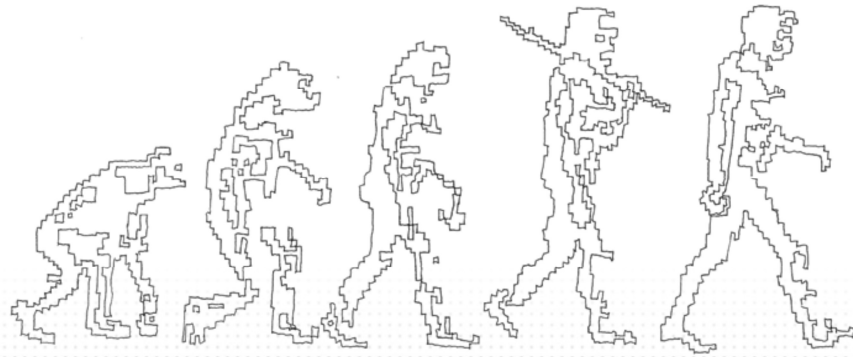
This matters because of neuroplasticity.

Our brains change throughout our lives. Our experiences form memories. We react to events based on the store of memories and patterns that we build up. This is a large part of what makes each of us different from one another – and the fact that people in a culture build up a large library of shared patterns is the reason why we develop cultural identities. Recently science has begun to call the neural web the “connectome,” and the argument from some neuroscientists is that the connectome is “who we are.” That it is the seat of personality and mind.

How Games Think = How We Think

In short, if we play games more than we used to, that means we internalize game ways of thinking.
If we internalize game ways of thinking, that changes the patterns we build in our brains.
The way we build our brains effectively changes how we think, and who we are.
This means that the ways in which games think become the ways in which WE think.

- > Games invite categorization, quantification, and quantization.
- > We used to experience the world in a more analog way.

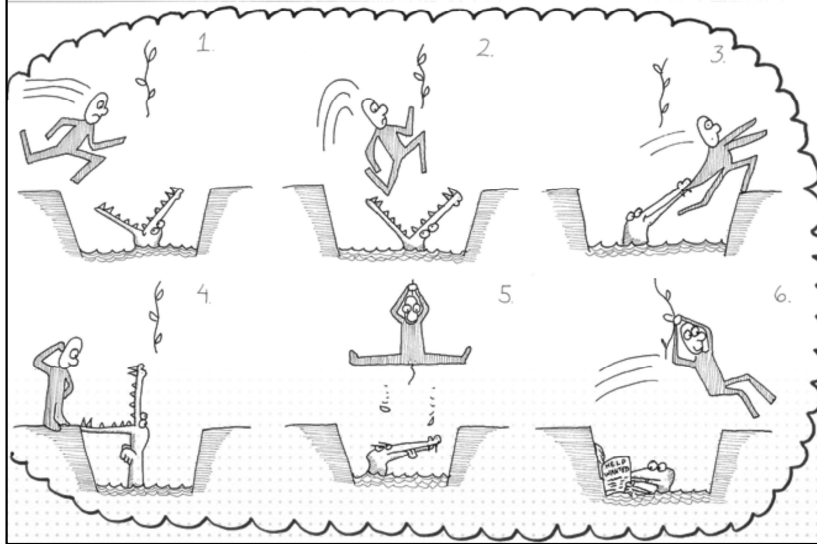


Let's think about some of the ways in which games think that are different from the world we used to experience.

Probably the biggest is that games – even board games – invite us to think digitally, rather than in an analog way. In games, we have positions on a team; we have a fixed set of rules that are supposed to be applied fairly and rigidly. We have things divided into categories, and those things have a fixed number of powers, and statistics, and these can be given numeric values.

This is very different from how language operates, which gives us a clue as to how we have traditionally thought in relative terms. We speak of someone being stronger, and strongest, but we don't quantify it very precisely. We say that someone has a job, but we know it is lazy thinking to assume that this job is the sum total of the person, or that this job is everything about their past and their future. We speak of something being more red or more blue, and we even invent names for the colors between... but we don't presume that there is utility in knowing a name for every single shade of purple.

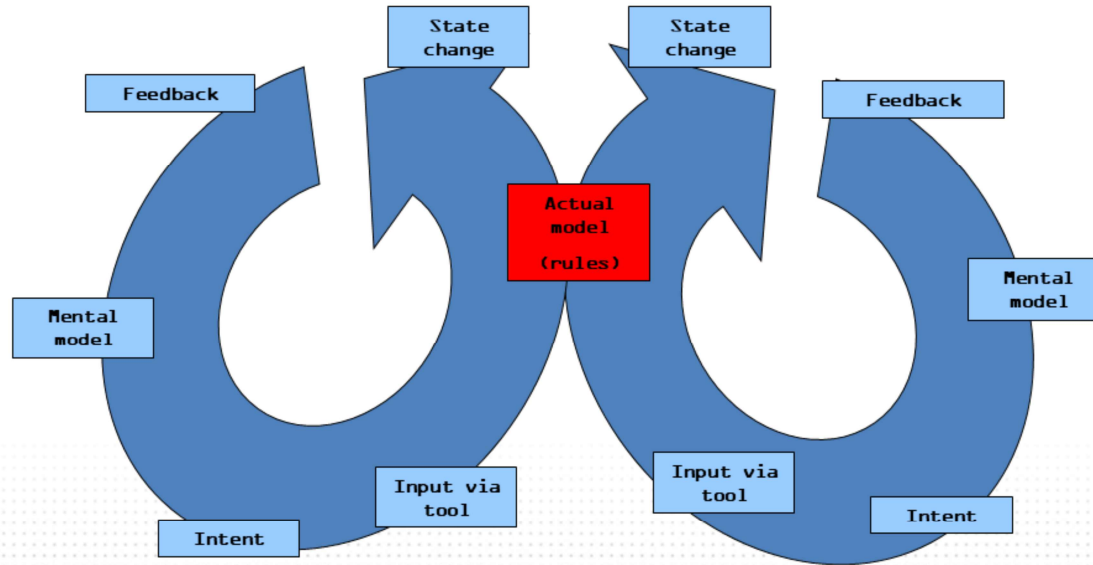
> All games feature challenges to solve.



In the real world, we know that there are problems. We have all read the novels or seen the films where the primary action is a character study. There are the stories about arguments between the traditionalist older members of a family and the younger rebels, for example. This is a cycle of life – there isn't a right answer, because times change, and people change with time. There isn't necessarily a singular challenge to overcome. Or stories about logic versus intuition. About patience versus rapid action.

But in games, there always is a real challenge. It is definitional to games that there is a problem to solve and an issue to overcome. It forces picking sides in debates like the above. Games are defined by challenges, and what's more, they generally present the challenge to you in a neat clearly explained package. As we all know, in the real world, it can sometimes be very hard to determine what the problem to solve actually IS.

> Conflict has been a part of much art, but not all.

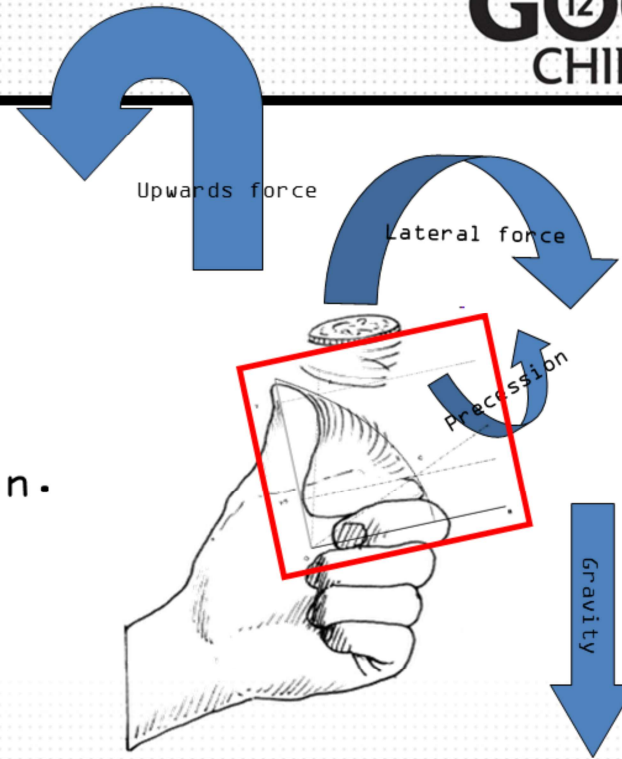


In other words, games have an implicit opponent.

Not all art and culture has been about conflict in this sense. Oh, conflict is common, of course. But much of what we term art, as opposed to entertainment, moves away from simple dichotomies to force us to consider the complexities of situations. When we meet troubles in life, it is not always the case that there is someone actively working against us... in fact, usually it is not the case. And often, opponents simply have motives we do not understand.

Games tend to package this away by declaring it non-comprehensible. When we kill bug aliens or slime monsters, we simply assume that we cannot communicate with them, cannot understand their motives, or that they operate in a realm of pure evil, and could never understand that they are doing us harm. We essentially cast the opponent as incapable of empathy, for the sake of the game.

> Games are
about action.



This is because in most ways, games are about action. This is clearest in games that take turns. Nothing happens when an action is not taken. But even a fast moving first person shooter is still “taking turns” – 60 times a second, the players and the opponents make decisions and take action.

Contemplation in games happens between actions. Contemplation is more a result of games, than it is a quality of games. We contemplate the actions, and the consequences. This is very different from many types of media – music is not about actions we take.

- › Goals are made extremely clear
- › In many games, there is only one way to get to them.



A very common characteristic of games is that they not only present an opponent, but they present a limited set of victory scenarios. In effect, many games are more like puzzles than games, really, where you have to figure out the solution the designer had in mind.

Needless to say, in the real world, even the most straightforward of problems rarely has just one answer, and rarely was it “designed” to have a solution. In fact, the biggest problem that many have in life is deciding what their goals are in the first place.

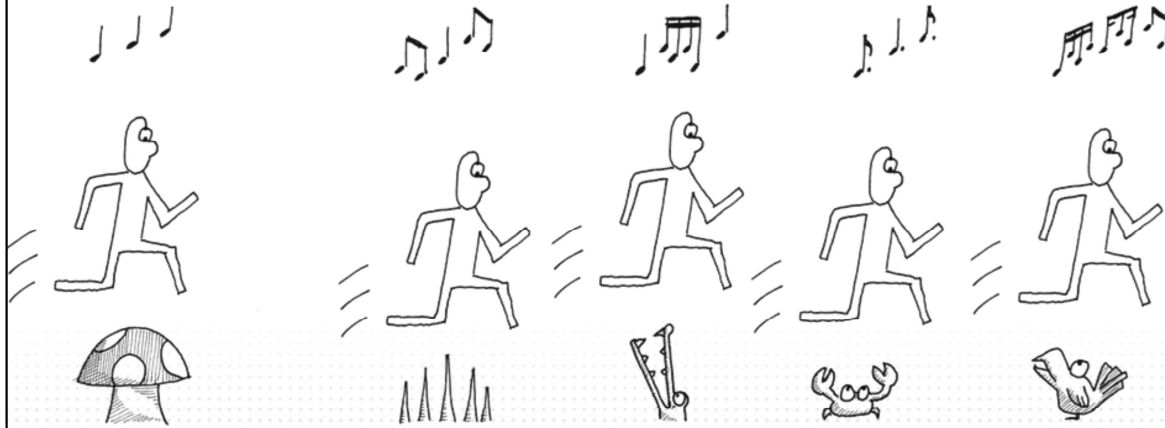
> You can keep trying. There is
always another match, another life.



Since games are intended to teach us in a situation where the stakes are low, as a form of simplified practice reality, the principal way in which they work is to give you second chances. You get lives. You get a new match. You can try again. As bounded activities, you can pass through them again and again, exploring the boundaries.

In the real world, there are often second chances at the same situation, and usually, the second chance is not much like the first one. Especially if you failed miserably the first time. If you don't get to kiss the girl because you insulted her terribly, the game is a lot harder the second time. If you performed your job badly, people are less likely to let you try again. There is no complete reset on life.

> Games tell us there is something new around the corner.



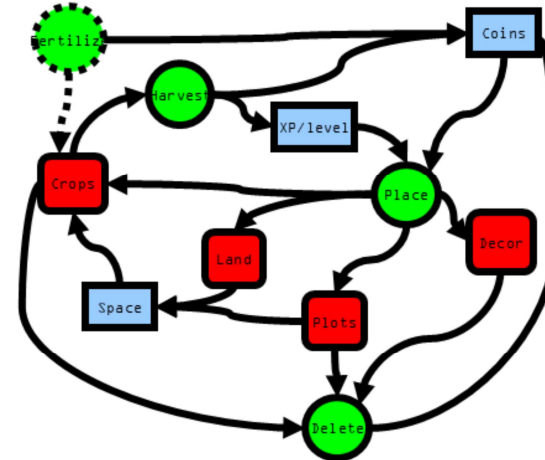
On the other hand, games hold out a promise to us that there are more levels, more items, more things to see and do. Games always have a new pretty particle effect. They pull us from one thing to another quickly, and throw a steady stream of information at us. But many jobs and things we might do in life are not full of novelty. They are often full of tedium, of repeated actions that may not vary much from one instance to the next.

Games are also built for rapid attention cycles, so that you can click away and click back, and “multitask.”

The human brain does not actually multitask – it’s an illusion. Our brains are simply not designed to change focus that often. It takes 15 minutes for us to really dive into a task of any sort and deeply focus on it. Switching rapidly lowers our effectiveness. But we love to lie to ourselves about it.

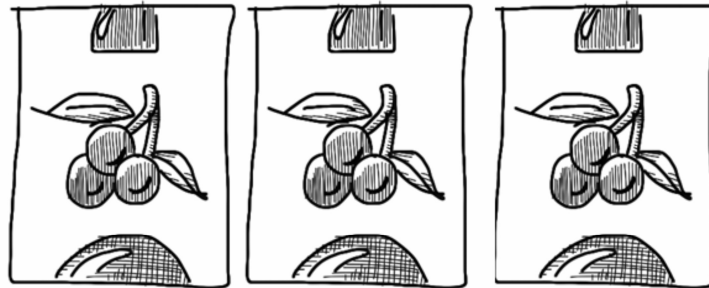
> Games are not about understanding the rules (though advanced players may).

> Instead, they are about understanding the system.



We don't actually end up learning the rules from games. What we take away with us is the dynamics of how the system works. We learn more about "when I do this, this other thing happens" than we do about how it functions. It is a very practical sort of learning.

- > As the systems change, they tell us how.
- > But we are susceptible to feedback
 - our brain has bugs.



Lastly, the way in which games instruct us to the utility of what we are trying to do is by providing us with feedback.

But it so happens that our brain's software has real issues with certain types of problems and feedback. We have what appear to be instinctive, inborn reactions to certain sorts of feedback. Across the world, major chords are happier sounding than minor chords. Across the world, humans have problems projecting out exponential curves or estimating odds. This means that games can and often do exploit these characteristics of the brain, usually for commercial purposes.

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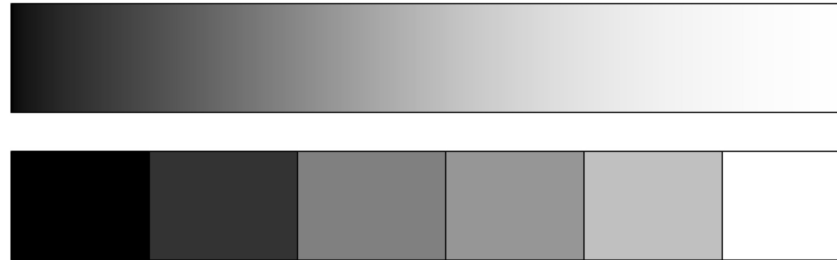
So how do games then make us think?

> We now have a generation who grew
up with them. We can see.

We now have a generation who grew up with games.

People like me.

We don't have to speculate, we can actually go look and see the ways in which they think differently.



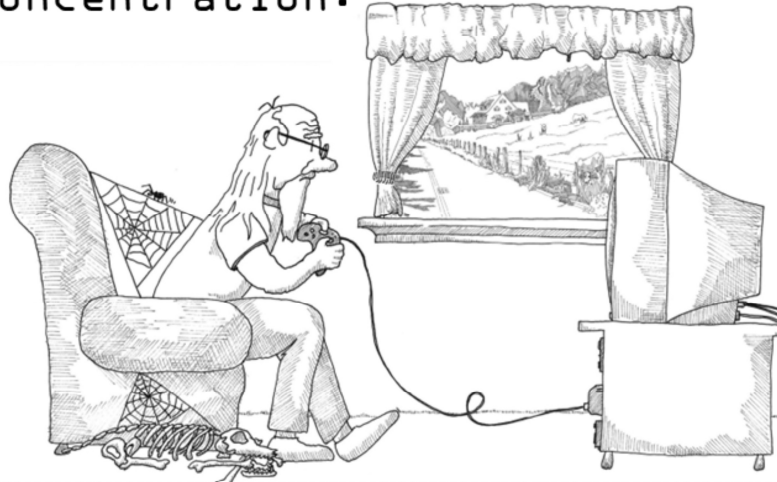
> Games teach us to reduce and
simplify, because they quantize.

Perhaps most obvious is the fact that games teach us to reduce and simplify. This is manifesting most clearly in the way in which we are rapidly deploying game metaphors into every aspect of our lives via gamification. We all know there are many kinds of friendship, but digital social networks force us to classify and reduce complex relationships to “friend.” We are now granting achievement badges for visiting restaurants, and putting star ratings on everything under the sun.

Along the way, we are falling prey to the flaws of a quantized system. For example, there are only a few star ratings that convey useful information: 5 stars, 4.5 stars, 4 stars, and everything else.

> Ability to focus

- > Because games provide constant feedback, they undermine certain types of concentration.



- > They don't need to...

Games tend to provide very regular feedback, because we have determined through metrics that this is what leads to optimum retention. We worry about letting the player go ten or thirty seconds without getting some sort of pat on the head. This means that there are some types of concentration that game-trained brains will be worse at.

This manifests in the workplace as employees who demand constant feedback on how they are doing, or as an emphasis on choosing projects that can show short-term results rather than the ones that demand patience.



> They are profoundly collaborative.

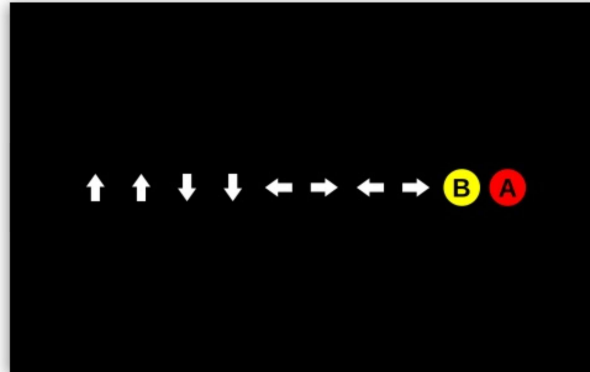
Games are not just directly collaborative, as in team sports – or guilds -- but also collaborative in asynchronous ways, such as strategy guides. They lend themselves to wisdom of crowds solutions, as everyone tackles the same problems together and shares solutions.

This sort of large-scale problem solving has already proven to be of great value in many ways, from the experiments with using games to solve protein folding, to the marked improvement in team problem solving that we see in the Millennial generation.

- > Younger people entering the workforce seem to expect there to be rules for things that are usually unstated.

Of course, there is the assumption that reality functions like a game does; if you are used to your entertainment providing clear rules, well, then you also see the same from people who have been game-trained, as they approach real situations. Again, we have seen that the younger generation in the workplace tends to assume faster advancement along with their regular feedback, greater clarity on process and rules, and a sense that the rules must always be followed. When the rules aren't, it can lead to a lot of resentment.

> There is also the notion that there must be a shortcut, “cheat code” or equivalent.



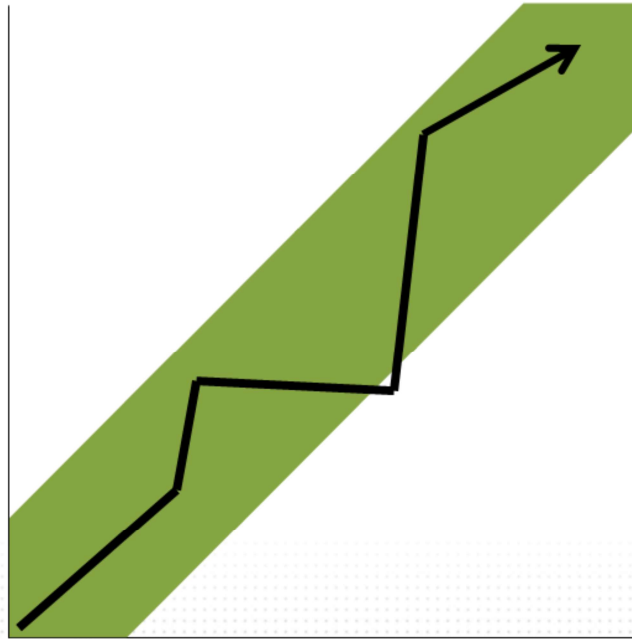
One wonders to what degree the amount of entrepreneurialism is driven by the amount of games-playing that people do. I am unsure what it is like here in China, but in Silicon Valley, there is something of a culture that the “score” (revenue, company valuation) matters more than the goal or product. Entrepreneurs are advised to “pivot” – change their business goal – when things are not working, which often means abandoning a passion project that simply does not drive enough revenue, rather than staying true to your heart.



> In the microtransaction marketplace, we have taught people that you can buy your way out of problems.

It is not honest to teach people that they can buy their way past problems, but that is what much of the microtransaction system does. At its best, free to pay lets people play the way they want to, for the amount that they want to. But at its worst, it can prey upon the bugs in our brain's software, and teach that money can get you anything. Ancient wisdom tells us that this isn't so.

> In games, we use a classic rising action curve for difficulty.



In fact, one of the ways in which games most consistently lie to us is by presenting a reality in which problem difficulty ramps smoothly. In games, we use a difficulty ramp which has rising action, key challenges with bosses, then a moment of relaxation, followed by rising again. This is actually something very much like what novels do for rising tension.

The real world, though, does not work in this sort of fairly linear way. Events in the real world have discontinuities. If a game worked the way reality does every once in a while, for no reason whatsoever, your RPG character might get cancer and die, or a huge monster might appear and kill everyone in the level. This isn't fun, but it is more honest.



> But the real world does not work
this way.

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> Optimizing our customers

- > We treat customers as aggregated data.
- > This is good business.
- > But it means that we can run experiments to see what works, without understanding WHY.
- > This can lead to ethically questionable choices.

Finally, we as designers treat maximizing the revenue as a game itself. And this means that we see the customers, the users, the players, the community, our fans, as just numbers. Remember, the more we treat things systemically, the less empathic we get.

It is good business to treat our customer base as data. But The Big Data approach is not science in the classic sense. Science forms hypotheses as to WHY. Big Data does not need to know why as long as results are evident. This can lead to ethically questionable choices, and also to shortsighted choices – metrics help us optimize local maxima, but not find greater peaks in the possibility space.



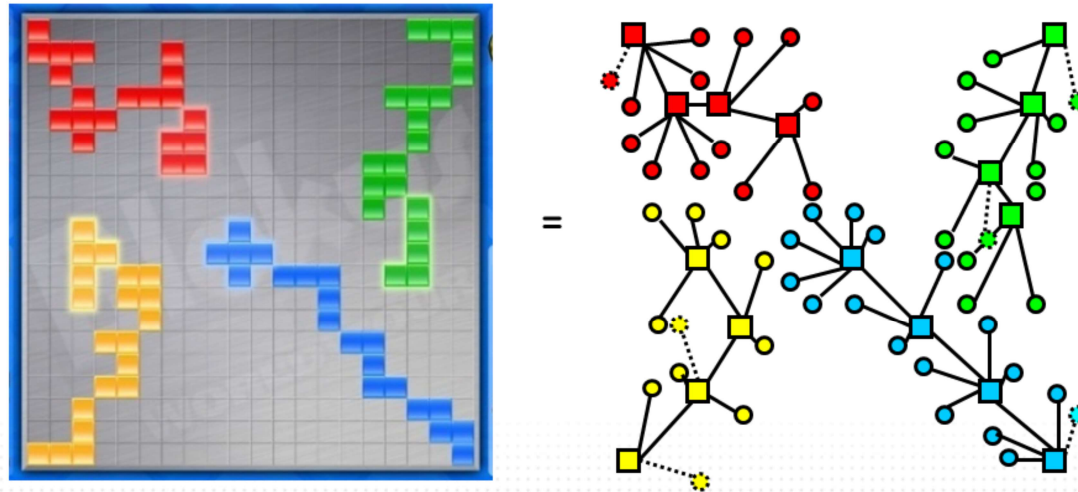
- > All of these effects sound like they may be negative.
- > But there is still scope for art and beauty.

I do not mean to sound negative. I was asked to provide inspiration to you all, and instead I have presented what seem like the bars of a cage.

All media, all art forms, have limitations and strengths. These are just the ones that we here in this room happen to work with. The better we understand how games think, the better the games we will make, and the greater the contribution to culture that we will make.

Just like pixels can still come together to present a work of art, these rigidities of games can still come together to create beauty.

> People have gotten better at seeing the essential things that matter.

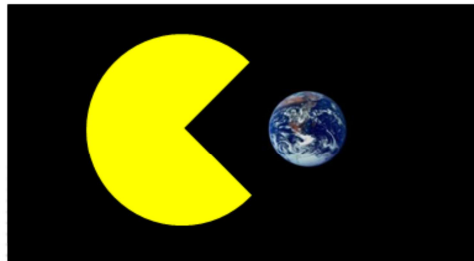


Just as games are not their surface, games have taught us to look past surfaces. They teach us to ignore the inconsequential and focus on solutions, on the essential, on what really matters. We have become editors of our confusing reality, cutting to the heart of issues more readily, because games have taught us how to sort the important from the distractions.

[illegible]

Seeing the world entire as a system that is interconnected, a game that we all play through our actions, that responds in complex ways to our actions, that is something that games have trained us in.

- > On the other hand, they also come in believing that every problem can be solved.
- > Games never give us impossible problems.
- > The real world sometimes does.



But there is a great virtue to the way that games present systems. They are always tractable. They can be solved. Games do not give us impossible problems. In fact, games that model aspects of the real world often present issues that in the real world seem impossible, and present a reduced, solvable, comprehensible version of them. This may actually be the great virtue of games, that they make us believe that we can solve even the most confusing, perplexing of issues. They are fundamentally optimistic. It may be that in our future people trained on games will solve real, large, complicated societal problems, precisely because they approached them with the mindset that it COULD be solved.

> The science of happiness tells us that games are good at the things that make people happy.

Gratitude
Using your strengths
Social connection
Generosity
Mindfulness: savoring your experiences
Striving for goals
Optimism
Don't reduce the bad - increase the good

To me one of the best things we have learned is that games truly do work to create greater happiness in the world. Science now knows more about what provides a person happiness. Happiness is hard to achieve, but we have a pretty good sense of what gives it now, based on empirical data, and you know what? It looks a lot like what games give at their best.

There are a lot worse things in the world than to make others happy. Much of art, writing, music, as been aimed at nothing more than contentment. It is a noble goal, and one that we should not be ashamed of, even if some call it frivolous.

> Game design is mind control



> It can be easy to think of this as
just business every day.

> We have a tool of immense power.

> We are makers of joy.

In the end, these are the things that I hope inspire you.

We have great power now. We are changing the world.

That games teach us to solve the impossible. That games teach us how everything is connected, and everything matters. That games teach us what really matters. As you go out and make more games, attend conferences on how to maximize your revenue, I hope that you hold those truths to your heart.

Go, and remember, that you are makers of joy.