PREFACE

Every person in the world has limitations placed upon them. Some of these are artificial boundaries, such as the regulations set in place by governing bodies. Other limits are set in a reality, such as a person that does not have functioning limbs. Beyond these examples, every person has boundaries within their mind. If asked to imagine certain scenarios, every member of a crowd could reply in a different manner. This is true because of the large number of variables that go into a person’s creative abilities.

Throughout time, stories have been hailed as a useful tool in personal development. Fiction is treated as a means of mental expansion by enhancing an individual’s creative capacity. Throughout many forms of literature the notion of stories transporting people to a faraway land is rehashed time and time again. This is done to drive home the power of stories.

Too often people are informed that the best usage of their time is to entirely focus on the practical. Much of the academics within engineering disciplines reinforce this concept. Anything that does not immediately reap a practical benefit in a tangible way should be disregarded.

Working towards an undefined perfection through practical refinement misses the mark of life’s purpose. Without the tool of imaginative arousal there is little room for innovation in science and technology. A science fiction writer might be deemed a dreamer in his time, but how many of these people laid the mental framework for work that society is doing today?

With these thoughts in mind, the central issue can now be tackled. What are the best mediums of the day for telling a great story? Movies have been around for a century and books for centuries more, but in the past half of a century a new medium has been created.

Video games quickly rose up in the eighties as a viable corporate market and their presence in the media hasn’t died since. They are a unique facet of story teller because they allow a person to
control the exact ways in which a story plays out and experience events from a first person perspective, instead of watching the events happen to someone else or reading about events that occurred already.

Due to this property that sets games apart, there are different opportunities available to game developers than those obtainable by a film maker or literary author. A major difference between a story told through a game and an experience passed down through a written work is that certain skills are required to navigate the story within the game, whereas anyone with the ability to read can understand the story within a book; because of this there is an extra sense of accomplishment in successfully completing a video game.

Having this property, providing a compelling experience that stretches the imagination while providing a user with a sense of accomplishment, makes games a great candidate for usage by people from all spectrums of functional diversity. From the average Joe, to a person with a physical disability, to an elderly woman whom resides in an assisted living facility, video games can meet the needs of people from many age groups and a range of physiological abilities.

To the average Joe a game is enjoyable for different reasons. Most importantly is the ability of games to introduce new forms of mental stimulation. This could be as simple as an interesting piece of music all the way to a type of thinking or action that isn’t yet possible in the real world. Take for example the independently developed sensation, Minecraft. By playing this game a person is literally able to forge a world that is limited only by his or her imagination. Nature bends to one’s will and the adventure never ends as the world constantly expands.

Additionally there is a raw entertainment value. People can play alone or with other people working towards a goal that is fun in at least one way. The numerous genres available also make games highly accessible. There are social games which put the gameplay focus on the people whom play all the
way to single person RPGs where a player can immerse himself or herself in a different universe and escape reality for as long as the game system stays powered up.
GAME ON

GRANTING EVERYONE ACCESS TO THE WORLD OF VIDEO GAMES

A story told through a video game is a fantastical experience to those that have the capabilities to participate in the story. Game design focuses on making an experience that is new enough to entice a gamer while providing enough familiarity to make them somewhat comfortable. However, a secondary design aspect that isn’t often given a central focus is that of making games more accessible to those that lack the abilities needed to play traditional games. This holds true for both traditionally designed software and the commonly used models for gaming hardware.

Hardware design for video games has been relatively static for the past three decades. Each console cycle brings about a barely changed control scheme that involves some variation upon the joystick and the button. During the last two decades there have been multiple variations upon this structure, but little overall structural change. This isn’t entirely an issue related to console gaming. Personal computers suffer from the same design flaw in that they are driven predominantly by a pointing device (trackball, mouse) and a keyboard.

One side effect of this trend is that consoles alienate any person whom wants to play a game on a console, but lacks the physical capability to so do. These include people that are quadriplegic, have extreme muscular dystrophy, or any other physical disability that prevents the usage of hands and/or feet. Using a traditional controller with these impediments is cumbersome at best, and it wasn’t until the latest generation of consoles that the issue is beginning to be addressed.

Starting with the Nintendo Wii, a brand new way of gaming interaction was made available to the public on a massive scale. Motion sensitive controls remove the restrictions that a user has the ability to press buttons with the hands or feet in addition to being dexterous enough to manipulate a
directional pad or joystick. Instead, any user that can provide a range of motion with any body part can look past the hardship of needing to control a joystick-like device.

Although this is a move in the right direction of abstraction away the hardware requirements to play games, the input systems still aren’t perfect. Even the Kinect for Xbox 360 requires a wide range of physical mobility in order to use the device. Hardware developers appear to be moving in a direction that abstracts away the devices needed to play so that a gamer can focus on the experience itself. This transition is akin to paper books moving towards audio books. In order to properly fit the physical needs of all potential gamers, hardware must be a minimal part of the experience a developer attempts to immerse a player into.

At the current point in time, there is an altogether separate grouping of solutions to this problem. Instead of manufacturers working to remove hand based input to gaming devices there is a movement of physically disabled people working towards hardware that better fits their needs. These solutions come as new input devices that aren’t focused on input through dexterous hands.

A less creative alternative to say, an Xbox 360 controller, is a device that bridges input between a standard controller and a device that is connected with buttons that are easier to operate and organized in a way that don’t require the normal functionality of the human hand. Easier to press buttons and switches that can be manipulated with other body parts are examples of these secondary devices. Since they lessen the barrier to current technology, these input systems are still useful, but by no means serve to create a new way for disabled people to play.

A device that does strive to achieve this design goal is a sip-puff switch. These devices work off of a user blowing into the device or sucking on the device. This small hardware change means a quadruple immediately has a means to overcome the barriers of entry into a gaming experience. An input mechanism of this type is a great leap beyond making traditional controllers “softer” so that
weaker people can use them, yet something still isn’t quite perfect with the innovation. These switches require maintenance to deal with the saliva build up and therefore build up large costs over time.

An example of a sip-puff switch

http://dsikeyboards.com/images/products/detail/MERGAC0300_01.jpg

Taking the same idea as a sip-puff switch comes the eyebrow switch. This device still enables someone with a lesser physical state to manipulate the input of a game without hands or an expensive mouth operated switch. Instead, a lightweight device is attached to an eyebrow, turning a slight muscular tightening into the button press required to send a game input. This input mechanism is also highly versatile. Conceptually, it abstracts the press away from a button. Therefore, this same input could be tied to a jaw moving or nose clenching.
A sensor kit that can be used on the eyebrows

The latter two examples show a well-designed solution to the hardware related problems created by serving physically disabled people the same gaming experience afforded to the average gamer. It is critical to include the human factors of design at all times, but especially when designing products that don’t fit the typical demographics that are targeted for those designs. By creating intelligent solutions to the hardware barriers that hold back physically impaired gamers, those potential players will be given access to the same mind expanding simulation available to the common public. However, the benefits reaped will be greater. It is one thing for a fully functional teenager to play through a 3D adventure game, but disabled people commonly treat the experience as a true portal into another world. An average person takes for granted the ability to walk without impediment, but a person who cannot use their legs gains more than the average person when given the chance to run and jump in a video game.

Opening up these life changing opportunities is not a problem that can only be solved at the hardware level. Additionally, software engineers need to both step up their designs by considering non-traditional gamers within their demographics. Mainly they can accomplish this by putting in the time to design relatively simple systems that significantly empower disabled gamers.
Someone that does have access to the aforementioned specialized input devices can run into blockades within a game itself that prevent an entertaining experience from being available. One major complaint of disabled gamers is that a game which is hailed for its great gameplay lacks a simple to build configurable input system. Most commonly, these are found in PC games. Architecturally, a configurable input system takes almost no time to implement, and is actually a good design principle before considering the benefit it provides to disabled gamers. With this simple configuration screen, a disabled gamer can re-define the buttons that are needed to perform specific actions within a game. This makes changing a conventional keyboard and mouse game layout on the PC to a non-traditional input device’s configuration a breeze. On the contrary, if this simple piece of software is left out, then the user has almost no options to overcome that hurdle.

There are means of fitting any game design into the usability requirements of a person with less than traditionally required abilities of a gamer, but a game designer has the power to build the game mechanics themselves in a way that suites disabled gamers. One style of design that is often more tuned towards a wider audience of gamer is the one-switch gameplay style. In this mode of development, an experience is built around a core input mechanic that depends on a single button being pressed. At first this might appear extremely limiting, but when factoring in the ability of a single button to also have its state measured over time this style opens up new modes of creative thinking.

An example of this is to take the traditional 2D platformer gameplay control elements. A player manipulates a protagonist by defining left and right as two separate input commands. Traditionally, these are mapped to separate buttons on a piece of hardware. Instead the control could be assigned to a single button being quickly tapped twice in succession? Another typical action is that of jumping. Rather than go with the typical approach of assigning a separate button to the command, the game could have the null state of a player as running. This means that when no buttons are pressed, the
character on screen runs in whatever direction is faced. Then, a single button press on the same button already used to control direction could be detected as jumping. Holding down that same button could be counted as the input to stop running.

With a simple redesign of the way traditional platformers are treated, disabled gamers have been given a large foothold onto the same gaming experience that can still be enjoyed by traditional gamers. Great games are often viewed as such for only innovating enough to make an idea fresh while borrowing the best concepts already well-defined within other great games. This same mentality can easily be applied to the problem of designing amazing gameplay experiences that invite normally excluded audiences without alienating the current user base.

Although the physically handicapped are by no means the only group that is often left in the dust as far as being granted the privilege of gaming, there are a large number of disabilities that can hinder possible gamers from thinking they would be able to play. Another example is that of a bling gamer. Today’s game developers put a major focus upon the graphics of a game, but games such as Abe’s Odyssey show how much more important sound is as a design component.

This game is an important example because it is known for its incredibly deep sound design. Every action within the game is mapped to a different sound effect, and these sounds are produced in stereo sound. This means that someone can listen to the game through a stereo system and detect what needs to be accomplished through trial and error by listening to the outcomes of actions taken.
Terry Garret, a blind gamer with an impressive play through of Abe’s Odyssey.


This is not a theoretical example, but the story of a boy named Terry Garrett. Terry lost his sight at age 10 but was not hindered by that disability when it came to the Oddworld games. Thanks to well-designed sound layout he is able to create “sound landmarks” and play the game to near perfection without any need to see what is happening on screen. Terry is a great example of how important a game is to people in general, but especially to someone who might be tempted to feel down on himself due to a physical disability. Rather than be held back Terry trudged forward through the games and is now on his way pursuing his dream of becoming the first blind astronaut. Did a video game alone accomplish this? Of course not, but it no doubt contributed somewhat to his imagination and provided a positive affirmation from time to time that he wasn’t all that limited when it came to enjoying the finer things in life.
The trial and error required also opens the door to another piece of soft architecture that game developers should implement for all gamers. In game design this element is known as a quick save. Quick saves provide a player the opportunity to save the game’s state at any moment during gameplay. This is critical for a physically limited gamer because they often lack the quick reflexes required to overcome a new challenge the first time through. However, this game component serves the general public as well. Demographics such as the elderly are often excluded from gaming opportunities because many games are fast paced and unforgiving when mistakes are made. Quick save systems prevent mistakes from being so damaging that a non-seasoned gamer immediately gives up hope of continuing the gameplay experience.

There is a multitude of hardware and software design decisions that will better enable traditionally overlooked gaming demographics. Although some progress is being made there is still a core focus on improving the current understanding of game design without totally restructuring the goals that set when making a game. The more developers in both realms focus on reaching new groups of gamers without blatantly ignoring the current user-base, the more creative the solutions to these problems will be.

What is known at the moment is that video gaming is here to stay and that to many people it is a highly important medium. Mike Begum has a condition known as arthrogryposis, which greatly limits his dexterity in many joints. Beyond that road bump he is also the fifth best Street Fighter IV player in Texas. He masters the game using his tongue, cheek, and chin. His viewpoint on video games is what needs to be driving the medium forward instead of profit chasing rehashes of the same game year after year. When asked about why he puts so much time into gaming he responded, “Gaming has allowed me to go farther than I ever thought I would go. Gaming has lifted me up and helped me take another look at life - it’s a positive look.”

