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‘Colossal Cave Adventure – *Hindi Mein!’*: An experimental approach to second language acquisition through computer games.

Thesis

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By

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Abstract

As the meaning of learning and knowledge changes in contemporary digital culture, students are exposed to media information that is perhaps far more compelling than knowledge found in the classroom. And as this realization sinks in with educators, the growing need for using technology for education becomes urgently felt. While several educational technologies are in practice, the relative presence of computer games in the classroom is still in its nascent stages. In order to be able to exploit the persuasive environments of games, it is essential that we identify what draws children to games in the first place. Commercial statistics might reveal the popularity of violence and other negatives much of which probably carries the burden of the cultural history of games. Colossal Cave Adventure – *Hindi Mein!* is an attempt to document the inception of computer games and their inclusion in the academic institution as learning devices and is simultaneously both a critique of contemporary disembodied classroom practices as well as cultural design paradigms within which the commercial gaming industry thrives.

Introduction

In the summer of 2005 I played Grand Theft Auto, San Andreas (GTA-SA). At the time I was researching Nash Equilibrium in Game Theory and designing decision-making games that could be used for teaching Game Theory to business students. Little did I know that simultaneously I was having one of the most profound digital immersive learning experiences of my life.

A year later, as I landed at the Los Angeles International Airport to pursue a Master's degree at the University of California, Irvine, I realized how close the developers of GTA-SA had come to recreating the experience of a city. It was only then that I also realized that the three cities that GTA-SA was made of were Los Angeles, San Francisco and Las Vegas (incidentally the first three large cities I visited in the United States). Rockstar Games, perhaps unwittingly, had created for me a cultural experience.

Now there is one thing that needs clarification here. I'm not implying that GTA-SA captured the variety of cultures in those cities or even one aspect of the culture to the fullest extent. Nor do I think any game or artificial environment can capture culture or any of its many manifestations and do justice to it. Yet something was captured, and this something caused awe to me when I was 23 years old - more than a year after the game was played. For the purpose of this discussion let me say they managed to create an experience of a city not unlike Los Angeles.

Two other experiences are worthy of mention here: World of Warcraft and CounterStrike.

a. World of Warcraft: An interesting problem I faced while I played World of Warcraft involved playing on a non-U.S. server since I was initiated by a friend who played from India on an Oceanic[1] server. Now, my playing on that server meant late nights as well as interacting with a lot of people from other cultures. As a result of this, I often had to 'group' up with people who were from one particular country and had been playing with each other for a while. This posed an interesting communication challenge for me. While 'talking' to players from Australia was a smaller challenge as one only had to figure out the local colloquial terms, communicating with players from Indonesia, Malaysia and other Asian countries was a much harder task. As often happens, at times miscommunication often caused me to take a step that turned out to be counter-productive to the objectives of the group while at other times I had a difficult time explaining an idea to the rest of the team.
   The need to advance regularly in the game made me try and grasp what was being said. Often I would guess the meaning of a word or a phrase (which was easier

[1] Oceanic Servers are servers that cater to Australia and countries on the Pacific Rim.

when assorted with some English), and at other times I would end up making a mental note of a word that was repeated several times and, later, asking someone the meaning in the common chat.
Reflection on this motivation made me think about how my desire to perform well in the game translated to my having to learn words from another language. Much later, when I had stopped playing World of Warcraft, watching someone speak on TV in one of those languages brought along the revelation that I had, unwittingly, learned a little bit of that language.

b. Counter-Strike: I played Counter-Strike for a very short span of time – maybe a couple of months. Again, my involvement in the game, which stemmed from the premise of the game being an armed conflict between two teams (called Terrorists and Counter Terrorists respectively), required that I be well-versed with the weapons available in the game as well as my role in each round of play. While the latter factor (strategy) is common to many other games, the weapons used in Counter-Strike are modeled on real weapons and are remarkably close to their real-life counterparts (add to that the fact that factors like recoil and range etc. are very carefully modeled as well).
Many days after I had stopped playing CS, I realized that I had picked up a basic knowledge about arms. Much later, I would find the game mentioned in a newspaper article about its use by the Chinese Government to train Police officers to combat terrorism[2] and realize I could follow most of the discussion about the build and training regarding arms used by the Chinese Police!

A crucial question that this raised was whether I would have learned these details as meticulously and as enthusiastically as I had done unwittingly while playing these games. While I would like to acknowledge that some of these experiences are personal and vary from person to person, there was, I felt, something to be observed in this 'hidden' learning experience I had. Viewing any of these incidents in isolation might trigger a casual dismissal of my claim but when juxtaposed against each other, they present an interesting kind of learning or motivation to learn through games. This 'hidden' learning, which I was unaware of, and which happened while I was playing the game, was perhaps significantly more compelling than learning in a classroom setting [52]. It is this 'hidden' learning that I will talk about exploiting. For the purpose of this discussion, let me define this 'hidden' or tacit learning as the learning that is not necessarily intentional or even conscious [I use the word 'intentional' to work in two ways – the original game was not made with the intention of teaching something as well as the condition that the game was not played with the intention of learning]. By claiming that the learning is not conscious I use the second implication of 'unintentional' above – in that while in the act of playing the game, the player is not always aware of the learning.

The general idea discussed in this thesis, then, is the possibility of using a mainstream game for second language learning – motivated by my own experience of learning a few words in another language 'accidently'. I had not started playing the game with the intention of learning anything

[2] http://english.peopledaily.com.cn/90001/90776/6262328.html mentions officers acknowledging that the game reflects real-world scenarios well enough to merit use in training.

let alone a new language, but it happened and I was so engaged in playing the game while it happened that I had no conscious realization that any kind of learning had taken place. Also, one can say with a fair amount of conviction that the creators of the game had not intended anyone to learn to communicate in a foreign language while playing. So part of the problem that is discussed here is supposing the creators (or modders) of a game do intend to teach something through the game, how one would go about doing that. Assuming one would start from a position of slight advantage if one chose to mod an existing popular game in terms of having as many people ultimately play the game as possible, I chose to modify Colossal Cave Adventure to suit the purpose of teaching a second language through playing a computer game.

Colossal Cave Adventure was the first game of its kind. It is a text based adventure game or interactive fiction, if you will, and it has the player exploring dangerous caves and encountering fantastic creatures in a quest to find exotic treasures. The game world is gradually worked out in the player's imagination as the only method of interaction between the game and the player is through text. It progresses when the player types in short commands in response to the scene the game builds through short descriptions. The player can perform various actions like killing something that appears dangerous, picking up various things on the way or even just exploring the game world. At every turn (every time the player responds to the game prompt), there is a description of the scene. Since it is only text that the game and player deal in, the game design offers reasonable independence from the programming perspective (compared to more graphically advanced environments where technological bottlenecks may prevent certain ideas in the game design from being realized). In this sense, then, the game world can be made huge since the game designer can include many more things that don't require elaborate graphical implemenation and there is a different kind of relationship between the game and the player and each player's spatial experience of the game world may differ depending on his/her investment and engagement with the game.

A question that arises here is whether developing text adventure games makes any sense any more considering the immense popularity of the other kinds of games which require less and less imagination (in terms of the appearance of the game world) with extensive 3-D graphics and other forms of multimedia support. The answer to that question in the commercial sense is in the negative - there is no market for text adventure games. Most such games are open source and available free on the internet. Yet, game enthusiasts still develop such games and in fact, they develop and maintain platforms which make the design of such games much easier (Inform, TDS).

One of the reasons for this might be the low investment on the part of the creator – all that is needed is an interesting storyline and some effort towards programming. Once the game world is clear in the imagination of the creator, it takes significantly less effort programming it. This is not to say that it is no work. There is a lot of work that goes in to making such a game a fun experience. However, all this can still be done by one person. So if a person has an idea that he/she wants to make into a game, it is not a task that requires a team of technologically adept people working for multiple years with large amounts of processing, graphics and database resources.

On the part of the player, these games are still fun. Having been a game enthusiast myself, my personal experience is that playing such games is an entirely different experience. One big appeal of such games is the fact that one's imagination is not limited by technological constraints

such as poor graphics or inefficient coding that cause the game to run slow. The effort in these games is distributed between the designer and the player and playing these games is an exercise in creativity. There is an effort to reflect momentarily on each of the scenes and take it in before considering one's next step. In most modern commercial games, the scenes are graphically elaborate and it is easy to miss so many things that were intended to be seen by the designer. Plus, the game is as is. The objects, the places and the creatures in the game are all 'there'. In interactive fiction, there is an interesting but short description of the surroundings and the rest is left to the player. So, if a description of a building tells me some things about the building but left other things unsaid. I imagine the rest of it. As I explore the game, I build the rest of the game world consistent with my initial impression; if it isn't mentioned what era the building was made in, and the rest of the description is absent, it is up to me to imagine a skyscraper in a modern city or a lone farmhouse in the country with a red façade or a yellow one.

As the game challenges the player's creative instincts, the player's imagination continually changes to maintain a balanced world-view. This is, as Gee explains in his book, *What Video Games Have to Teach Us about Learning and Literacy*, a preparation for imbibing new knowledge as well as laying down a framework for new information to fit in consistently with what we already know [5].

Colossal Cave is based on an actual cave within the Mammoth Cave system in Kentucky, USA [7]. After I played GTA, one of the factors that enhanced my memory of the experience was the knowledge that it was based on an actual city. Similarly, there are anecdotes from people who have both played CCA as well as have visited the actual site in Kentucky that testify the accuracy of the map in the game.[3] In my own experience, this is a factor that lends to suspension

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[3] Online at http://www.rickadams.org/adventure/b_cave.html, Mel describes how caver Bev Schwartz got her start:

"On a survey trip to Bedquilt, a member of my party mentioned she would one day like to go on a trip to Colossal Cave, where she understood the game ADVENTURE was set.

"No, I said, the game is based on Bedquilt Cave and we are going there now. Excitement!

"Throughout the cave, she kept up a constant narrative, based on her encyclopedic knowledge of the game. In the Complex Room (renamed Swiss Cheese Room in Advent) she scrambled off in a direction I had never been.

"'I just had to see Witt's End,' she said upon returning. "It was exactly as I expected."

"When we finished with our work, I let her lead out, which she did flawlessly, again because she had memorized every move in the game. Believe me, the cave is a real maze, and this was an impressive accomplishment for a first-time visitor.

"...I felt that her knowledge of the cave was so good that in February, I had her be a guide for two survey parties that had work to do in upper and lower Bedquilt, respectively.

"Rather odd directions: 'Bev, you've got to get the lower Bedquilt party to J-73. That's the Complex Junction, you know, just after the Dusty Room, as your are entering the Bedquilt Route, before the Two Pit Room. You know that north from there is the climb down to get water for the plant. That's really the KA chimney to the E-survey, which is where they are going.'"

of disbelief and a major respite to one's sub-conscious effort to work on the consistency of the framework provided. Thus, CCA had a natural advantage among the other games I was considering to use for this purpose.

The basic game-plan in terms of introducing a second language through the game was based on a slight modification of the implicit narrative: the creatures inside the cave speak a different language. As the player enters the cave, words in the second language start coming up in descriptions of the scene and as he/she goes deeper into the cave, these words start becoming more and more frequent. Starting from exchanging commands in English, the player has to gradually move towards exchanging commands in the second language. Hence, the motivation to learn the new language is camouflaged within the motivation to progress in the game.

Context and Background

Besides being a platform for learning Hindi CCA – *HM,* as an artistic endeavor, is meant to raise a number of critical issues concerning the medium of games and contemporary social and cultural practices associated with and influenced by the practice of this art form.

First and foremost, since CCA – *HM* is a game about learning, it is simultaneously an experiment in the use of a technology in the field of teaching as well as a critique of contemporary classroom practices. The thesis of my argument is that computer games have an unmet potential to assist learning in major ways. Thoughtfully designing these games can help us leverage this potential in ways that don't look like schooling (Gee, 215). [5]

In his book *What Video Games Have to Teach us about Learning and Literacy,* James Paul Gee elaborates 36 learning principles that are knowingly or otherwise built into computer games by virtue of their design. These, he elaborates with the help of personal anecdotes and interviews with gamers, are things that one doesn't necessarily notice while playing the game. Hence, learning is happening but the gamer isn't really aware at a conscious level that he or she is actually learning. Of course, there is considerable debate over whether what is learned through playing contemporary games is good or not, and the purpose of this discussion is not, at least directly, to try and resolve that issue. The purpose is to bring to attention the vast potential that games have with respect to good and effective teaching methodologies. Among the learning principles that he discusses, there are a few I would like to mention and elaborate with respect to my thesis.

Gee describes among his learning principles [5], the Intertextual Principle:

> "The learner understands texts as a family ("genre") of related texts and understands any one such text in relation to others in the family, but only after having achieved embodied understandings of some texts. Understands a group of texts as a family (genre) of texts is a large part of what helps the learner make sense of such texts. And the Intuitive Knowledge Principle that stresses the importance of intuitive or tacit knowledge that is built up through repeated practice and experience. What games provide, through their very nature, is embodied experiences for situations that we might, in some cases, encounter in real life, and in other cases are completely fantastic." (Gee, 110) [5]

Just like in real life, inside the game, the player progresses by learning to operate in a sub-domain of the game during the training. Most games have progressive levels of difficulty or at least get more and more challenging as the player gets deeper into the game. As a result, episodes earlier on in the game anyway function as training. Most games however do have some sort of mechanism to teach the fundamentals of operating within the game in the beginning.

It could, then, be useful to view the exercise of playing *Colossal Cave Adventure – Hindi Mein* as training to learn some of the fundamentals and rules of Hindi. Learning a new language is usually a challenging and frustrating task. What embedding the language in a game is doing, essentially, is facilitating the process of acquiring the new language without the stress and pressures of using it at once. Furthermore, the reward structure in games is such that making a mistake is neither always embarrassing nor always bad [5]. As the game progresses, the language gets harder and while you don't have to use Hindi to play, it is encouraged through the scoring and some artificial intelligence which creates an arrangement where evaluation exists without the social pressure. Indeed, if the game is interesting and motivating -and this applies to future efforts in this direction as well - the player might want to play it multiple times in order to get a higher maximum score, or discover new things by trying different strategies. This, in turn, brings into action the Concentrated Sample Principle (Gee, 142) [5] where Gee talks about the player being fed more fundamental signs and actions than would be the case in a real scenario. This makes them practice with these fundamental samples more and learn them well as they generally form the base on which the rest of the concepts are based.

CCA –*HM* is also a commentary on the existing schism between the classroom and the 'game'. Ever since their first appearance, computer games have existed in a sort of counter-culture (I suppose it is natural in this day when the office job metaphor brings to mind a person sitting before a computer - games provide an entertaining break from work without having to necessarily get up and go outside). Besides, with violence, warfare, gangs, high-speed cars etc. being the buzzwords in the gamers' world, there's a justified reservation about the content of mainstream computer games. Consequently, even though there has been a lot of attention given to analytical approaches to computer games in recent times, full-fledged game-related programs and game labs at universities are either completely absent or in their nascent stages.

If one looks at what exists out there in terms of 'educational' games, very few of them actually find place in the classroom and among the most prominent uses of computer games for teaching is in the area of military training. In fact, there have been a few attempts to appropriate gaming technology in areas that are considered more 'serious'. A case in point is the Serious Games Initiative that was launched in 2002 by the Woodrow Wilson International Center for Scholars with the objective of using computer game technology to address policy and management issues. A serious game, however, as defined by the Serious Games Initiative, is a simulation with the look and feel of a game, developed using game-development technologies but corresponds to non-game events or processes. As a result, while the initiative benefits in looking towards wider use of game *technology*, much is still left untouched among factors that contribute to the technology being a *game*, viz. narrative techniques, contextualization and the elements of 'fun' that games and playing, by their very definitions stand for. Again, much can be deduced by the fact that the largest users of Serious Games are the U.S. government and military and while other groups like Games for Change and Games for Health have emerged to explore other specific avenues that can be tackled with game-based technologies, the scarce presence of computer games in schools and universities is an issue that needs to be addressed; one of the implications of this thesis is to explore the possibilities of modding and appropriating existing mainstream

games to teach in classrooms. This is an area where the academy will benefit widely from collaboration with the industry.

It is also important to consider other attempts at designing games for language learning viz. Tactical Iraqi Language and culture Training (TILT) - to teach Iraqi, *A la recontre de Phillipe* - to teach French, as well as ongoing projects such as the Open Language Learning Initiative - to teach English to non-natives in America, and several others. These games have been designed expressly for the purpose of language learning.

Arguably, the most prominent amongst these has been TILT (in pictures), which is built on the Tactical Language and Culture Training System (TLCTS) [51]. TLCTS is a learning platform that helps the player quickly acquire communication skills in foreign languages and cultures and is built as a series of mission-oriented interactive lessons.

The system makes extensive use of game-technology in terms of graphics, 3-D environments and sound effects as well features such as automated speech recognition to provide feedback to the learner. It is worth noticing that the game was used by the American Army to train soldiers for their postings in Iraq.

What we also have to pay attention to is the amount of time young (and old, of course, but here we are discussing school education to start with) people are spending playing computer games. Clearly, if we believe Gee, there is already a great deal of learning taking place in this playing time. Again, what is of concern is what learning is happening. The persuasive environments of games force us to rethink current paradigms in both educational techniques and the game design industry. There is an urgent need to collaborate and take obvious advantages of what the gaming industry offers and the gaming industry needs to expand horizons and gain approval for use in schools.

As more and more people get involved in playing computer games, and as it becomes more and more acceptable culturally and socially, the onus is on the designers to pay a little attention to the content those games. I want to make it clear here that I am not advocating monitoring the content of computer games through some sort of censor or law – the last thing a gamer would advocate is to institutionalize games - but I do feel that as practitioners in this relatively new medium, we

need to constantly challenge and question our notions as well develop a critical and reflexive practice.

Then, CCA – *HM* is a critique of contemporary game design paradigms in the industry. Commercial games have always been made with the white male as the target audience in mind - a fact that is not surprising as the biggest consumers have, indeed, been white males [27]. David Leonard's essay *To the White Extreme: Conquering Athletic Space, White Manhood and Racing Virtual Reality* interrogates this bias in the industry with respect to sports games (games based on real life sports) and although he focuses on this particular genre only, his argument can well be applied to most games [27]. Of course, it is not unknown that the portrayal of colored people in contemporary games is dictated by cultural stereotypes (consider the immensely popular *Grand Theft Auto series* where the player's character has to deal with Sikh Cab drivers or Korean, Japanese or Chinese Mafia or exotic Asian prostitutes or the black gangs from the ghettos. Up until the last title in the series *Grand Theft Auto - San Andreas*, the played character has always been white and his primary goal has been to tame the other crime gangs in the city - which are dominated by non-white people.)

Leonard talks about this tendency as being a means to justifying the white reign:

> "The ideas of blackness introduced through video games reflect dominant ideologies, thereby providing sanction for the status quo, legitimacy for white supremacy and evidence for the common sense ideas of race, gender, sexuality and nation." [27]

Perhaps CCA - *HM* can be framed to have appeal for the white male's colonial sense; even though the relation might appear far-fetched at first, such notions are deeply embedded in the design of so many commercial games. In CCA – HM, this fact is highlighted by the use of the foreign language and culture. The slightly exaggerated cultural stereotypes that appear as the NPCs in the game(e.g. Native Gods appearing as demons in the cave) added to the fact that the unknown is below the ground and into a 'foreign' place, further push the player to reflect on the colonizing metaphor. Perhaps one might go so far as to mention the conversion frenzy of the religious missionaries traveling to unknown places with the motivation of redeeming the colored people from their non-believing existence. The link is far-fetched but not entirely imaginary. The natives of the cave are either friends or foes. Not even friendly is enough, they must join the cause of the attacker and help eliminate the other natives who resist. Ideally, I want the game to function in such a way that it critiques the lopsidedness in contemporary production of video games. Of course, it is an acknowledged fact that the market plays the major role here, but that makes it all the more critical that game designers take the initiative to address this negative cultural stereotyping.

Finally, and at a Meta level, the project is an effort to cause reflexive thinking and critical practice among game players - a trait almost conspicuous by its absence in the gamers' world view. With the help of cultural references, at some point while playing CCA - *HM,* the player is supposed to realize that the language being introduced is a real world language and the culture being represented actually exists. This causes one's notion of play to be interrupted. Critical reflection on the game causes questions of learning and playing to come into question; what is the meaning of learning in our society and why is it considered as opposed to playing? As a much simplistic analogy, animals learn by playing with each other. And in all probability, before we developed these rather elaborate systems of symbolic interactions, primitive man would have learned through playing. And what are the paradigms within which we operate? Why is there such a separation between learning and playing? Isn't one related to and even part of the other?

It is critical that today's players, who are most likely to be tomorrow's designers, develop this reflexive game play strategy.

Media Arts Influences

While there is a large number of artworks that deal in language on the level of text, there are a few that indirectly bring up some of the issues discussed earlier. Here we look at some work that has addressed issues of nation, culture, multiplicity while keeping language at the core of the interaction.

In Warren Sacks' *Agonistics – A Language Game* (2004) [36], players post to one or more online public discussions using email programs and their posts are translated into graphical displays. The system then translates and 'understands' their message and depending on their content, positions them on a circle. The goal is to move into the center of the circle which happens when the player wins points by indicating that he/she has read the other people's posts. Hence to move to the center, one has to either reply to a message or cite a message posted by another player. This translates into getting into a dialogue with as many players as possible.
Sacks cites Lakoff and Johnson's *Metaphors We Live By* [28] to explain how the argument is a metaphor for war in today's culture – we 'defend' our viewpoints and 'attack' others'. We use tactics and strategies and gain or lose ground. We can be 'on target' or 'off' in our criticisms. When considered in the context of multiplicity and different languages and culture, the concept of the 'other' comes up and how our perspectives are 'right' within our own value systems. Yet, the same can be applied to other perspectives operating within other systems. This is crucial to consider in the context of today's computer games where an overwhelming majority of mainstream commercial games pit the idea of the self against the other. Across genres, the main idea is to win or 'overpower' rather than to collaborate[4]. Sacks calls on the audience to conceptualize Lakoff and Johnson's idea of a society where arguments are 'collaborative dances' rather than verbal warfare – the idea of a cooperative discussion, where parties are not hostile but constructively adversarial [36].

Ben Fry's *Valence* (1999) [34] is a project exploring visualizations of large sets of information. The software reads a large body of text in a linear fashion, dynamically assigning a position in 3-dimensional space to every word. The frequency of a word determines its position on the space – more frequent words are places outside for easy access while words at the center are the less common words. This causes a kind of crowding in the center. If two words are found adjacent in the text, they move closer as a result of mutual attraction.
This is a sophisticated idea of representation of knowledge, which, in a visual sense, is a representation almost opposite of *Agonistics*, where the players representing the most number of views move towards the center. However, the idea of contextualization from a quantitative frame of reference is similar to the idea of contextualization of unknown words in CCA – *HM* from a cultural frame of reference. In CCA – *HM,* a kind of visualization of information occurs when the player encounters new words and references in a language. Through the actions and events in the game, then, this new information is structured into an understanding of the new language. This is also linked to the key idea of navigation. In fact, this is a critical feature of this genre of text adventure games - the concept of navigation through text. Location, in fact, is a key idea of the genre and is the basic foundation of developing an interactive fiction. In Colossal

[4] In games like World of Warcraft, the idea of the self can be framed as one of a community or a faction against the other. Hence collaboration is within the construct of the 'self'.

Cave Adventure – *Hindi Mein!* we are performing another kind of navigation – one through meaning. Metaphorically, then, a parallel can be drawn between the two. What we conjure in our imagination through the messages that we get in every turn of the game is a geographical map meaning where words are continually mapped with respect to other words as the knowledge flows in. While we assign mental images to the descriptions of various locations in the game, we also possibly assign words in our own language (which are, in turn, mapped with ideas) to the words in Hindi that we come across. This is a key strategy of learning which translates into navigation in the context of the game.

CCA – *HM* also draws inspiration from the *On Translation: The Internet Project* (1996) by Antoni Muntadas which focused on various forms of international communication, translation and interpretation [35]. Highlighting the role of the translator, the project had its conceptual foundation in the children's game *Chinese Whispers*, communication networks (the internet) and the translation process. An English sentence was first sent to a Japanese station, translated into Japanese and then sent to a German station for translation of the Japanese sentence to German. This process was repeated at twenty different international sites after which the circle is closed with a translation of the 'travelling' sentence back to English. As the web interface, there is a spiral different points of which represent different languages and the current state of the sentence. The idea was to make the translation central to the work because of the changes in meaning that occur with translations. Different cultures interpret the same things differently and invest some of their meanings into their translations. This issue, of cultural multiplicity, is also central to CCA – *HM*. While *On Translation* highlights how people translate the values of their nations, CCA – *HM* focuses on the dialogue between two languages/cultures. As the player learns the second language immersed in an environment representing the second culture, the differences are realized and the player accommodates the second culture broadening his/her own frame of reference – the issue central to the game.

Finally, a major source of inspiration and indirect influence has been James Joyce's writing. In both *Finnegan's Wake* as well as *Ulysses*, there is a remarkable depiction of the conflicts of various cultures. Through language, Joyce negotiates between Eastern and Western philosophy and culture depicting the protagonist's constant struggle with the 'other'. Through his stream-of-consciousness style, he questions established norms in language and the larger effects they have on our cultural identities.

Language learning through the Game

For whatever reasons one chooses to go about it, learning a second language can be a challenging and frustrating experience; yet it is not uncommon. This game is an attempt to 'camouflage' the learning so as not to present the learning as an academic task - instead motivate the player through game-play; while having a foundation in academic research in the area. One of the objectives of this project is to understand learning models associated with language acquisition and employ them in the development of the game. This is also Gee's major critique of existing educational games - that they lack substantial research of the learning models and principles concerning those fields. Indeed, it is intuitive and generally accepted that an understanding of second language acquisition theory can help instruction (Fillmore & Snow, 2002; Hamayan, 1990). [30] [41] [42]

While there is extensive research in the field of second language learning, it is Stephen Krashen's research that most motivates and justifies the project. In this section we review some of the basics of his idea of second language acquisition and then explain how it applies to this thesis. We also streamline theoretically the idea of language acquisition through the game and what stage of learning it is meant to target (It has been stressed earlier in the thesis that such a game is not claimed to be the ultimate application of this research which could teach a language in its entirety; it is merely an attempt at exploring the horizons of computer game technology for pedagogical purposes).

First, it is essential to differentiate between learning and acquisition - thus far we've used the two terms interchangeably. Krashen explains that a second language is 'picked up' or acquired in much the same way as the first language - by using it. Learning, on the other hand, is a more conscious effort e.g. formal instruction. Such formal instruction is helpful, but not essential to acquiring a second language. This in fact is Krashen's Acquisition-Learning Hypothesis. [11]

Krashen's theory of acquisition consists of five main hypotheses [37]:

The Acquisition-Learning distinction is the most fundamental of all the hypotheses in Krashen's theory and the most widely known among linguists and language practitioners. According to Krashen there are two independent systems of second language performance: 'the acquired system' and 'the learned system'. The 'acquired system' or 'acquisition' is the product of a subconscious process very similar to the process children undergo when they acquire their first language. It requires meaningful interaction in the target language - natural communication - in which speakers are concentrated not in the form of their utterances, but in the communicative act. The acquistion-learning disctinction hypothesis also claims that adults do not lose the ability to acquire languages the way that children do.

The 'learned system' or 'learning' is the product of formal instruction and it comprises a conscious process which results in conscious knowledge 'about' the language, for example

knowledge of grammar rules. According to Krashen 'learning' is less important than 'acquisition'. [11]

The Monitor hypothesis explains the relationship between acquisition and learning and defines the influence of the latter on the former. The monitoring function is the practical result of the learned grammar. According to Krashen, the acquisition system is the utterance initiator, while the learning system performs the role of the 'monitor' or the 'editor'. The 'monitor' acts in a planning, editing and correcting function when three specific conditions are met: that is, the second language learner has sufficient time at his/her disposal, he/she focuses on form or thinks about correctness, and he/she knows the rule.

It appears that the role of conscious learning is somewhat limited in second language performance. According to Krashen, the role of the monitor is - or should be - minor, being used only to correct deviations from 'normal' speech and to give speech a more 'polished' appearance.

Krashen also suggests that there is individual variation among language learners with regard to 'monitor' use. He distinguishes those learners that use the 'monitor' all the time (over-users); those learners who have not learned or who prefer not to use their conscious knowledge (under-users); and those learners that use the 'monitor' appropriately (optimal users). An evaluation of the person's psychological profile can help to determine to what group they belong. Usually extroverts are under-users, while introverts and perfectionists are over-users. Lack of self-confidence is frequently related to the over-use of the 'monitor'.

The Natural Order hypothesis is based on research findings (Dulay & Burt, 1974; Fathman, 1975; Makino, 1980 cited in Krashen, 1987) [43] [44] [45] which suggested that the acquisition of grammatical structures follows a 'natural order' which is predictable. For a given language, some grammatical structures tend to be acquired early while others late. This order seemed to be independent of the learners' age, L1 background, conditions of exposure, and although the agreement between individual acquirers was not always 100% in the studies, there were statistically significant similarities that reinforced the existence of a Natural Order of language acquisition. Krashen however points out that the implication of the natural order hypothesis is not that a language program syllabus should be based on the order found in the studies. In fact, he rejects grammatical sequencing when the goal is language acquisition [11].

The Input hypothesis is Krashen's attempt to explain how the learner acquires a second language. In other words, this hypothesis is Krashen's explanation of how second language acquisition takes place. So, the Input hypothesis is only concerned with 'acquisition', not 'learning'. According to this hypothesis, the learner improves and progresses along the 'natural order' when he/she receives second language 'input' that is one step beyond his/her current stage of linguistic competence. For example, if a learner is at a stage 'i', then acquisition takes place when he/she is exposed to 'Comprehensible Input' that belongs to level 'i + 1'. Since not all of the learners can be at the same level of linguistic competence at the same time, Krashen suggests that *natural communicative input* is the key to designing a syllabus, ensuring in this way that each learner will receive some 'i + 1' input that is appropriate for his/her current stage of linguistic competence.

Although Krashen's 'input' model was initially developed to apply to oral interaction, in his book, The Power of Reading, he extends it to reading as well, promoting 'Free Voluntary Reading' as a powerful tool for language acquisition. Free Voluntary reading happens when the material is self-selected and the environment is comfortable to support reading. Both of these are assumptions that we are working on in a game environment. Since the game is being played primarily for pleasure, the material read in-game is seen in that context of light reading. [49]

A slightly different argument applies to the justification of the way the player produces language by typing out the commands (writing). Although writing is a self-conscious process and monitors are at work during writing, there is sufficient reason to believe that the overuse of these monitors would be prevented by certain factors. Lourdes Ortega researched computer mediated interaction between L2 learners in a computer assisted classroom discussion and her research reveals a key advantage of computer-assisted second language discussions between students viz. the learners are able to contribute as much as they are comfortable with at their own pace. This is advantageous to the shy students who would normally be apprehensive of evaluation by interlocutors – hence increases their willingness to participate. There are some similarities to the interaction proposed by our game and Ortega's method in particular the learner is not concerned with issues of pronunciation and evaluation in L2 and that wait time is not a crucial issue in the production. Hence it is our assumption that these advantages would apply to the interaction in the game as well.

Finally, the fifth hypothesis, the Affective Filter hypothesis, embodies Krashen's view that a number of 'affective variables' play a facilitative, but non-causal, role in second language acquisition. These variables include: motivation, self-confidence and anxiety. Krashen claims that learners with high motivation, self-confidence, a good self-image, and a low level of anxiety are better equipped for success in second language acquisition. Low motivation, low self-esteem, and debilitating anxiety can combine to 'raise' the affective filter and form a 'mental block' that prevents comprehensible input from being used for acquisition. In other words, when the filter is 'up' it impedes language acquisition. On the other hand, positive affect is necessary, but not sufficient on its own, for acquisition to take place. [37]

From the perspective of the acquisition-learning hypothesis, the game can be viewed as one supporting 'tacit' acquisition over 'explicit' learning. This statement is in a way misleading because ultimately the purpose of the game is to help 'teach' a second language. However, there is a subtle point to note here: the language learning is embedded in the game-play but it is not a task of the kind one might get as an assignment in school. It is not our aim to make an 'educational' game - as stressed earlier - but to experiment with embedded knowledge in games that could likely be mainstream games that are played solely for the fun aspect.
Therefore, the idea is to design an environment where the focus is on 'the meaningful interaction in the target language - natural communication - in which speakers are concentrated not in the form of their utterances, but in the communicative act.' (Functional practice correlated with proficiency (Oxford, 1986). [46]

> *"Acquisition requires meaningful interaction in the target language - natural communication - in which speakers are concerned not with the form of their utterances but with the messages they are conveying and understanding." (Krashen)* [11]

The player does not *have* to use the target language, although it is encouraged but messages must be exchanged. The objective is to make the signs and symbols of the target language more meaningful with embodied experiences. Hence the player comes across the language being spoken in the cave in different contexts and learns as the game progresses much as one would remember a particular strategy in another game or perhaps even a set of codes. Learning the target language *by heart* is not at the core of the project but if it happens as a part of the game (say, in order to end with a higher score), then that is acceptable. Ultimately, if we go by Krashen's contention that 'learning' is less important than 'acquisition' then this is a reasonable approach to be offered.

The Input hypothesis is applied (although its effectiveness can be questioned) through the scoring in the game. As the player gets deeper and deeper in the cave, we introduce slightly more difficult words and structures to be decoded. Ideally, this would be done by taking feedback from the player but CCA - *HM* is a small game and game mechanics dictate that a player revisit many locations in the game so what happens consequently is that the language levels are associated with the locations rather than the player's level. Hence for the first time the language level rises uniformly but at successive visits to the same locations there is repetition. This is, however, a technical flaw in this game and once noted, can be kept in mind in later designs so as to implement this idea more effectively. At any rate, this attempt could serve as a prototype to guide further attempts at similar games.

Finally and perhaps most importantly, is the application of the Affective Filter hypothesis. Affective factors play an important role in systematic variation. For example, learners in a stressful situation (such as a formal exam) may exhibit much less target-like forms than they would in a comfortable setting. In the context of learning the language, this is perhaps the biggest appeal of a game-play environment.

> *"The best methods are therefore those that supply 'comprehensible input' in low anxiety situations, containing messages that students really want to hear. These methods do not force early production in the second language, but allow students to produce when they are 'ready', recognizing that improvement comes from supplying communicative and comprehensible input, and not from forcing and correcting production." (Krashen)* [11]

There is disguised motivation to progress in the game and this can be made to mean progress in the language - the messages are ones that a player wants to hear. There is no forceful production, but it is encouraged. Again, social factors are much less active here and anxiety with respect to performance or evaluation is reduced to a minimum.

One area that can be improved significantly is the choice of the input. Nation (1978) reviews various studies which indicate that about 98% of the words in running text should be previously known in order for extensive reading to be effective [47]. In accordance with this, we choose a set of common Hindi words that are used in everyday speech and substitute the corresponding English words with these Hindi words. Many of these words refer to actions and objects that are

repeated several times in the game. At a later stage, simple sentence construction is introduced with the length of sentences completely in Hindi not greater than 3 or 4 words.

> *"What kind of input is optimal for acquisition? The best input is comprehensible, which sometimes means that it needs to be slower and more carefully articulated, using common vocabulary, less slang, and shorter sentences. Optimal input is interesting and/or relevant and allows the acquirer to focus on the meaning of the message and not on the form of the message. Optimal input is not grammatically sequenced, and a grammatical syllabus should not be used in the language classroom, in part because all students will not be at exactly the same level and because each structure is often only introduced once before moving on to something else. Finally, optimal input must focus on quantity, although most language teachers have to date seriously underestimated how much comprehensible input is actually needed for an acquirer to progress."(Krashen)*

A more systematic approach to the choice of words and sentences based on research is a next step.

A great deal of research has also taken place on input enhancement, the ways in which input may be altered so as to direct learners' attention to linguistically important areas. In terms of reading input enhancement might include bold-faced vocabulary words or marginal glosses in a reading text. Hence, Hindi words appear in italics in the text.

From the larger view of second language acquisition, language learning takes place in a continuum - sequential stages that mark the increase in level of the language learner. While the later stages call for a more involved participation and production, the first two stages are the Silent/Receptive or Preproduction Stage and the the Early Production Stage. These occur before the speech emergence stage up to which the learner has picked up a vocabulary of around 3000 words and can use short phrases and simple sentences to communicate. Though the speed of learning usually varies from person to person, it usually takes from a couple of months to a year to reach this third stage.

In the Silent stage, the learner is receptive to about 500 words (which he/she might not still be comfortable using) but is likely to not start speaking. In a kind of bootstrapping strategy, the learner is still 'preparing' to use the second language. During this stage users respond by understanding simple commands relating to actions and a few gestures.
The early production stage is marked by an increase in vocabulary (to about 1000 words) as well as some production, speech in one or two words and some understanding of new material by responding to yes/no, what/where and similar questions. [11]
Our target, therefore are the first two stages.

The goal of the above research is therefore to justify theoretically the intuition that games are a good platform to facilitate language learning. In the previous section, we used Gee's learning principles to explain how learning takes place in the process of playing the game. In this section, we explained how certain kinds of games can functions as platforms for language learning specifically.

"*What theory implies, quite simply, is that language acquisition, first or second, occurs when comprehension of real messages occurs, and when the acquirer is not 'on the defensive'... Language acquisition does not require extensive use of conscious grammatical rules, and does not require tedious drill. It does not occur overnight, however. Real language acquisition develops slowly, and speaking skills emerge significantly later than listening skills, even when conditions are perfect. The best methods are therefore those that supply 'comprehensible input' in low anxiety situations, containing messages that students really want to hear. These methods do not force early production in the second language, but allow students to produce when they are 'ready', recognizing that improvement comes from supplying communicative and comprehensible input, and not from forcing and correcting production*." (6-7, Krashen) [11]

Game Design for Language Learning Game

Colossal Cave Adventure (CCA) was chosen for multiple reasons. Being a text based game the primary token of exchange of information is language. A construct somewhere between individual words and sentences is the feedback from the player to the game. Since the purpose of the game is to provide a language learning environment, repetitive manipulation of language is the intuitive means of interaction and if that were to be immersed in a narrative based on the culture being represented, the combination seems a reasonable choice for the purpose.

Winn (2002) has characterized the history of educational technology in terms of four ages – the age of instruction, the age of message design, the age of simulations and the age of learning environments which is the current age [24]. Dickey (2006) attributes this to the concurrent epistemological shift in paradigms of learning from objectivism to constructivism – supporting the idea that learning is initiated and directed by the learner [2]. This is indeed central to our approach of designing a game environment for learning language.
Dickey invokes the medium of computer and video games because they offer the learner more control in the learning process – an active role in problem solving and decision making within the context of the game. He characterizes adventure games as problem-solving environments, where players must 'synthesize diverse information and analyze strategies.

> *Within the adventure game genre, narrative provides two main functions: both motivation and a cognitive framework for problem solving. Narrative has been found to aid in comprehension (Laurillard, 1998) as well as serving as a tool for navigation in multimedia environments (McLellan, 1993).* [13] [17]

The narrative supporting CCA is specific yet open-ended enough for modifications. An adventurer in a cave will almost definitely have an experience different from one on the surface of the earth but ways in which it can be different can vary. One can have an entirely fantastic experience meeting monsters and demons, or a more realistic experience with nature encountering snakes and bears. In one particular Indian myth, when people die their souls might have to spend some time in the underworld or *Patal* which is literally below the surface of the earth. A natural structure like a cave is likely to have mention in most cultures, yet what is in a cave is unknown and possibly dangerous. This leaves a lot of room for story-telling. The structure of CCA can be appropriated to design a narrative around any culture taking from its mythology the nature of the narrative.

> *Gee's (2003) discussion of literacy and popular games also emphasized the value of fantasy and role playing in fostering multimodal literacy. According to Gee, popular games support problem solving by allowing players to become embodied in the game-play experience. As players move through fantasy or imagined worlds, they encounter situations and obstacles that require them to actively and critically reflect and solve problems. The multimodal environments of games provide embodied experiences in which players take on new roles and identities while managing complex multiple sign systems (semiotic domains) (Gee).* [5]

A major motivation for the choice of CCA was the logistics involved in making a game. The production of a commercial game today typically involves a fair number of programmers, graphic artists and writers. The cost of production can go into millions of dollars. True, in some cases, extensive graphic capabilities lend an aspect of realism to the final product and facilitate suspension of disbelief but there is increasingly lesser room for innovation with paradigms being defined more and more rigidly. Jerz (2007) summarizes the benefits of interactive fiction for the design of a narrative based context specific game. [7]

> *"Because interactive fiction authors can draw on an existing body of narrative techniques, as well as emergent code-based interaction techniques, the medium (free from the corporate pressures associated with team-based development) is well-suited to individual experimentation and innovation."* [7]

An important point to be clarified at this point is the objective of the entire exercise. It is not my claim that language in all its richness can be learned from playing a game. It is also not my claim that an entire cultural history of a civilization can be captured in one game. In fact, I believe that it is impossible to capture even one aspect of culture in all its variety in a series of games. Just to make the problem harder, the critical period hypothesis claims that native competence cannot be achieved in a second language if the language is learned after a certain age. On the contrary, if the problem is achieving 'the ability to communicate with native speakers of the target language'; it is my thesis that a game environment is a valid learning platform.

Colossal Cave Adventure:

History

Colossal Cave Adventure was the first computer game of its kind – the first text adventure or 'interactive fiction' game. It was first created by William Crowther in 1975-76 after his divorce with his wife Pat. Both Pat and William had been working for Bolt, Beranek and Newman in Boston in the development of the ARPANET, the predecessor of the internet.
Crowther and his wife were ardent cavers. In their spare time they had explored and mapped portions of the Mammoth and Flint Range cave systems in Kentucky for the Cave Research Foundation [31]. Rick Adams provides a history of the game on his homepage.

> *Crowther was known as a meticulous cave surveyor. He had a ASR33 Teletype set up in his living room, connected remotely to a computer at work, that he and several friends used to input cave survey data. His wife Pat wrote a program that would read this data and plot maps of the cave being surveyed.* [31]

Following his divorce, after the caving had stopped, Crowther decided to recreate his experiences of caving in a game that could be played by his daughters (who he was now estranged from). He wrote the original CCA introducing fantasy role-playing based on his maps

of portions of Mammoth Cave. His daughters enjoyed the game, shared it with friends and it passed from friend to friend in those early days of the internet.

Later that year, at Stanford University's Artificial Intelligence Lab, Don Woods found a copy of the game on one of the university computers. He contacted Crowther by sending an email to crowther@sitename where sitename was every computer then on the internet. To his surprise, he got a reply and Crowther's blessings to expand the game. [31]

For the most part, it is Don Woods's version of CCA that is known today. Woods, a Tolkien fan, introduced elves, a troll and other fantasy elements. Later the game was ported to C for UNIX platforms (the original was written in FORTRAN for a Digital Equipment Corporation PDP-10 machine). Other versions were made with more puzzles, different points systems and other extra features but it was Woods modification of Crowther's code that is considered the original Colossal Cave Adventure.

The history of Colossal Cave adventure is important not only because it was one of the first games and the first of its kind but because of its significance to Gaming culture as we know it today.

Open source and spread through the internet:

Crowther wrote Adventure with two primary objectives – to recreate his experience of the caves enriching it with his fantasy role-playing and to make a game which his daughters could enjoy. Indeed, aside of financial reasons, these reasons still carry weight. The emotion is appropriately expressed by Jerz (2007):

> *"Adventure" was written for fun and shared for free; it was the cultural product of an educated, puzzle-loving, and fundamentally altruistic geek culture.*

Further, he also captures the significance of the fact that CCA was left open to modification and when Woods contacted Crowther for his permission to modify the game, he immediately gave his consent:

> *Writing of the game modding community, Au (2002) observed that mods (amateur variations upon and expansions for commercial products) "represent the most visible success of the free software movement on the larger culture. For the millions who play computer games, the same ethos of volunteerism and shared ownership that characterizes free software has helped utterly transform the gaming experience and the $8 billion-plus gaming industry.* (Jerz, 2007) [1] [7]

Addictive:

One of the characteristics of computer games, and indeed games of any kind, is their addictive nature in that a relatively larger percentage of those who are considered serious gamers spend significant amounts of time playing. The impact of CCA when it was discovered is something the gaming community would immediately recognize and identify with. It spread rapidly through college campuses (university laboratories with computer infrastructures) and workplaces and people were hooked to their computers. Some websites recounting the experiences of those who were among the first to play

CCA (relying, of course, mostly on memory and urban legends) reminisce how the game affected their lives:

> "*The game spread like wildfire across the Internet, inspiring such obsessive efforts to solve the game that it is rumored numerous college seniors did not graduate that year as a result.*" [31]

The game also found popularity among those working in the computer industry.

> *"The entire computer industry was set back by a week."* [31]

The urge to continue playing the game, the race to be first to know all the secrets hidden in the game and the fight to finish with the highest score are all representative of the gaming community and is, after all, one of its charms.

Game Culture folklore:
There is lots of interesting trivia associated with the game-play of CCA. (XYZZY, Maze of Twisty Little Passages, Plugh)[5]. In my opinion, this trivia is important in more than one way. While it creates a feeling of richness in the culture, it also sets a platform for the culture to further expand. Indeed, the element of *fun* associated with playing games and computer games in particular, resonates in such allusions in other games or even different media. As people of the generation of CCA preserved the memory of their era by leaving trivia 'scribbled on the walls', so do the creators who, instead of erasing this, carry it forward and propagate and strengthen the cultural bonds between the player and the experience of playing.

The Game

Colossal cave adventure begins with the following message:

> *You are standing at the end of a road before a small brick building. Around you is a forest. A small stream flows out of the building and down a gully.*[6]

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[5] These are some of the phrases that were used in CCA as secret words, descriptions or hints. They were later used in some other games and sometimes in software codes for applications other than games by those who had played the original game. It was mostly a humorous reference or an inside joke. For references of usage in other games and software, see Appendix.

[6] Different versions have more than just this message. For example, one version, presumably written by Jim Gillogly who ported the game to C for UNIX, starts with "Somewhere nearby is Colossal Cave, where others have found fortunes in treasure and gold, though it is rumored that some who enter are never seen again. Magic is said to work in the cave. I will be your eyes and hands. Direct me with commands of 1 or 2 words. I should warn you that I look at only the first five letters of each word, so you'll have to enter "northeast" as "ne" to distinguish it from "north". (Should you get stuck, type "help" for some general hints. For information on how to end your

The game is set in a cave which the player is supposed to enter with a set of keys that unlock the grate. The keys are available to the player as the game starts. Interaction with the game is through the keyboard by writing commands based on information provided by the game at every step. For example, right in the beginning of the game, after the initial message mentioned above, the game waits for a response from the player. You can type a direction (e.g. *N* or *north* or other variations of the word) or actions (*go in* or *enter building*)[7].
After performing an action the game returns with feedback and the next state reached as a consequence of that action. At key points in the game, the player's score is affected.
At various stages in the game, the player encounters different kinds of items – some of them useful at later stages and some absolutely necessary. There are also treasures like gold and silver nuggets, jewelry and diamonds that are found lying around the cave.
There is no definitive highest score/fewest moves solution to the game since a lot depends on the random appearance of the Pirate and the dwarves. The Pirate, appearing randomly, steals one's treasures. Dwarves may appear from time to time - the first one throwing an axe at the player and missing. The player must pick up the axe and keep it for protection against the rest of the dwarves.
The game works on a two-word parser that takes textual input and performs actions accordingly.

Modifying CCA:

The purpose of this game design is to modify Colossal Cave Adventure for language learning. This can be done by a combination of the modifications listed below.

- *Narrative*

  There is already a narrative framework available to us in CCA. What we need to do is expand the existing framework to make plausible the use of Hindi and justify and contextualize the use of certain characters as Non Playing Characters. Modification – Cave dwellers are different from earth people. They speak a different language and behave differently (this is almost justified by the behavior of the elves, dwarves etc.) Since it's always dark in the cave it is possible for a human adventurer not to arouse any suspicion if he/she can adapt to the cave. The farther the player can go unnoticed, the better it is for his/her safety and the safety of the guide. However, if noticed, he/she must kill as soon as possible and return to the pretence. Directions have been scribbled inside the cave by the dwellers for their convenience but as one goes deeper the language of the directions gets more

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adventure, etc., type "info".)
- - -

[7] In the original version, the game recognizes some variations (e.g. *"go in")* while rejecting others *(e.g. "enter building")* replying with messages such as "*You can't do that"* or *"I do not recognize that action".* Later versions have rectified much of this problem by recognizing several different variations of commands.

and more pure. In order to continue unharmed, the adventurer must keep up with the language and write down words (Inventory) or phrases that might come in handy. It is also possible for the player to ask the NPC who is with him at the time but asking too much is not advised for fear of disrupting the silence of the cave. Consulting the Inventory is permissible also but it is advised not to do it too often because using the Inventory wears out more and more battery power as one goes deeper in the cave. Batteries are available to the player but he must return to the vending machine time and again to do that – which is again not in the best interest of the progress.[8]
During the adventure, the player will encounter several fantasy creatures and depending on what kind of a creature it is, the player must befriend it, chase it away or kill it. Classification of these creatures will be a simple three class structure: benevolent, malevolent or neutral. It is intended to allow the player to kill the benevolent and neutral creatures at will, too, but the player must know that killing a benevolent creature may cause the death of a critically important NPC who could guide the player through a particular quest.

- *Non Playing Characters*

One of the hindrances in the game-play of CCA is the interaction between the player and the game. This causes effects at two levels - the present structure of the game functions on commands from the player and works with a two-word parser. These two word commands required for every action are often not extensively coded. As explained earlier, '*enter building'* is not a valid substitute for '*go in'* or '*pick keys'* doesn't work while *'take keys'* does. This limits the game-play somewhat.
The other way in which game-play is affected is the lack of direction that the player faces once inside the cave. Even at the beginning there is no mention of a cave nearby – the player has to exit the building, follow a stream in the surrounding forest and go downstream until the cave is reached. Once inside the cave, lack of a defined quest structure or even a narrative can leave the player confused about progress in the game. Perhaps because Crowther was a caver himself and he was making the game for his daughters, he didn't think it was necessary to provide a background for the new player. This combined with the fact that the entire game was a casual exercise for him – in the sense that he didn't really imagine it becoming the famous game it is now.
One way in which this can be improved or at least experimented with is by introducing **Non Playing Characters**. Since the player already receives messages from some entity and is guided loosely through the game, these NPCs can take up the role of the guides. An NPC structure can lay the foundation of a story around which the game is based and provide clues and information as the narrative progresses. The NPC will present the next step to the player in the form of a **quest** and might act as a guide through the quest or leave the player alone.

[8] In terms of the Game-play structure, too much use of the Inventory function may result in a loss of points.

> *Because narrative typically plays a more important role in adventure games than other genres for instance first-person shooters, sports-based games and racing games, they offer designers more space to exploit the game-play space to design quests and missions around a central task – the player must solve these missions and quests in order to advance the plot (Dickey, 2006).* [2]

Since the primary objective of modifying the game is the appropriation of a game environment to a language learning platform, and the second language being used is **Hindi**, these NPCs can be characters from Hindu mythology or Indian history. Interaction with NPCs based on well-known mythological characters provides context as players exchange messages with Hindi-speaking entities rather than just an unknown something in the game and could be an effective device in producing an immersive experience.

> *The context and setting in the form of backstory establish boundaries of what is plausible. It is during the backstory that the physical, temporal, environmental, emotional, and ethical dimensions of the game are established. The physical dimensions are the physical boundaries of the game-play environment. The temporal dimensions are aspects of time and timing. The environmental dimensions define the characteristics of the game, such as fantasy or realism, as well as the historical and/or geographical setting (Rollings & Adams, 2003)* .[20]

Regarding the choice of NPCs - in the particular case of this game, which is based in fantasy, mythological characters from Hindu mythology, which is rich with legends and fables and fantastical creatures, might be appropriate.

Vogler (1998) provides a guide for the nature and behavior of roles in a typical adventure game setting by invoking Jung's archetypes (which he also argues are part of our collective unconscious – and thus, sought by us). These are (a) hero, (b) mentor, (c) threshold guardian, (d) herald, (e) shapeshifter, (f) shadow and (g) trickster. However, he mentions that these shouldn't be considered as fixed roles, 'but rather as a "function performed temporarily by characters to achieve certain effects in a story".' [23]
There are numerous examples of characters based on such archetypes in ancient Hindu mythology. If one was to include non-Hindu Indian mythology, the options would be endless. One way to tie this together would be to pick a single story or event and use characters that figure in that story alone although this would introduce lesser known characters. Another possibility is to loosen the story a little filling it with other well-known characters based on designer's imagination. The latter choice has been preferred because it provides a more independent story structure.

- *Embedded Language Learning*

  Crowther's original intent was that the deeper one went in the cave, the more fantasy would appear. In terms of the modified game as well, this would hold, and would be reinstated by the language of the scribbled directions in the cave getting progressively tougher.
  At some points, the player might have to pretend to be a native of the cave. This would require a test of the language to be learned.
  A feedback system – using the scoring system of the original game can be used to gauge the player's current level in the game (roughly translated – the level of his /her Hindi). This would provide feedback to the game to provide appropriate NPC help. Based on this, the NPC would supply information just a level harder than what is the player's current level.

  Based on Dickey's observation -

  > *The narrative story line in adventure games provides an environment in which players can identify and construct causal patterns that integrate what is known (backstory, environment, rules, etc.) with that which is conjectural yet plausible within the context of the story.*(Dickey, 2006) [2]

  It seems to be a plausible strategy. Since it is established between the player and the game in the beginning that cave-dwellers speak a different language and that the deeper one goes, the less contact with the world above remains, it seems only fair that the language problems offered to him get progressively tougher.

  There are two resources that the player can consult for help during the game – an inventory (of words) called the *dictionary* and help from an NPC. The inventory contains words that the character has learned (and the player has encountered) in the course of the game. It can be consulted by a simple command followed by the word in question and the reply will be the translation of the word in Hindi. The other resource is the help of the NPC. When a player encounters a new word, phrase or sentence, the NPC translates it for him. Since the NPCs encountered during the course of the game have spent increasing amounts of time under the cave, this strategy exploits a plausible means of contextualization.

Sample scenario of interaction in modified game:

You are standing at the end of the road before a small brick building. Around you is a forest. A small stream flows out of the building and down a gully.
>enter
You are inside a building, a well house for a large spring.

An old bearded sage sits meditating in a corner of the hall. It is well known that he helps people get to the cave you are looking for. It is also rumored that he is immortal but his immortality boon is ineffective in the underground.
>kill sage
You cannot do that! He is immortal.
>fuck sage
Real adventurers do not use such language. [9]
>approach sage
You walk up to the sage. He opens his eyes before you can talk.
“Hello, traveler, are you here looking for a cave? I’ll help you get there but be warned, no one has returned from the cave! Here, here is a key to the cave. To use it you must say *chabi* and it will open most locks. There is also some food, a bottle and a shiny brass lamp for it is dark in the cave in the adjoining room.”
The sage summons a young boy to whom he talks in a different language. You hear the words *botal*, *bhojan* and *diya*.
The young boy fetches a bottle, some food and a brass lamp.
“Go with him, traveler, he will guide you to the entrance of the cave. Fill some water on your way from the stream for it will come in handy. I rescued this boy from the cave so he knows a little of the language of the cave. He also speaks some of your language. He will leave you at the opening of the cave where you will meet a holy guard who will help you in. Follow the boy, his name is Sewak. May you come back alive.”
>follow Sewak
You follow Sewak as he walks out of building. He heads to the stream and stops at the bank. “*Paani*,” he says. You repeat the word and he realizes you don’t know what it means. “*Paani*.Water.” You realize he means water. You fill the bottle with water. Knowing you are going to need a little help he conveys to you that Bottle is *botal*, food is *bhojan* and lamp is *diya*. You follow him as he walks downstream.

[9] This is the response in the original CCA if you type an expletive.

Implementation

Colossal Cave Adventure – *Hindi Mein!* is implemented in Inform 7 – an interactive fiction/text adventure development software and an open source engine.

The language of Inform 7 is a programming language like any other, however, the 'code' is written in simple English. Natural English language sentences function as commands that run the story. In other words, Inform 7 is very high level programming language. The language however 'understands' only the basic language that is built into the platform and hence there are both advantages and disadvantages in using Inform 7 to program an interactive fiction.

There are alternatives to using Inform 7 such as TADS (Text Adventure Development System) which is fully object-oriented language IDE and there is an obvious advantage to programming in TADS - it gives more independence to the programmer. However, it leaves little room for modding which was a conscious choice for this project.

The first thing that is created is a room. A room is a construct that defines the starting location of the player when play begins. From there onwards, the game progresses when the player moves from 'room' to 'room'. The foundation of the game in the language is the map. As we describe the various locations, we have to also define their relative positioning with respect to each other. With these descriptions, Inform creates a map of the game-world (Figs. 1 and 2). This map functions as the skeleton for the game and the rest of the story is built above this map. Once the map is made movement from room to room is supplied by the Inform code[10].

[10] A point to note here is that a 'room' is a basic unit of location in Inform. Hence even a cave is a 'room' and the next location a player can be in is a room too. This is also true of open spaces like 'The End of the Road' in Colossal Cave Adventure.

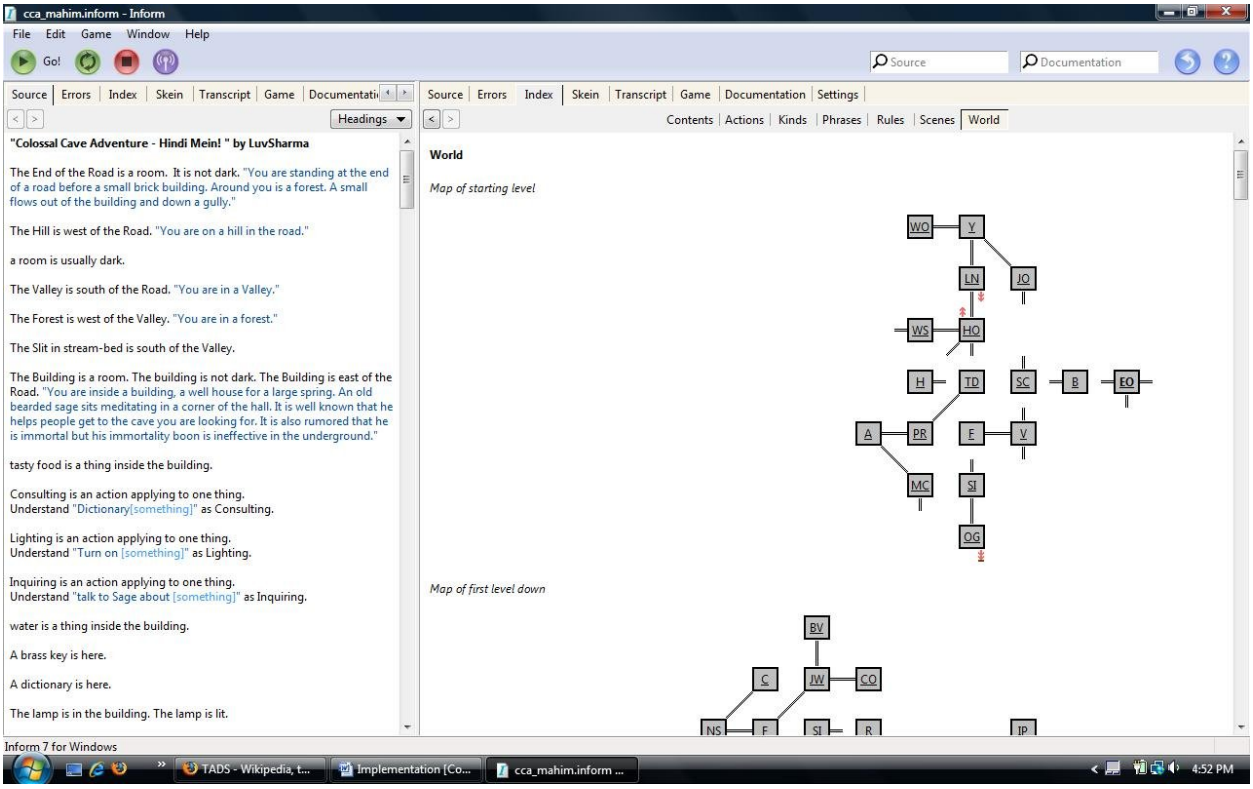
cca_mahim.inform - Inform
File Edit Game Window Help
Go!
Source
Documentation
Source | Errors | Index | Skein | Transcript | Game | Documentati
Headings
"Colossal Cave Adventure - Hindi Mein! " by LuvSharma
The End of the Road is a room. It is not dark. "You are standing at the end of a road before a small brick building. Around you is a forest. A small flows out of the building and down a gully."
The Hill is west of the Road. "You are on a hill in the road."
a room is usually dark.
The Valley is south of the Road. "You are in a Valley."
The Forest is west of the Valley. "You are in a forest."
The Slit in stream-bed is south of the Valley.
The Building is a room. The building is not dark. The Building is east of the Road. "You are inside a building, a well house for a large spring. An old bearded sage sits meditating in a corner of the hall. It is well known that he helps people get to the cave you are looking for. It is also rumored that he is immortal but his immortality boon is ineffective in the underground."
tasty food is a thing inside the building.
Consulting is an action applying to one thing.
Understand "Dictionary[something]" as Consulting.
Lighting is an action applying to one thing.
Understand "Turn on [something]" as Lighting.
Inquiring is an action applying to one thing.
Understand "talk to Sage about [something]" as Inquiring.
water is a thing inside the building.
A brass key is here.
A dictionary is here.
The lamp is in the building. The lamp is lit.
Source | Errors | Index | Skein | Transcript | Game | Documentation | Settings
Contents | Actions | Kinds | Phrases | Rules | Scenes | World
World
Map of starting level
WO
Y
LN
JO
WS
HQ
H
TD
SC
B
EO
A
PR
F
V
MC
SI
OG
Map of first level down
BV
C
JW
CO
NS
F
SI
R
IP
Inform 7 for Windows
TADS - Wikipedia, t...
Implementation [Co...
cca_mahim.inform ...
4:52 PM

Figure 1

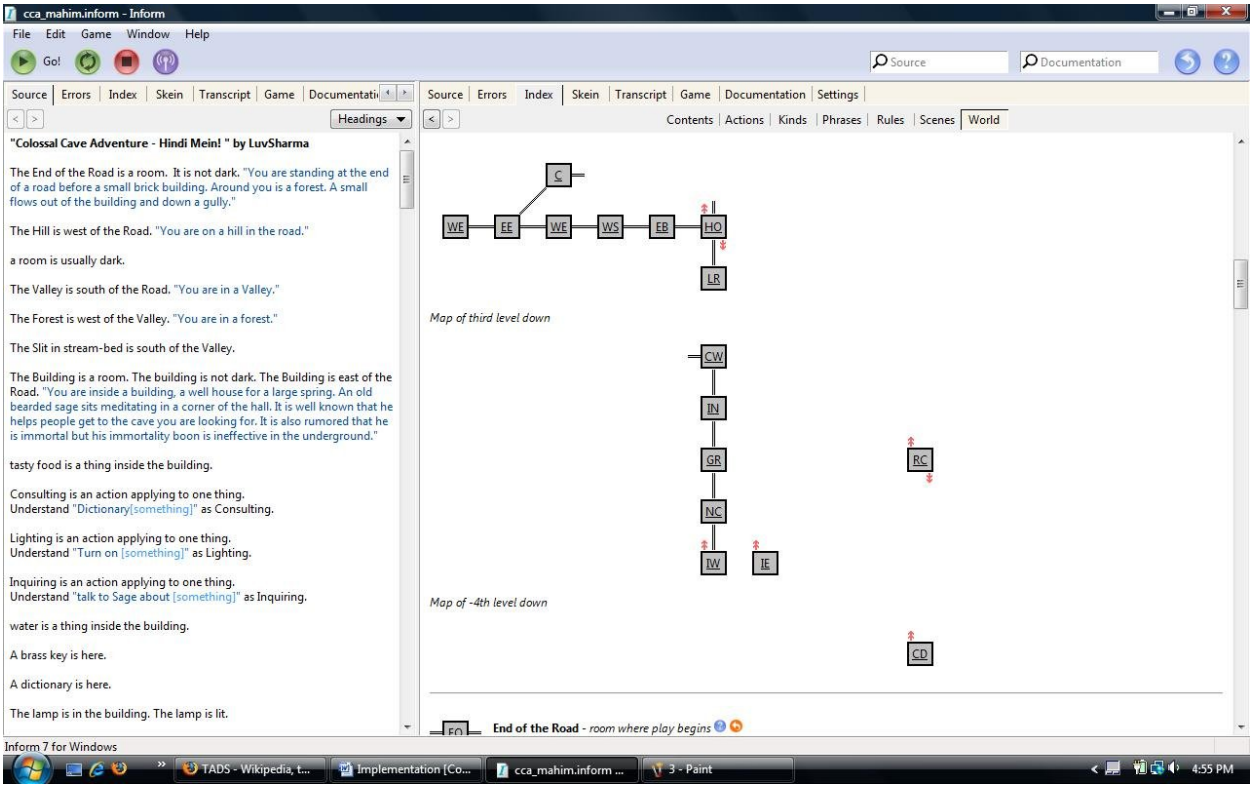

Figure 2

Few simple actions are coded into Inform that can be used as such. For the most part, we have to define actions in the language that Inform understands. For example, Inform does not understand ‘lighting’ something. So we write:

```
Lighting is an action applying to one thing.
Understand "Turn on [something]" as Lighting.
```

This tells the software that when the player writes ‘Turn on Lamp’, it is equivalent to ‘lighting the lamp.

Now, we define lamp as a thing in the building and explain that a lamp is something that can be lit. So we write:

```
Instead of burning a lamp: now the noun is lit; say "You light [the noun]."
```

So when a player ‘burns’ a lamp or ‘turns’ it on, the lamp is lit. Inform understands that something that can be ‘lit’ provides light when it is lit. So if we have described the room to be a dark location, we will not be able to see anything in the room we had a lamp and the lamp was lit. On the other hand, if the room was not dark, we wouldn’t need a source of light. Each room can be either dark or not. Inform also provides us with a key word ‘usually’ which is handy when

we have a larger number of rooms and most of them are dark while some are lit or vice versa. In this case we can write in the beginning:

```
A room is usually dark.
```

Which tells Inform that when we do not mention whether there is enough light in a room or not, by default it should assume that the room is dark and a source of light is needed to do anything in the room. We can state explicitly if a room is not dark by mentioning it at the time of the creation of the room.

This feature of being able to create new actions also works in favor of CCA – *HM* because Hindi words are being introduced in the game. These Hindi words referring to actions or things don't mean anything on their own but one can work around the affordances in the software to give the semblance of the game understanding Hindi. For example, the word *Uthao* means 'pick up' and is a directive but since Inform doesn't understand that, we have to explain to the code in the following way:

```
Understand "uthao [something]" as taking.
```

Since taking is an action provided by Inform and it adds that object to the player's inventory, when we '*Uthao'* something, it stays with us until we drop it.

The general way in which an interactive fiction moves forward is the movement of the player. There are four directions corresponding to east, west, north and south and in certain locations the player can move up and down as well. In some cases a text adventure can also have freedom of movement in the composite directions like north-east and south-west.

One of the major shortcomings of using Inform is that interaction with the Non-playing characters is not facilitated and one has to find ways to work around it. Conversation cannot be carried out with the NPCs and actions concerning other living beings are practically absent. Hence, the action 'inquire' is the backbone of all NPC interaction since most verbs are coded to relate to inquiring something from someone. Now this presents a major problem to the designer if there have to be multiple interactions with NP characters. For CCA –*HM*, this has been overcome by relating all such actions with 'things' or objects. Since NPCs can have objects and can perform actions on them as well as give or receive them, this offers an affordance to the designer and conversations can be handled by relating them to certain things. For example, if a particular character has a thing (say 'a note' with a message on it), the character can give the player the thing at a point in the game and based on the point of giving we can code dialogues before, at or after the giving takes place. This is also convenient because an 'Inventory' function is in-built into the software.

From the perspective of the design environment, the IDE is designed to offer maximum affordance for collaborative development and the play-as-it-is-developed approach. The code just needs two locations to be compiled because then it can understand the player's command of moving somewhere. For areas not explicitly defined, it denies access but does not stop in an error. A 'Go' button at the top compiles the code and runs it on top of the software (there is no separate class files made yet). A 'Release' button allows one to literally release a version of the

game by making a file of the extension .z5 that is a platform independent application which plays on certain environments called Interpreters (FROTZ for windows is one z-machine interpreter which can run files of this extension.

Conclusion

In conclusion, Colossal Cave Adventure – *Hindi Mein!* challenges the concept of education and learning in contemporary digital culture. Thus far, the academic institution has viewed the gaming industry at arm's length paying attention to purely academic aspects and the industry has kept input from the institution minimal. In terms of the use of games to educate there is a growing need and urgency to initiate dialogue between academia and industry. The effort is to demonstrate that we need to look beyond our current paradigms of mutual exclusivity.

Classrooms and schools need to investigate how they will benefit from the use of games to educate and as stressed before, CCA – *HM* is one step in this direction. In fact, CCA – *HM* can be viewed as just a demonstration of how a mainstream game can be appropriated for educational use in and outside the classroom; there are many areas in which a game for language learning can benefit from the advances in game technology. As CCA – *HM* is a text-based adventure game, the use of sound-effects can potentially enhance game-play experience – on one level if the new language is read as well as heard (instead of just being read currently) and on another level where sound effects supporting the narrative facilitate immersive game-play.

Then, a language teaching game (or any educational game) would benefit vastly from using advanced computer graphics and 3-dimensional environments. Intuitively, visually elaborate efforts appeal more to younger children and as much as the first generations of computer gamers cherish the games that first 'invaded' computers, games of that era have a more and more limited audience as time goes by. As a matter of fact, many of the earlier computer games have been developed on more recent game-engines, some of them greatly enriching the experience through state-of-the-art 3-dimensional graphics, surround sound etc. and similar development efforts could be applied to CCA – *HM.* Also, a number of mainstream games have released their source codes and quite a few game developers are advocates of keeping their games open-source throughout. This is a critical resource that is often underutilized because of lack of skill-sets at universities and schools but as technological bottlenecks clear up and software development is introduced earlier and earlier in the curriculum, this factor might become less and less important.

Furthermore, as in the example of TILT (the game to teach Iraqi), automated speech recognition technologies can be used to gain feedback and perform online evaluation of one's progress in the second language. This is a valuable resource because when blended seamlessly with the game-play, such a technology would facilitate the engagement with the audio and verbal along with the visual. As a result, not only would the player hear what is said in the other language and how it is said, he/she would also have an opportunity to try and participate actively in producing the second language and know an estimate of his/her current proficiency level from stage to stage.

It is worthy of mentioning here that it is not my claim that merely using more and sophisticated technology makes a game more playable but that the possibilities have increased with current technological developments and must be explored.

Having said all that, designers need to also simultaneously engage in depth with various disciplines while making games to exploit tacit learning. Not only must one be technically adept, but also academically qualified to make precise decisions about various learning strategies and different kinds of technologies that can be exploited for different disciplines; just making a game without a deeper knowledge of the specific purpose might not be enough.

From the perspective of second language acquisition research, CCA – *HM* is meant to address, in the context of second language acquisition, the silent period and the early production stages. These are stages when the learner is still only grasping the roots of the language. By providing a platform on which one's knowledge can be tested repeatedly without social or academic pressure, the game offers a new way to think about language instruction in classrooms.

Whether the game is a success or not depends on the evaluating strategy. From the point of view of language learning, different individuals bring different strategies to language learning, and while learning a language is a deeply social activity, there are stages of acquiring a second language (as mentioned above) in which the learner progresses at his or her own pace. Warschauer, in his paper *Technology and Second Language Learning* distinguishes between Cognitive and Sociocognitive approaches - the major difference being the emphasis on the role of social interaction in learning in the latter approach. However, it is emphasized in this effort that this game intends to target those stages in second language learning in which the learner progresses individually. So, the idea is not to have such a game exist on its own only but to have it compliment the other experiences that the learner is having in learning the second language. In that sense, then, CCA – *HM* will have to be evaluated along with the rest of the learning process that is happening outside of playing the game and will be as successful as the combination of the entire learning process.
Within the game, the success of a player is measured by the score, and at the end of the game or in the case of premature 'death', the player is ranked on the basis of his or her score. This is admittedly a somewhat primitive method to evaluate the success of a player but it seems the best available keeping in mind that the evaluation has to be as discreet as possible so as not to reveal, so to say, the hidden learning in the game.

The critical issues brought up through the game are encoded in the game-play such as the existence of cultural stereotypes in the conscience of the player's avatar that are dictated by the industry's innate bias and irresponsible nature, and the 'white, colonizing' characteristic of the narrative in contemporary mainstream game design. Such reflections are to be triggered by events in the game and raise concern about the kind of cultural divide that negative stereotypical

representations of race and nation might be perpetuating. This is clearly linked with the lack of a critical practice or its ineffectiveness in the domain of the manufacturing of commercial games which is another issue being probed through the effort. Finally, that the game is a modification of the first text-adventure game is both a tribute to the beginning of computer game culture as we know it today as well as an attempt at documenting the inception of this genre that influenced and paved the way for so many other hugely popular games today.

Tying back to my original motivation then, Colossal Cave Adventure – *Hindi Mein!* is my attempt to document my experience with tacit learning through games. The idea for my thesis was borne through my realization that without having the slightest idea I was learning anything, I had picked up a significant breadth and depth of knowledge in various fields just by engaging deeply with the games I was playing at the time. Grand Theft Auto, World of Warcraft and Counter Strike are all mainstream commercial games; all three of them among the highest-selling and most popular games of all time, yet at first sight, few people would realize that within the act of playing those games lies the future of learning.

My intention has never been to undermine games that are made expressly for educational purposes but I would certainly be lying to myself if I claimed that back in the day I would choose to play an educational game over one of those mentioned above. Yet, there was some learning that happened through each of those games. In one case, I picked up handy phrases in a different language (World of Warcraft) something that is considered helpful in a positive way, and in another I picked up knowledge about state-of-the-art arms (Counter Strike) which is questionable. But having skirted issues regarding the content, my intention has been to bring to attention the fact that each game as an independent system makes the player learn about the functioning of its mechanics – and a lot of real world knowledge can be encoded in those systems. If even a fraction of these popular commercial games is open-source and open to appropriation and only a subset of those ultimately used in the purposes of education, I feel we would still be justified in exploring our options within those games.

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