ABSTRACT

The *Game Wise Network* is a game that plays other games.

The system takes the shape of a web-based network that is not only a collective of game players but a human-powered game decision-making system. This group's collective intelligence is the opponent in the games played by individual members of the same network. The site is structured as a Network Wide game (NW game). Participation in the overall NW game improves the decision-making processes of the Network's role in individual Player Initiated games (PI games). From the perspective of the individual player, the PI game proceeds like any normal correspondence-based game. The player makes a move in the game then waits for their opponent to a move. While the individual player is waiting, the NW game is being played to evaluate the situation in the PI game.

The NW game is broken down into two separate mini-games. The two games, Hedge Betting and Quick Voting elicit different types of evaluations from the players. The combination of these two approaches is aggregated into a single decision regarding one move in a PI game. The move is then made on behalf of the GWN after which the individual player makes a move in response and the cycle continues until the game is concluded. This asynchronous play can be applied to any turn-based game designed for human vs human competition such as *Go*, *Chess*, *Poker* or *Dominoes*. The *Game Wise Network* (GWN) effectively eliminates the need for artificial intelligence programs in competitive turn-based games by replacing it with a large number of people contributing small rational thoughts which, if organized correctly, make wise choices in games.

Keywords
Game Design, Network, Artificial Intelligence, Collective Intelligence, *Chess*, *Checkers*, *Go*, Decision Making

DISCIPTION

Concept Overview
The interface for the GWN takes the form of a website that keeps track of all the records, possible games and related discussions generated by the network. The site displays all the relevant games available for a player's action on a dynamically generated page

Illustration 1: Normal Game Interface

unique to each player. Consistent navigation features allow access to less pertinent data such as profile information,

awards and high score lists. The site is built to be accessed from a traditional browser on laptop or desktop computers.

First time users are taken on a visually narrated tour of the various aspects of the site where they are introduced to the broad concepts and shown a tutorial on how to start their own game, play the Hedge Betting min-game and the Quick Voting mini-game. After the introduction and demonstration of play, users are free to vote and bet on any
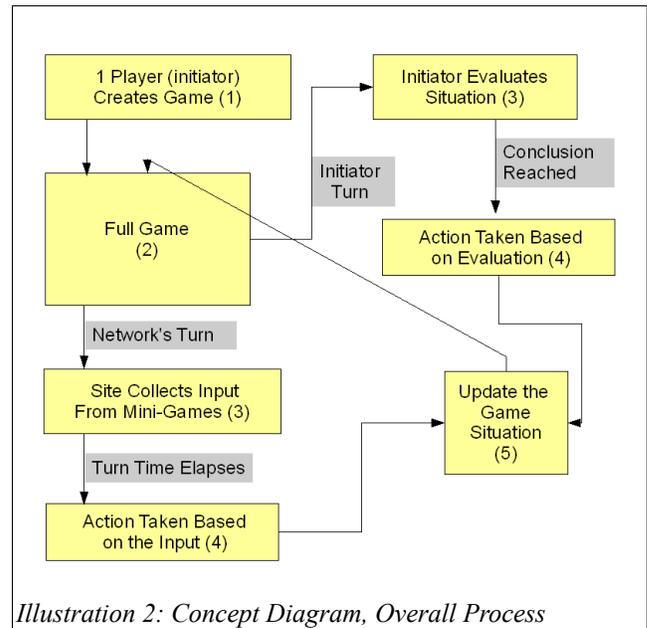

Illustration 2: Concept Diagram, Overall Process

of the PI games currently available or start their own.

Rationale
Game decision problems are about more than just probability and number crunching. Complex games such as *Go* and *Chess* allow for exploration of a large space of possibilities. Artificial Intelligence(AI) programs are constructed to create the shortest possible route to the solution. It is the wandering that a human being does en route to this goal that makes the challenge not only more interesting but more satisfying.

I want to be able to play traditionally human versus human competitive games against an artificial intelligence and not feel like I'm being allowed to win. When playing a single player video game, I'm exploring and engaging the system in an effort to advance the plot. It is a series of obstacles which must be overcome to advance to the next series of obstacles. In games where the competition is driven by another human player, the other player decides which challenge should next be provided. When the role of a human player is taken over by a game, the
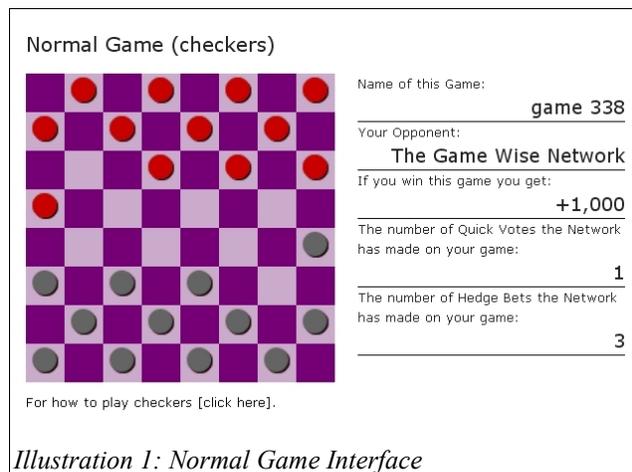
designers of the artificial intelligence program are now responsible for making a series of scripts and algorithms to challenge the human player in the place of a human mind.

The rules and goal of a game create a limited possibility space with a clear objective that becomes a perfect
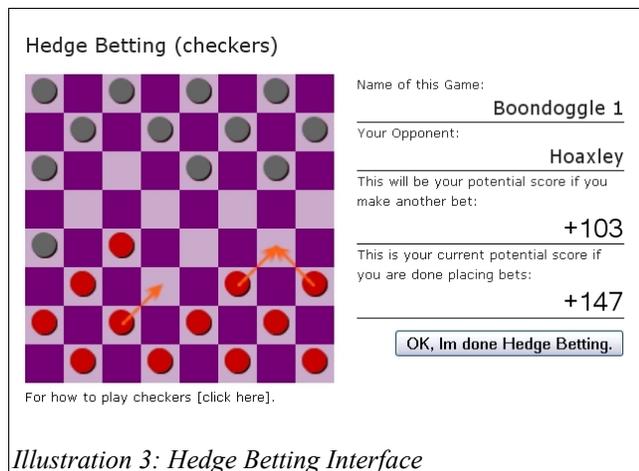

Illustration 3: Hedge Betting Interface

environment for logic driven action. Depending on the size of the possibility space, an AI program will be able to perform more efficiently than the mind. This artificial intelligence must be adjusted by the designer to provide the appropriate level of difficulty in every situation a particular game could present. My Game Wise Network (GWN) removes the capacity for an artificial intelligence to play without error by replacing it with a collective intelligence of human players.

The benefit of the AI taking on the responsibility of an opponent is that it will always be ready to continue the player's dialogue. The GWN provides a human intelligence, augmented into an AI-like form, to games that are traditionally driven by human competition. The elimination of an individual's responsibility to constantly monitor a particular game replaces a sense of obligation with that of opportunity.

Goals
Success in this endeavor can be judged by several different rubrics. If I can generate a better gaming experience for myself and others, then I will

have succeeded in what I consider the most difficult aspect of the project. The most obvious measurement of that success will come in the form of direct feedback from the users and a growing participation network. The GWN is set up to be a positive feedback loop. If the design of the NW game is correctly applied, this quantity of attention will translate to an increased quality of the results in the PI games. Aside from game experience, the construction of the system itself is a technical challenge.

The individual technological components of this project are not forging new ground. However, I have yet to find a particular combination of database manipulation, game mechanics and interface design that facilitates the type of self-propelled action I'm trying to provoke players into undertaking. Bringing these self-propelled aspects to life technically will be a fundamental starting point to which revisions and expansions can be made.

Audience
The GWN has aspects that would appeal to the casual and hardcore gamer alike. The shallow learning curve, immediate feedback and network-wide record of accomplishments are traits common among casual games. These elements are exemplified in the GWN in the simplicity of the Quick Vote system, the consistent rewards relative to the speed and accuracy of the participation and the public display of those rewards. The hardcore gamer would look to the GWN as a platform on which to find a new type of challenger for their favorite game.

The side of the NW game that would appeal to the hardcore gamer is the Hedge Betting system. Hedge Betting rewards not only depth of knowledge of the specific PI game one is betting on, but an understanding of how the network at large will respond in the given situation. The dedicated *Chess* player would find not only a network of like-minded individuals but a chance to challenge their collective intelligence. That chance comes in the form of a game that tests the *Chess* player's knowledge of his own game. A direct result of that dedicated *Chess* player's efforts is a game of *Chess* played against the rest of the GWN. A fan of casual games can skim the surface of many other games focusing just on
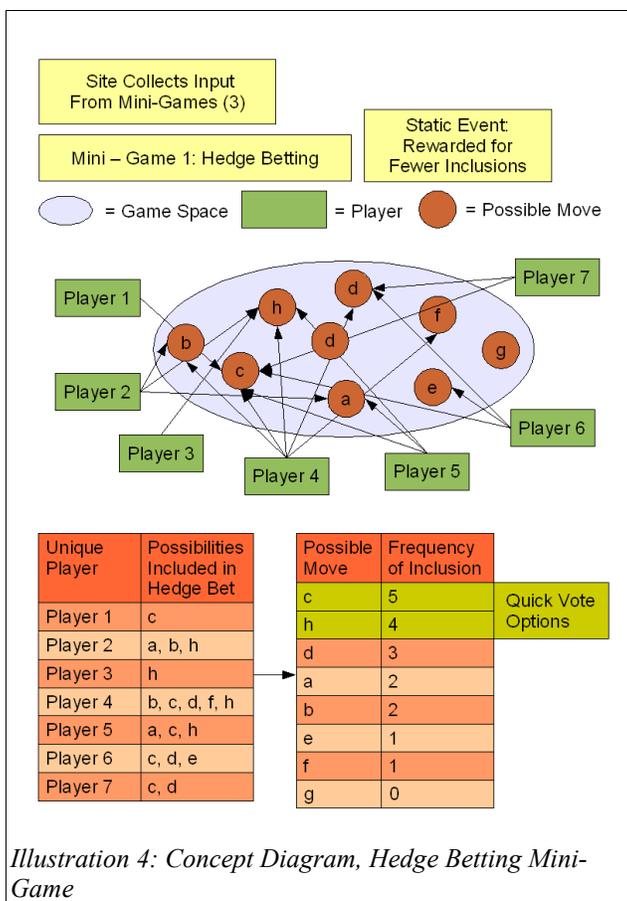

Illustration 4: Concept Diagram, Hedge Betting Mini-Game

the NW game while always having the option to delve deeper into any of the PI games for a more specific challenge and reward.

Core Features and Functionality

The actions that reward players with Game Wise points are focused on creating winning solutions for the network's role in each PI game. The two methods for playing the NW game are Hedge Betting and Quick Voting. As motivation for positive contribution to the process, once a PI game is finished, the winning side (be it network participants or the individual challenger who started the PI game) will be rewarded with Game Wise points at a greater margin than the losing side.

The first step in each collective decision is to propose the next set of possible actions in the PI game based on the situation presented. The 'invested' players are the ones who either by volunteering at the beginning of the PI game or by continued participation over the course of the particular PI game have shown they are willing to spend their time analyzing the situation and proposing possibilities to the larger network. It is these type of players for which the Hedge Betting system was created.

The idea behind the Hedge Betting system is that the invested players will chose the fewest number of

Illustration 5: Concept Diagram, Quick Vote Mini-Game

possibilities they think will be the next action in the game. They will be rewarded in proportion with the number options they chose (fewer options will yield higher points) and will receive no points for excluding the action that is voted on by the rest of the network in the Quick Vote side of the process. Rewarding the players for proposing the fewest number of possible actions on the condition that one of those options is chosen by the Quick Voters increases accuracy while broadening the potential pool of sensible moves at the same time as shrinking the number of foolish moves. The two most popular actions among the invested players will be shown to the Network. Quick voting on these two proposals is the next step, and is open to the rest of the network.
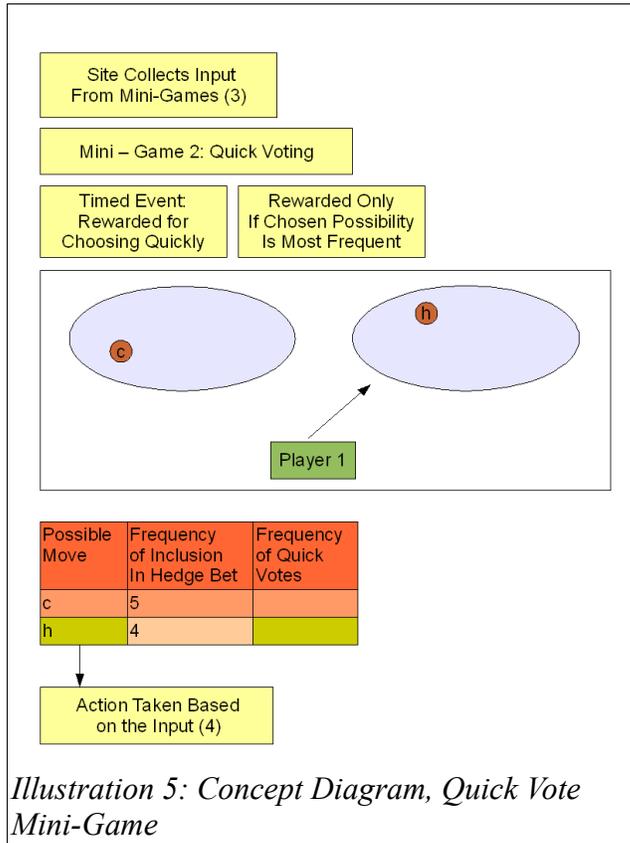
The attention that would normally be required to analyze a large number of possibilities can now be focused on the pros and cons of two carefully selected options presented for the scrutiny of the larger audience. To increase the emphasis on instinct-based choice, the amount of time spent by the player looking at the possibilities before actually casting the vote is recorded and rewarded for both accuracy and speed. The contrasting modes of thoughtful analysis of the big picture and reactionary instinct to binary options complement each other and provide different modes of engaging the players.

The necessity of the turn-based configuration lies in the need to give a large number of people the opportunity of action. The larger the network of players the shorter the time frame can be while maintaining a high enough sample for the responsibility of action to be distributed among multiple players.

Background and Context

More often than I would like to admit, I find myself wondering how I just managed to lose 3 hours of my time to a game. I only feel like my time is wasted when I have more pressing matters that have yet to be dealt with. If my tasks for the day are completed, the time invested in the game feels like a effort well spent with regards to how much enjoyment, intellectual stimulation and relaxation I get in return. If my effort can be both productive in the sense that I created value for myself through enjoyment, stimulation and relaxation as well as having created value
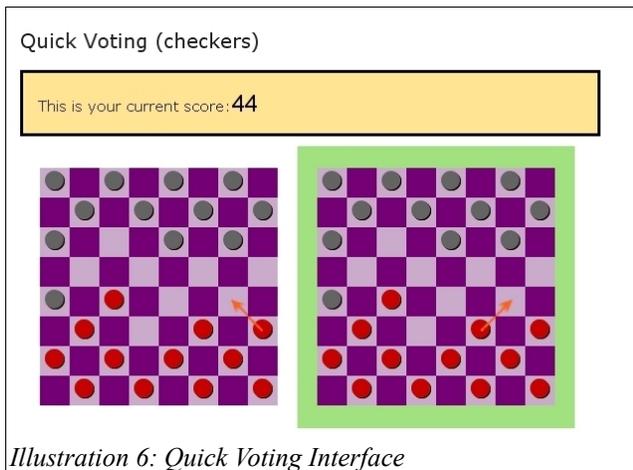
Illustration 6: Quick Voting Interface

for another task, then the value that I create for myself is magnified. The level of magnification of the self-value is largely dependent on how important I perceive the ulterior motive of the game to be.

For example, *The ESP Game* is an online cooperative naming game in which the goal is to create as many jointly verified single word descriptions for a string of images shared by both players. The game displays a single image to two randomly paired players who then start listing as many single word descriptions of the image in question as they can. Points are awarded to both players as soon as one player submits a word identical to any of the other player's previously submitted words. The players are given a time period in which they try to come up with matches for as many images as possible. The other variable in the game is the constriction of certain descriptions. Taboo words are provided to both players who are told they will not be counted as potential matches.

I was not motivated to play *The ESP Game* for the purpose of enhancing the relevance of image search results. I was motivated to play the game because the concept of finding shared ideas from a common source intrigued me. *The ESP Game* is the first of several "Games with a Purpose"
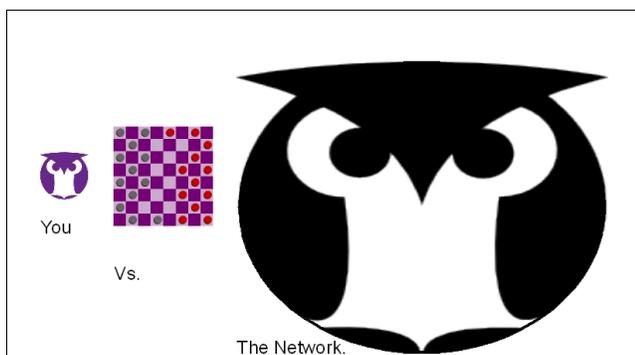

Illustration 7: Player Perspective (purple), Normal Game

created by Luis von Ahn. He created the games as a way to prompt people to execute certain tasks at which humans currently out-perform computers (von Ahn, 96). I chose this game because von Ahn and I are parallel in both our methods and the motivations for our methods. Von Ahn has created several other games that are similar in approach to the *The ESP Game* game. For example, *Squigl* is an in-image object identification game in which the players are rewarded for accurately outlining the same object depicted in the shared image. *Verbosity* uses partially completed phrases to match associated context with single words. All three games leverage the competition inherent in games to promote accuracy of the action.

The ESP Game and the *Game Wise Network*(GWN) both leverage a group of volunteers to further a task that would normally be handled by humans in the format of a game. As regards the GWN, I seek to differ from von Ahn's Games with a Purpose by enhancing the level of emphasis

on network. The closest direct benefit from the ulterior actions of *The ESP Game* manifest in the form of more relevant Google image searches for the player. With the GWN the ulterior actions create a challenging, creative and patient opponent.

The ESP Game and the GWN differ most dramatically in usage of the player's efforts. The stated goal of Games with a Purpose is to make computers smarter. GWN will make the player's opponent not smarter but better. Benefits to the player will vary depending on the game. If the player were to play a game of *Chess* against a traditional AI system, the AI system will always have the capacity to win. In such a situation, the benefits of the GWN lie in providing creative but also fallible moves. I mention fallibility as a benefit because when one defeats a program that has an inherent capacity to defeat any player, victory is bitter. One is being *let* win. However, if the same player were to challenge a traditional AI system to a game of *Go*, the results would vary depending on the skill level of the player. If the player is even moderately skilled they will always defeat their AI opponent. Due to the number of potential moves the computation power needed to evaluate a full *Go* board has not yet been achieved. In the case of *Go*, the GWN would provide AI-like behavior to the individual player in addition to providing the type of intelligence that algorithms cannot: style interpretation, situational relevance and intuition.

The GWN absorbs the energy generated from participating in games. Instead of channeling that energy into outside tasks, it uses that energy to make the games themselves better. The GWN puts more emphasis on the players than the Games with a Purpose by turning the activity of playing the mini-games into one part of a larger game.
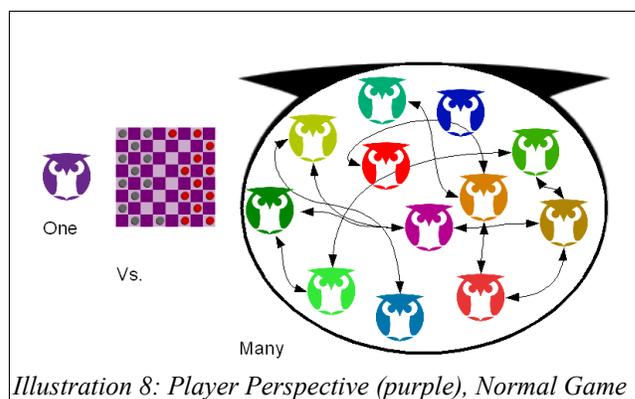

Illustration 8: Player Perspective (purple), Normal Game

Alternate Reality Games (ARGs) are a connected group of puzzles, mysteries and challenges that are given the illusion of relating to or deriving from real world events, locations and entities. For example, *I Love Bees* (ILB) was an ARG used to promote the release of the video game Halo 2. ILB used the collective intelligence of its players to solve the large scale search and analysis problems which in-turn advanced the collaborative narrative that developed

between the players and the designers. The end result of the challenges was the completion of the narrative and a hands-on preview of the game the ARG was created to promote.

The ARG provides a game related example of how a group of people self organize and work together on a complex problem. The scale of problem solving in ILB is important because the intended scale that some of the decisions being made by players of the GWN are of a similarly complex nature. In ILB the players are faced with multiple courses of action that all are likely to succeed. The trick is finding out which one is right given the situation. A similar problem occurs in the early and mid sections of most games. A player must decide on the best of multiple possible courses of action. ILB's approach is to present the problem in an ambiguous way that promotes a multitude of hypotheses from which the group of players must collectively distill into a course of action. (McGonigal, 17). The complex problems presented to the players of the GWN come in the form of early and mid game course of action choices. Both complex problem solving systems reward participation with social status among the group of contributors. The GWN goes one step further and solidifies social status by framing it as a game where quality based participation is rewarded.

This is the only game genre with the focus of the game play is on large scale collaboration. While many other long term games provide content based on user feedback, the ARG is the only one where the narrative is necessarily built up in direct response to the capacities of the players(McGonigal, 30). The player's capacity for collaboration then determines the scope of the challenge. If I can increase the player's capacity for collaboration, it is therefore logical that the player's problem-solving ability will increase proportionally. I intend to increase that capacity by providing the communication tools and competitive framework.

The usefulness of ILB as an example of participation resides in how ILB got their players to care enough to participate to the extent which they did. The lead designer of ILB Jane McGonigal had this to say about how individuals contributed in ILB, "...players individually formulated hypotheses, presented them to the group, and then solicited help in collaboratively testing and refining them."(17). It is the reliance on and participation with the larger network that brings a player to want to invest time in solving a complex problem. A person is more willing to contribute if they know that their contribution is not going to be ignored. Every Quick Vote and Hedged Bet contributes not only to the group discussion, but is rewarded by the system. ILB rewards players abstractly with intangibles such as reputation and sense of network. To promote this kind of social motivation the GWN is structured as a NW game to concretely reward these activities in the form of score and achievements.
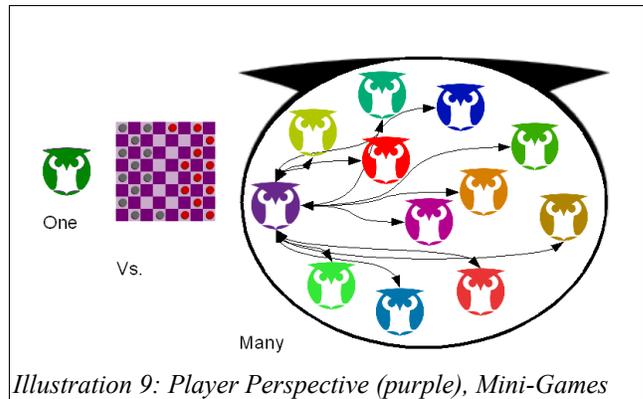

Illustration 9: Player Perspective (purple), Mini-Games

Jane McGonigal referring to a smaller group of highly invested players: "As such, their work serves as an excellent microcosm of the larger, sometimes seemingly chaotic, cooperative speculation and data processing that took place..." (17). GWN attempts to use this idea of self-designated specialists as a method for dealing with the size of the problems inherent in decision-making in games. There are usually many possible bad choices and only a few options that are truly plausible in a given situation. The results of the invested player's efforts are in turn used to provide the few plausible options to the larger group which lets them make a more informed choice.

Even without the framework of clearly defined goals and constraints, people can forge strong ties and create communities to address large scale and complex problems as evidenced by the successes of ARGs. While the GWN provides that framework in hopes to solidify the socially rewarding aspects of participation, the real decision-making process is perpetuated not by social rewards but by the competition fostered by pitting the players against each other as a method of producing higher quality results.

CONCLUSIONS

Goals Accomplished
My technical goal of creating this self-propelled system have been meet. The GWN has been constructed and has only recently seen it's first players. Games decision are being collected and implemented based on the two mini-games and individual players are responding. The decisions cannot yet be evaluated in a qualitative manner without the context of the game's outcome. Due to protracted nature of correspondence-based games, the GWN has yet to see a completed game. Without more data, I cannot say with any certainty that this is a viable alternative to AI in terms of a win/loss percentage, however it does successfully forms human reposes into AI-like behavior.

Lessons Learned
The initial plan was to construct the GWN around *Go*, a game with a very large possibility space which has not yet been solved by AI programs. Upon further investigation

into the accessibility of the game, I came to the conclusion that the whole process needs players more than theoretical results. Without a large player base to aggregate from the GWN is not as effective. As an accessible alternative to *Go* I chose the of Checkers to be the first game incorporated into the system.

Discoveries

To my surprise, the rules of checkers were not as widely know as I had assumed. I discovered new rules myself. After more investigation into the popularity of asynchronous strategy games I discovered that *Chess* has a large online fan base which led me to conclude that I could have used *Chess*, despite its lack of accessibility, to draw player into the GWN and then add more complex games afterwards.

Next Steps

The evolution of the GWN will take the shape of added games, improved interface, revenue generating advertisements and expanded community support. The next game that will be added is *Chess*. Once *Chess* has been incorporated, hopefully increasing the player base, I can add *Go* and test the GWN's viability as an alternative to traditional *Go* AI programs. I will also be adding advertisements to help sustain the costs involved in

maintaining the site. The next phase of interface improvements will take the shape of providing more relevant feedback to the player regarding cause and effect of their actions. This will initially take the shape of information about a player's positional change of overall rank and score and will be eventually include their pending Hedge Bets and Quick Votes.

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