False Prophets: Exploring Hybrid Board/Video Games

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ABSTRACT
In order to develop technology that promotes social interaction rather than isolation, we are exploring the space between board games and video games. We created a hybrid game that leverages the advantages of both physical and digital media. A custom sensor interface promotes physical interaction around the shared public display while the un-oriented tabletop display encourages players to focus on each other rather than on the interface to the game. The ensuing social interactions define the course that the game takes, while the computer enhances the gaming experience by completing the menial tasks and providing dynamic, exciting environments. Our hybrid board/video game has the potential to enhance natural and enjoyable recreational interaction between friends.

Keywords
games, social interactions, CSCP, tangible interfaces

INTRODUCTION
The main objective of our current project is to explore the space between board games and video games, leveraging the advantages of both. Traditionally, board games are collective in nature, played with two or more people. The playing surface and rules of many board games are present to facilitate interactions between players. In contrast, electronic games tend to support interaction with the system more than with other players. Computer games are generally played alone. Even in on-line game play, where distributed interactions between players occur, there are no rich face-to-face interactions. Gaming consoles such as the Nintendo™ or Sony Playstation™ systems, allow for multiple co-located players. When players gather together around these consoles the players generally sit side-by-side and interact with the screen, not directly with each other. Thus, their interactions occur via the interface, through the game. With these two exceptions, electronic games tend to be individualistic, played in an isolated manner [5] which is fundamentally different from board game environments.

Related Work
Ishii et al. [3, pg. 395] define computer supported collaborative play (CSCP) as "computer technology that enhance[s] physical exertion, social interaction, and entertainment in sport and play." Their PingPongPlus [3] game is an example of an athletic tangible interface for co-located, competitive play. Other researchers have also been looking at using physical media to interact with digital information in a game context. The Pirates! [1] game developed by researchers at the PLAY and Nokia research studios integrates social aspects of traditional game play into computer games. This is accomplished by bringing some computer game elements into the physical world. The Geney [2] project from the EDGE Lab is a genetics game played in a distributive manner on handheld computers in a physically co-located environment. In Pervasive Clue [4], the traditional game of Clue is played in a physical environment with tangible objects. In all of these examples, the social interaction between players is an essential component of the game play. Although computers mediate these games, the human-human interactions define the game play and eventual outcome.

HYBRID BOARD/VIDEO GAMES
With a goal of developing technology to facilitate social interactions, we are examining issues related to co-located CSCP. Our research is exploring new interaction paradigms to support multi-user collaboration and competition in CSCP. We are investigating techniques to integrate the strengths of traditional physical and virtual play in a hybrid physical/electronic game environment. In particular, we are examining how technologies such as new displays and interface techniques can enhance natural and enjoyable recreational interaction between users.

There are many salient features of physical board games that make them enjoyable to play. For example, most board games are very interactive. The interface to the game is generally non-oriented, allowing for multiple people to view the board from multiple angles. Board games are mobile, providing support for dynamic players and locations. The flexibility of board games allows for house rules. Most importantly, the board, for the most part, is simply present to facilitate interactions between people, not interactions with the game. On the other hand, computer and video games provide for complex simulations, evolving environments, impartial judging, the suspension of disbelief, and the ability to save the state of the game. By combining the advantages of each of these modalities, a new hybrid class of games can be formed.

False Prophets: The Game
We have created a hybrid platform to investigate this new class of games. Our game environment consists of a

tabletop display system with a custom sensor interface. Initially, we have configured the game for six players although the goal is to have dynamically changing groups. The game board is a projected map, tessellated into a grid of 20 by 30 hexagons. Each hexagon represents a space that the characters are allowed to occupy and is one of four terrain types: water, plains, forest, and mountains. Initially, the map is not projected, with the exception of hexagons where players are located. As the players move around the board, the map is dynamically revealed.

The players are separated into two teams and are initially unaware of their team members. The goal of the game is to discover which team each player belongs to. This is accomplished by gathering virtual clues, making virtual observations of the other players, and using this information to solve a logic puzzle.

To support interpersonal interactions our rules encouraged players to concurrently and physically move around the board while communicating with each other in a face-to-face verbal or non-verbal exchange. We accomplished this through a number of game features.

1. Players gather clues about others by physically moving their character around the game board, collecting clues that remain hidden in clue holders like rocks and logs.
2. Players make observations by physically passing near other players on the game board. The level of detail of virtual observations (height vs. freckles) depends on the physical proximity of the playing pieces.
3. Private communication such as the exchange of clues and observations is not supported or mediated by the game. Any bargaining or player alliances must occur between players in the physical world.
4. To avoid a static turn-taking strategy, which would not support interactivity, we implemented an energy-based system to move around the board. Each type of terrain has an associated energy factor that depletes the player's energy as they move around the board. The characters' energy is replenished cyclically throughout the game and they must time their exploration accordingly.

Sensor Interface

To support players moving their characters around the projected display, we have implemented a custom sensor interface. The playing surface contains an array of infrared phototransistors, each corresponding to a hexagon in the game. Each character playing piece contains an infrared light emitting diode. The pieces emit a pulse that is sent though the phototransistors to the serial port and interpreted by the game software. Pieces also have buttons that are pressed to correspond to actions in the game. Pressing a button changes the pulse transmitted to the game. The pieces are a natural interface for players accustomed to dealing with physical figurines, yet provide a great deal of interactive functionality. These pieces, combined with the sensor array, provide us with seamless input to the game system. By making interaction with the computer components of the game seamless, we allow players to focus on each other, and not on the interface.

Handheld Interface

The display system consists of both the tabletop projection for public information as well as handheld computers for private information. The handheld computers also act as input to the game by allowing players to perform actions and make choices that cannot naturally be communicated via the game pieces. We deliberately limited the interaction through the handhelds to maintain focus on the other players, not on the private displays. The handhelds communicate to the game control through an 802.11 wireless network. All public input occurs through the pieces which connect to the game control via the serial port. The game control handles all game input, logic, and updates the display based on events in the game.

CONCLUSIONS AND FUTURE WORK

This game was created as an initial foray into the area of hybrid computer/board games. The next step is to perform qualitative analysis of players using the system. In the future, we plan to extend the computation power of the game pieces. Ultimately, our goal is to have playing pieces that store data, interpret contextual information, and travel continually with the players. We plan for these playing pieces to be able to communicate wirelessly with other proximal playing pieces. We also plan to be able to train these pieces so that a player's skill can be leveraged in the collaborative gaming environment. It is in these extensions that the power of ubiquitous computing for gaming environments can be explored.

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