Color Blind Computer Gaming

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1 Introduction

1.1 Why is color blindness problematic?

One of the more common disabilities today is color blindness - a disability which affects 2-5% of the population. While not as visible as for example full body paralysis, it is a legitimate disability - and more restrictive than one might think. For example, it's quite common to not be able to percieve a red ball on a grass lawn.

The entertainment sector has long been using various tools to help people with disabilites by for example using subtitles on movies or releasing novels on CD.

We believe that one of the primary tasks for a modern society is to reduce (or better yet eliminate) the gap between a disabled and non-disabled people. In essence, a disabled person should be able to do all the things a non-disabled person can do.

1.2 Human-computer interaction

In order to develop our own design patterns for colorblind accessability in computer games we have examined the basics interface design, accessability rules and International Game Developers Association (IGDA) design patterns.

One basic purpose of Human-Computer Interaction (HCI) studies is to improve and facilitate the interaction between users and computers eg. by making the computer applications more easy to understand and more intuitive to use. One way to accomplish this is to develop methods and principles for Graphical User Interface (GUI) in software, so called User Interface Design (UID). The user interface is what meets the eye/senses of the user of a computer application. The use of "icons", "windows", "buttons", the given nomenclature such as "save", "copy", "paste" etcetera in regular software GUIs are the result of UID.

Several researchers exist in the HCI field. Among the most famous ones are Don Norman, Jakob Nielsen and Ben Shneiderman. They have all developed design principles/rules of thumb for optimal user friendly design. The patterns presented in this paper are a product of these principles applied to our findings.

1.3 Evaluated games

1.3.1 World of Warcraft (WoW)

World of Warcraft (WoW): Wrath of the Lich King is the third expansion to World of Warcraft, the most successful MMORPG so far. WoW has around 10 million subscribers, and centers around the conflict between two factions - the Horde and the Alliance.

Gameplay is combat-centric and characters are class based. There's also a fairly advanced skill system which allows players to practice different crafts. Being an online game, social interaction plays a very large role in the game experience.

1.3.2 Chronicles of Riddick: Assault on Dark Athena (Riddick)

Chronicles of Riddick: Assault on Dark Athena is an First-person shooter (FPS) sprung from the movie series with the same name. The player assumes the role of Riddick, and plays out the eventual escape from the Butcher Bay prison along with the later attack on a space ship called Dark Athena. The game is a fairly conventional FPS, but with an inclination towards stealth gameplay.

1.3.3 Empire: Total War (ETW)

The Total War series is a line of strategy games where the player takes control over a historical culture.

The game is composed by a strategic map over the world, which shows the different factions and their holdings. The map allows the player to make decisions on a strategic level, whereas the actual combat takes place in a different environment. Interaction with the strategic map is turn-based while interaction with the combat map runs in real time.

1.3.4 Fallout 3

This game is a remake of the popular 90's FallOut series. The older versions were turn-based isometric 3D while this version is first person where the player can interact with almost all the environment. The player creates a character and leads it through a series of adventures and quests in a post-apocalyptic USA. The world is a mix of high technology and late fifties.

Having analysed several angles of this game, we find it hard to come up with any major issues. In the cases we did find problems from our point of view, the game offered a remedy, easily accessible to the player.

2 Patterns

These design patterns are intended to have a high level of abstractiwithin the context of computer games. For example, some of the patterns cohere with more than one type of genre and foci (as defined in chapter 4 of this paper). The following design pattern system has been inspired by the style of the design patterns compiled by Dr Martijn van Welie[1]. The patterns are not listed in any kind of order, and should be viewed as a basic source of inspiration for game designers and developers.

2.1 Pattern: Hostility

2.1.1 Problem

User can't easily tell if another player/NPC is an enemy or a friend.

2.1.2 Solution

Differentiate enemy/friend information more than with just colors.

[1] http://www.welie.com/

2.1.3 Use when

When a user need to make a quick choice based on detection of animosity or friendliness (in a FPS, while adventuring in an Massively multiplayer online (MMO)).

2.1.4 How

Consider the time critical information regarding other players available to the user. Is the information solely based on colorschemes? If so, consider adding more information; icons with clear faction information, name tag information etcetera.

2.1.5 Why

Being able to distinguish friends from enemies in a stressful environment is very important. A user who is less able to process this information has a serious disadvantage. By enhancing the information visibility both normal seeing and color blind users are helped.

2.2 Pattern: System Status

2.2.1 Problem

User can't easily recognise feedback from actions or understand what status the game is in.

2.2.2 Solution

Use sound, animations and flashing lights to direct the user's attention to the relevant information.

2.2.3 Use when

When the user need to make decisions based on information conveing information regarding changes in system status.

2.2.4 How

If color is the single information carrier of feedback/system status changes, consider adding blinking/movement or some animated element in order to attract attention.

2.2.5 Why

The user want to make correct decisions and take relevant actions responding to the system status. To facilitate this, the developer should enhance the users awareness of the system.

2.3 Pattern: Items

2.3.1 Problem

Users rely primary on colors to differentiate beteween in game items

2.3.2 Solution

By use of iconography/shapes/characters/text the items can be made easier to tell apart.

2.3.3 Use when

If several items with different effects share the same shape/icon, and an error can be detrimental to the game experience.

2.3.4 How

Item icons can be marked in such a way that they can easily be distinguished. For example, single characters or abrevations can be used, background patterns etcetera can differ.

2.3.5 Why

Users with color vision deficiencies may hesitate to use or equip certain items due to lack of information, or may use wrong item when stressed.

2.4 Pattern: Mapping

2.4.1 Problem

The user can not easily read her surroundings or use an item due to lack of visible information.

2.4.2 Solution

Enhance mapping by using icons or similar markers.

2.4.3 Use when

There is a risk that a user is hindered in her decisions making process due to lack of information.

2.4.4 How

Use of icons, images, and other forms of input rather than just colors.

2.4.5 Why

Color blind users may make bad actions based on weak or misinterpreted input. The developer should allow the user to understand the environment regardless of color vision status.

3 Final words

4 Acronyms

HCI Human-Computer Interaction

UID User Interface Design

GUI Graphical User Interface

IGDA International Game Developers Association

FPS First-person shooter

MMO Massively multiplayer online

MMORPG Massively multiplayer online role-playing game

WoW World of Warcraft

PvP Player versus Player

ETW Empire: Total War