<< RETURN

CROSS-PLATFORM USER INTERFACE DEVELOPMENT

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INTRODUCTION

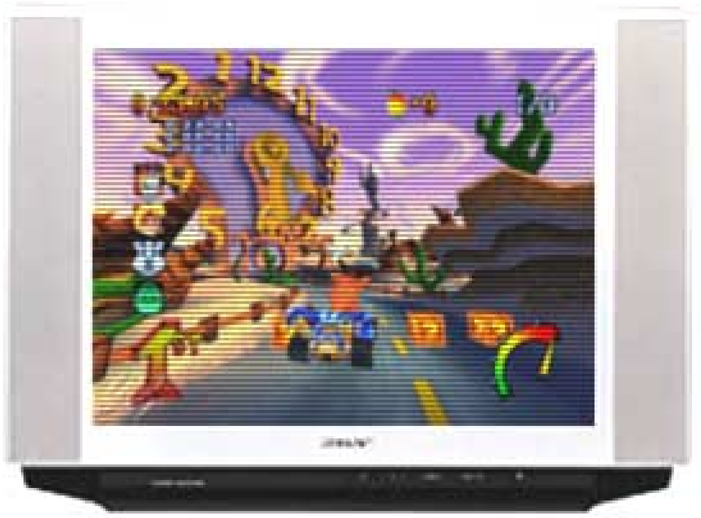
UI is always the first thing a player will see, and yet it's often the last thing a developer thinks about. Just like the opening credits for a movie, the UI can help to set the mood for the rest of the game, for better or worse. If a game has a UI that looks bland, or is difficult to use, how will that impact a player's first impressions of the rest of the game?

FROM PC TO CONSOLE

Whether you’re converting a PC game to console or developing an original console title, the PC is always going to be a major part of the production pipeline. This section will illustrate some of the major differences between consoles and computers.

The Display: What You See May Not Be What You Get

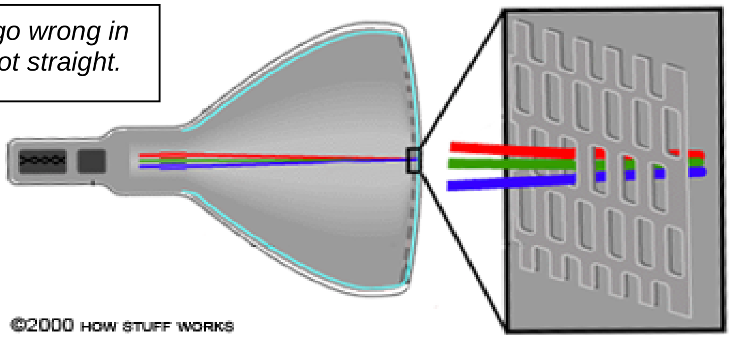
Content on the PC can look very different once it’s on a console. It’s important to understand the differences between the displays used for PCs and consoles.

Computer Game Display	Console Game Displays
 - *CRT Computer Monitors most commonly used by gamers* - *Variable Resolution: Typically between 640x480 - 1280x1024* - *Progressive (Every line drawn)* - *17”-19” in size (typically)* - *Small Dot Pitch* - *Consistent screen area(same for all models and brands)* - *Crisp and clear display: meant to be viewed up close*	 - *CRT Televisions most commonly used by gamers* - *Fixed Low Resolution: 640x480(typically)* - *Interlaced (Every other line drawn)* - *19”-36” in size (typically)* - *Large Dot Pitch* - *Variable screen area (different for every model and brand)* - *Fuzzy and blurry: meant to be viewed from a distance*

The Tech Behind The “Tube”

TVs use electron guns to shoot tight beams of electrons onto the screen from within a vacuum tube. The screen is coated with phosphor, which glows where it gets hit by the beam.

There are a lot of things that could go wrong in getting a contraption like this to shoot straight.



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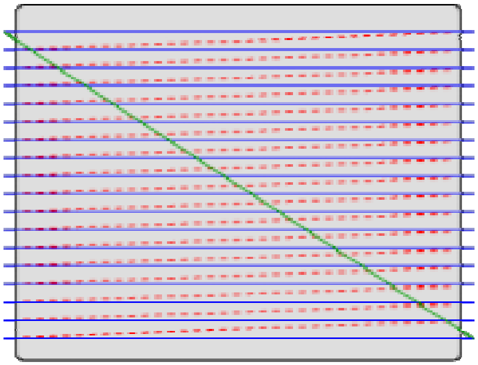
To draw the entire screen, magnetic coils move the electron beam in a "**raster scan**" pattern across and down the screen. The beam draws one line across the screen from left to right, then quickly flies back and down slightly, then paints another line, and so on down the screen, like this:



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Because the lines are spaced closely together, your brain integrates them into a single image. A TV screen normally has about 480 lines visible from top to bottom.

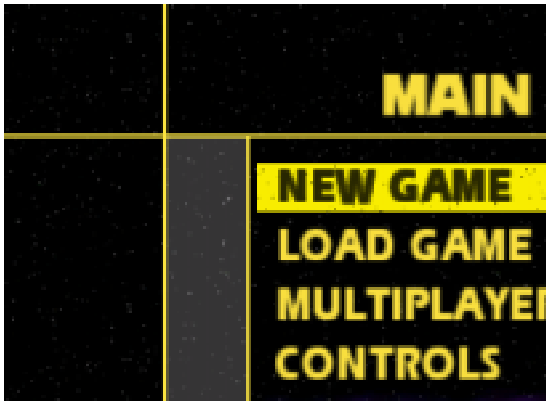
Standard TVs draw at 60 frames per second using a technique called **interlacing** where only every other line is drawn for a single frame. The next frame will draw the lines not drawn in the previous frame, and the brain, once again, integrates them into a single image.

Computer monitors, on the other hand, use a **progressive** technique that draws every line in a given frame. Progressive images require more sophisticated hardware, which is one of the reasons why monitors are more expensive than the average TV.

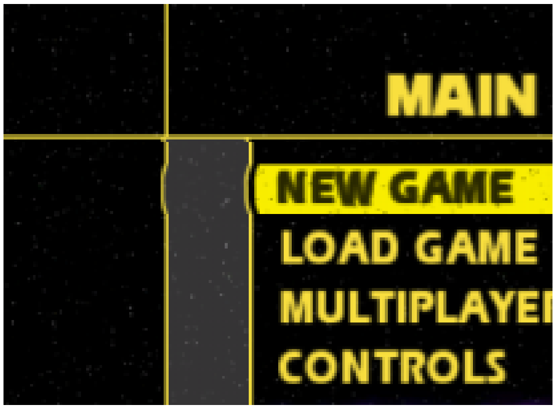
What Happens When TVs Behave Badly

Screen Distortion

The pictures below, from the beta test of Jedi Academy (Xbox), show one of the distortions that can occur on televisions.



What we sent to the frame buffer.



What we got on some TVs

This is what happens when you have a lot of electrons in one line of resolution and fewer in another. Electrons repel one another because of their like electrical charge. The brighter the color, the more electrons are being fired at the screen, which will mean more electrons repelling one another. The opposite is true of darker colors - fewer electrons repelling one another. Together these lines create screen-distortion.

Suggestions:

- Invest in a really cheap TV for distortion testing - the kind you get at a super market, not at Best Buy.
- Avoid using bright and dark colors together, especially with thin and/or straight lines.

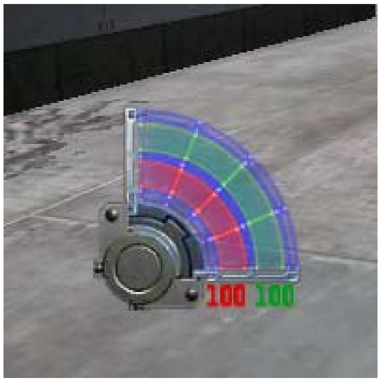
Screen Legibility

Text is such a common part of our daily lives that we rarely stop to notice just how complex it really is. Just think of how many polygons it would take to render a letter like “Q”. There is a reason why you never see “Books On TV” - you would go blind trying to read that much text on a TV. Televisions were never designed for reading text on screen. A console developer must always test for legibility of the UI on a television, especially when concerning fonts.

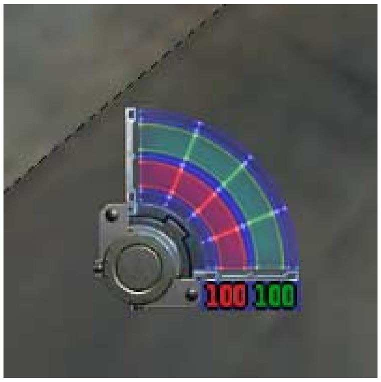
Concerning Fonts

- The larger and thicker the text, the easier it will be to read. It’s better to have the player page down than to try and fit it all on one screen with a smaller font size.
  If you can read this then you are straining your eyes ☺
- Try to make all your letter characters the same size. That will make it easier to manage long text strings.
- Avoid using lowercase letters as they are more difficult to read. Lowercase letters are also more difficult to manage since their sizes vary so much. Instead, try using smaller versions of uppercase letters.
- Consider using an outline for the font. It may not look as clean, but it can go a long way towards making your text easier on the eyes.

HUD Readouts in *Jedi Academy (Xbox)*



Before

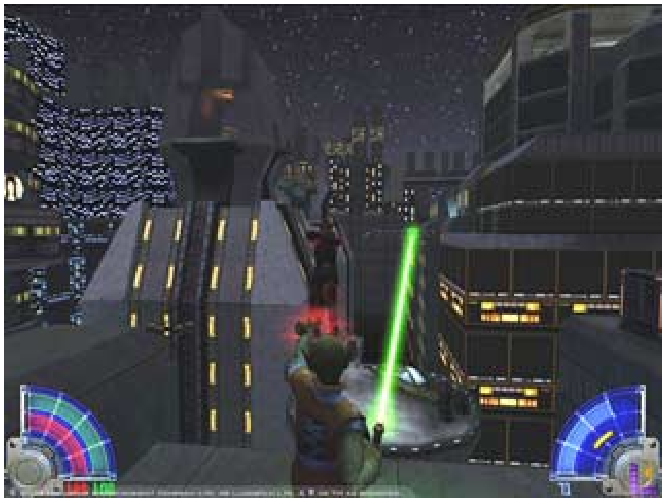


After

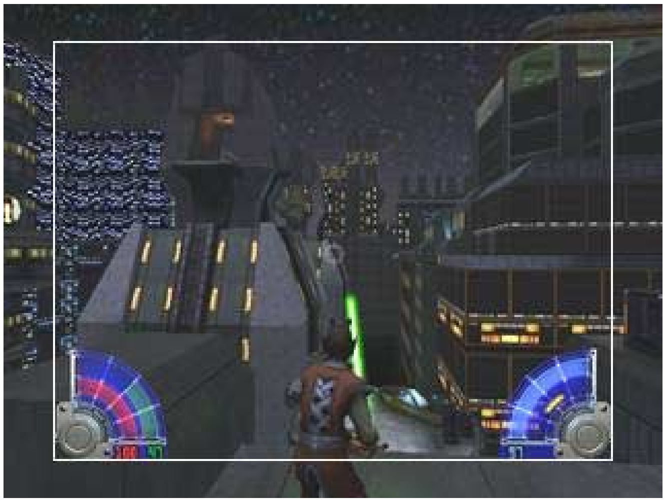
Over-Scanning

TVs tend to over-scan their screen area, which means the picture on the screen is a little larger than the display. How much the TV over-scans varies from TV to TV. To compensate, console manufactures (e.g. Sony, Microsoft, Nintendo) require that the edges of the screen not contain any important information. That means things like a heads up display, dialog boxes and UI elements must remain within the confines of a safe region. Sony, Microsoft, and Nintendo have different requirements, but none of them have restrictions on being too cautious. Microsoft requires that an Xbox title have a safe region that uses only the middle 85% of the screen (544x408) making it the most conservative. We have yet to find a TV that this safe region won’t compensate for. (Note: The safe region is different for HDTV)

Jedi Knight: Jedi Academy



PC



Xbox

The pictures above illustrate the impact the safe region (added outline) had on Jedi Academy. Note the difference it made to the HUD.

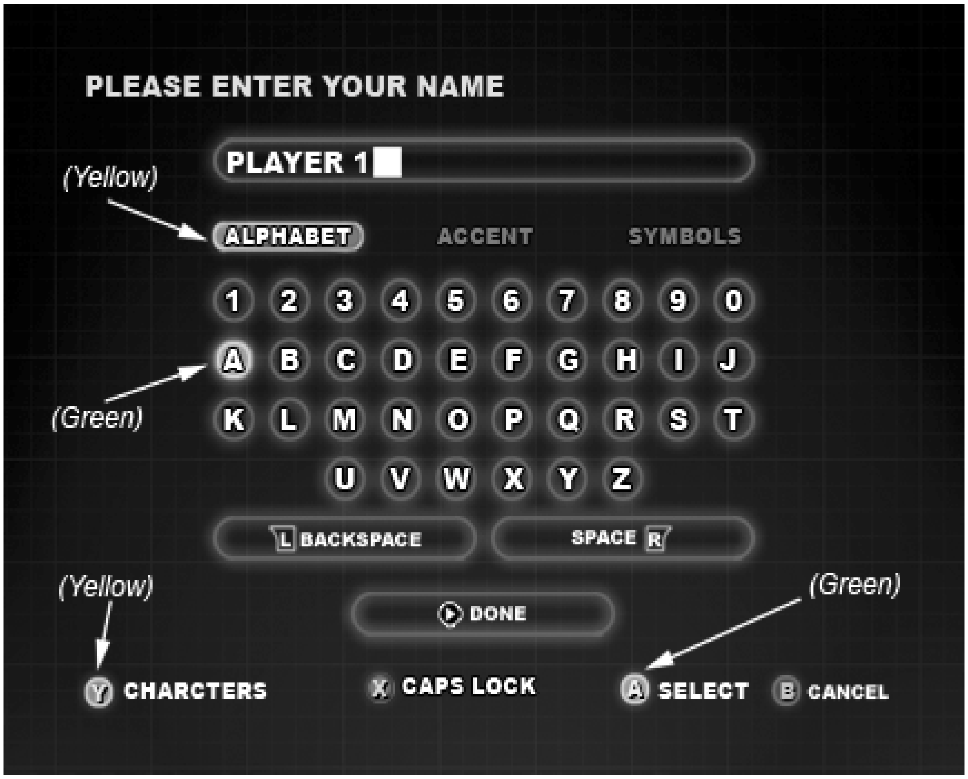
A Note on Technical Requirements
Games that do not meet manufacturers’ technical requirements (such as conforming to the safe region) are not allowed to be published. Manufacturers do grant exceptions, but generally not for any really significant violations.

Input Devices

> *"The keyboard and mouse give you near instant response and near exact control. The controller is a far less precise, far more...well...leisurely input device."*
> - Warren Spector

The Soft Keyboard

Since no major console comes with a keyboard and some don't even support them, console games rely on a software solution for text input. Console developers have taken many different approaches toward soft keyboard design. Microsoft, however, has done usability testing on the subject which showed that players overwhelmingly preferred a horizontal, alphabetic layout over other virtual keyboard designs.



PLEASE ENTER YOUR NAME

PLAYER 1

The picture above shows a soft keyboard design for an Xbox title that has a number of advantages:

- Because the design resembles the look of an actual keyboard, people will instantly understand its purpose.
- Arranging the letters alphabetically is faster since any literate gamer will know the order of the letters. (QWERTY is based on motor memory, not visual)

- By splitting off the alphabet, symbols, and accents (for European languages) into three different keyboards, the user isn't bombarded with a large number of choices to make. Having fewer keys also minimizes cursor travel.
- Common functions such as "Done" (for accepting the entered text), Space, Backspace, Caps Lock, and switching between character sets are mapped to available buttons on the controller.
- Assigning Space and Backspace to the left and right shoulder buttons creates a natural mapping (Space moves to the right, and backspace moves to the left). They are also easy to use simultaneously with the "A" button and thumbstick/D-pad.

From Mouse to Controller

On PC games, the player uses a mouse pointer to precisely select the item they want. On a console, however, the player has to use the D-pad or thumbstick to cycle through the entire menu until they get to the item they want. It is therefore very important to make the UI menus as efficient as possible. Below are some guidelines to consider:

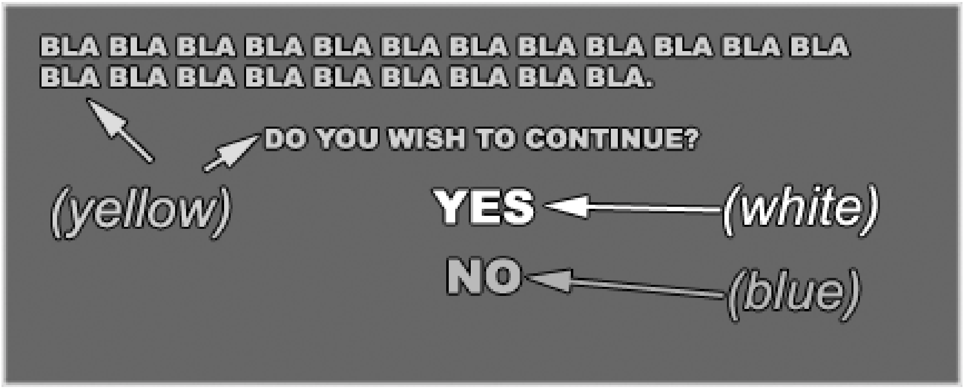
- Make sure that anything you put in the UI is absolutely necessary. Always ask if adding a particular UI screen will add to the player's enjoyment.
- Avoid having a menu so long that all the items can't fit on the screen and requires the player to scroll.
- Absolutely make sure that menu navigation is fast, and when I say fast, I mean instant. Screen transition animations are one thing, but having to wait a second between each menu item is incredibly frustrating and totally unnecessary.
- Use a cursor that blatantly draws attention to the currently selected menu item.
- Try to keep your menus vertical and cyclic.
    - Vertical menus can fit around 6 to 8 buttons typically and, since each button appears on its own line, are easier to read.
    - Horizontal menus allow for fewer buttons and could prove a real pain when localizing in different languages. Another drawback is less distinction between menu items, since they are all on the same line.
    - A cyclic menu is one that allows the menu to loop. This can make navigation more efficient.

THE DESIGN OF EVERYDAY USER INTERFACE

Donald Norman's The Design of Everyday Things is a must read for anyone that develops user interfaces. It points out things in our everyday environments that are poorly designed and don't need to be. This book is all about designs that effect our every day lives such as doors that you push that actually have to be pulled or car stereos with the "mute" button right next to the "increase volume" button. This section will take a similar approach towards the design of a game's user interface.

Get a Clue!

"The human mind is exquisitely tailored to make sense of the world. Give it the slightest clue and off it goes, providing explanation, rationalization, understanding."
- Donald Norman



BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA.

DO YOU WISH TO CONTINUE?

Here is a UI problem that just about every gamer has faced once or twice: a menu with only two items and no clear explanation of which item is currently selected. Let's break down the rationalizations a player might have when faced with a screen like this:

- If the player is not familiar with console games, they may have no idea which button to press on the controller.
- Since the two menu items are different colors, one of the items is selected and the other is not.
- The yellow body text is different from the menu text, so no clues there.
- The menu items are on top of one another, so the player can assume that the Directional Pad or thumbstick is pushed up and down rather than left and right.
- When the player pushes up and down on the D-Pad, the colors of the menu items are swapped.

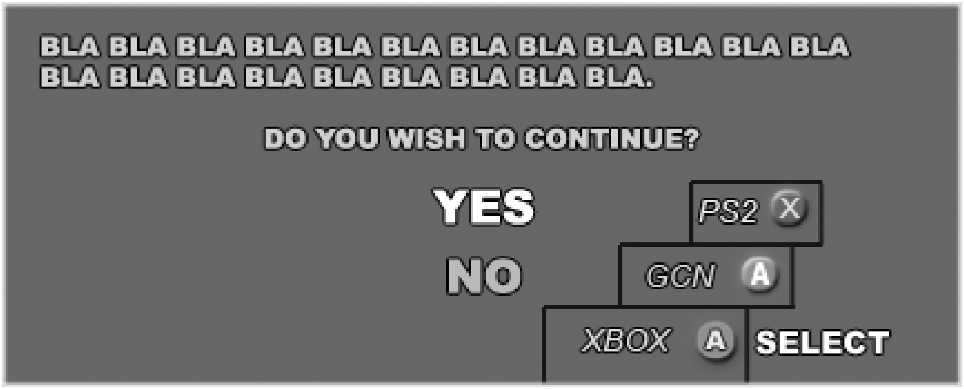
- One of the words is in white so that could imply that it's lit up. The other item is blue which could mean that it is off. But the reverse is just as likely.

So the player is left with two options: scan the manual for more clues or press any button on the controller and hope for the best.

The player presses the D-pad up, which makes "Yes" appear blue, and presses a button. The player ends up at the screen they were at previously. There was no feedback communicating that they moved back in the UI stack (for example a unique sound effect), but the player knows it's the previous screen because they remember what it looked like. With these clues they are able to deduce that *white text* is the selected item and blue is not. Now that the player understands the selection system, they get through the UI with greater ease and start playing the game.
In reality, this only took a few seconds to figure out, but it's still irritating. It wouldn't have taken all that much effort on the part of the UI designer to correct this kind of confusion.

Provide Instructions

"One of the most important principles of design is visibility. The correct parts must be visible, and they must convey the correct message."
- Donald Norman

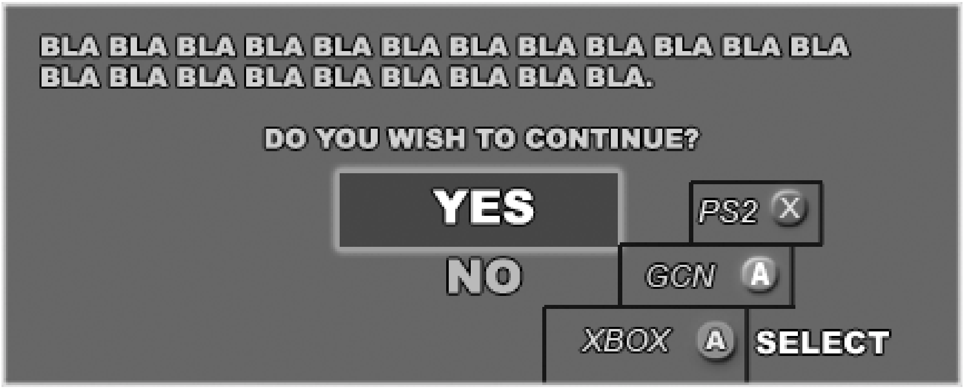

BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA.

DO YOU WISH TO CONTINUE?

For starters, it would help to give the player some instruction on how to make a choice. Insert a callout that consists of a brief text string that explains its mapped function, and an icon of the button to which the function is mapped. The icon should represent the button in color and shape. For some consoles, this is a requirement.

Provide Feedback

"Feedback: sending back to the user information about what action has actually been done. Imagine trying to draw a picture with a pencil that leaves no mark: there would be no feedback."
- Donald Norman



BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA.

DO YOU WISH TO CONTINUE?

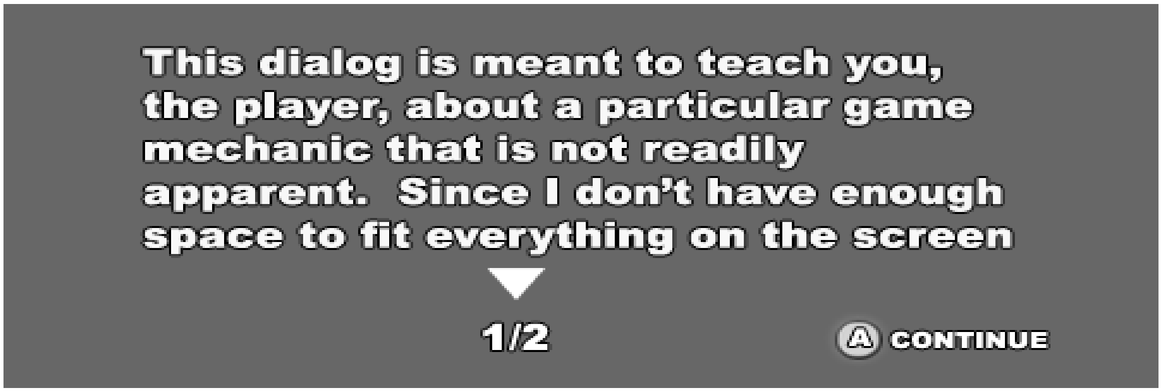
A cursor is an effect or collection of effects that are applied to the selected item that provides visual feedback to the player's actions. In the original example of this UI screen, the cursor's only effect was a color swap of the text. This may work in menus of three or more items, but is ineffective in a menu with only two.   A more refined cursor object, such as a glow effect and a shape that encompasses the text, is necessary.

Sound effects are also excellent for providing additional feedback for the player's actions. In addition don't underestimate the power that good sound effects can have on the player's enjoyment.

The Credo of Errors

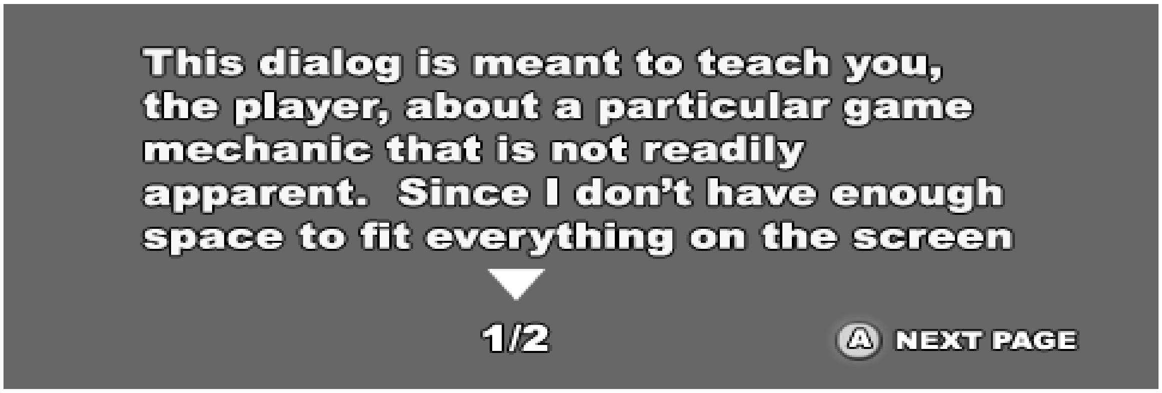
"If an error is possible, someone will make it. Errors should be easy to detect, they should have minimal consequences, and, if possible, their effects should be reversible."
- Donald Norman

All major console manufacturers require that any destructive action, such as overwriting a game save, have a confirmation dialog to allow the player to back out of a potential mistake. However, there are other kinds of irreversible actions that can still hinder a player's experience even if they are not as costly as losing a save game.



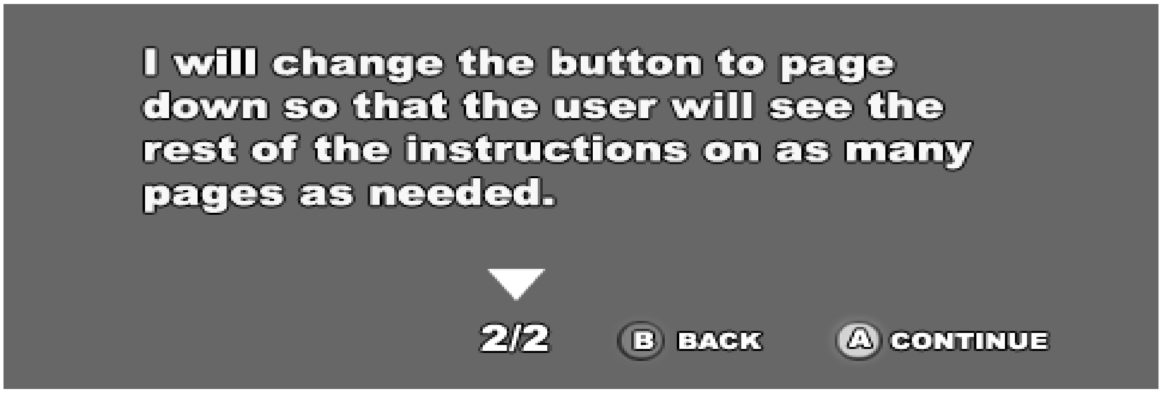
This dialog is meant to teach you, the player, about a particular game mechanic that is not readily apparent. Since I don't have enough space to fit everything on the screen

The example above shows an example of a training dialog that is meant to teach the player about a particular aspect of a game. The down arrow and page counter under the paragraph illustrate that there is a second page of information that the player can view by pressing down on the D-pad or thumbstick. Should the player press the "A" button, they will close the dialog box and miss the information on the second page. This design gives the player the ability to make this mistake. Below is an alternate approach to the same dialog that resolves this problem.



This dialog is meant to teach you, the player, about a particular game mechanic that is not readily apparent. Since I don't have enough space to fit everything on the screen

By binding the "A" button to move to the next page, in addition to the D-pad "down" button, it forces the player to see all the information, instead of closing the dialog and missing it.

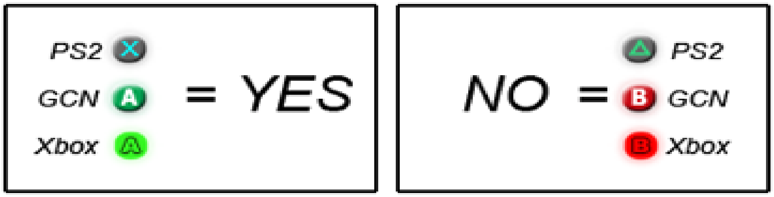


I will change the button to page down so that the user will see the rest of the instructions on as many pages as needed.

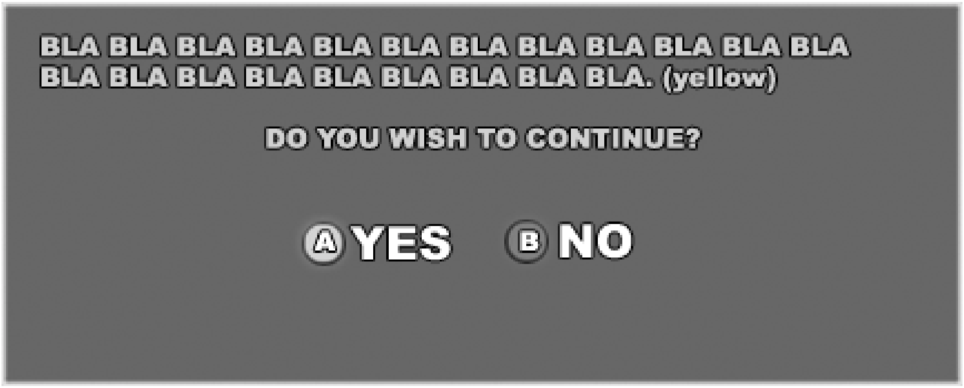
Once the player has seen all the screens, the “A” button will now close the dialog and return to the game. Pushing up and pressing the “B” button allows the player to return to the previous page if neccessary.

Confirmation Dialogs Don’t Have to be Menus

Confirmation dialogs are a requirement for a number of situations, on all major consoles. The choices illustrated here are “Yes” and “No”. Another way to think of them is “Positive” and “Negative” or “On” and “Off”. These relationships are types of Booleans.



Most games map the same buttons for moving *forward* and *back* in the UI stack and some consoles require it. Therefore it’s conceivable that in the player’s mind, these buttons are for “positive” and “negative” actions. UI designers can take advantage of these associations as illustrated in the example below.



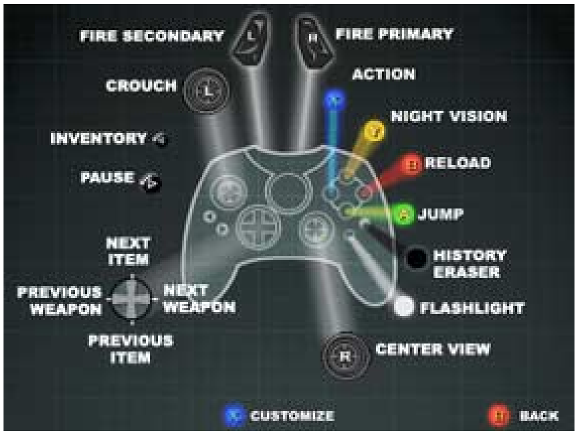
BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA BLA. (yellow)

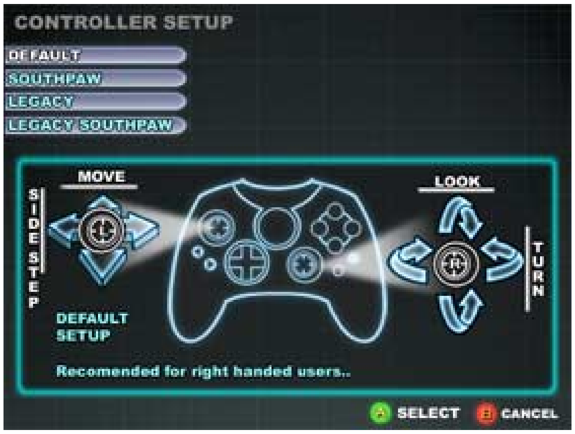
DO YOU WISH TO CONTINUE?

Rather than making the player press the D-pad to move a cursor to select their choice and then press a button, they just press a single button.

Break Things Down

It's important to keep the UI stack short, but it's just as important not to bombard the player with information. Trying to fit too much information on one screen can give a player mental indigestion. A common example of this problem is the controller mapping screen. Numerous games have functions mapped to every available button and try to fit it all on one screen. The example below shows a controller mapping for a first person shooter game that is broken down into two separate screens.





Recomended for right handed users..

Advantages

- Plenty of text breathing room for localization.
- The button icons are right next to their function instead of the function pointing to a button.
- Button Icons pointing to the controller help to establish mappings.
- Less information overload.

Advantages

- By separating the thumb-stick movement functions from the button functions, there will be no confusion with the thumb-stick buttons found on PS2 and Xbox controllers.
- Plenty of breathing room for text localization
- Less information overload.

FINAL THOUGHTS

Keep It Simple Stupid

While it's true that a good looking user interface is important, it should hardly be the focus of your technology. A UI is not an effective tech demo. A minimalist approach toward UI design allows the player to focus on the function, without getting distracted by the form.

Make It FUN!!!

Think of the opening credits for a movie. They tell the audience who did what in the movie, but filmmakers learned that it's also an opportunity to entertain the audience and set the mood for the rest of the film. If the player has fun with the user interface, it will only enhance their overall enjoyment when playing the game.

Source Material

Crash Nitro Kart
Publisher: Universal Interactive
Developer: Vicarious Visions

Jedi Knight: Jedi Academy (PC, Xbox)
Publisher: Activision
Developer: Raven, Vicarious Visions

The Design of Everyday Things
Author: Donald Norman

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