CS499  
Senior capstone project

Dungeon Warrior

Software Design Document

Version 2.0

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# Revision History

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| --- | --- | --- | --- |
| Date | Version | Description | Author |
| 29 June 2016 | 1.0 | Initial version of Dungeon Warrior’s Software Design Document | Randall Rowland |
| 18 July 2016 | 1.1 | Added interface graphic | Randall Rowland |
| 2 August 2016 | 1.2 | Added flow chart graphic and interface operations. | Randall Rowland |
| 23 August 2016 | 1.3 | Added UML and citations | Randall Rowland |
| 23 August 2016 | 1.4 | Swapped Flow Charts | Randall Rowland |
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# Introduction

The Software Design Document is a document to provide documentation which will be used to aid in software development by providing the details for how the software should be built. Within the Software Design Document are narrative and graphical documentation of the software design for the project including sequence diagrams, collaboration models, object behavior models, and other supporting requirement information.

## Purpose

The purpose of this software design document is to provide a low-level description of Dungeon Warrior, providing insight into the structure and design of each component. Topics covered include the following:

* Class hierarchies and interactions
* Data flow and design
* Processing narratives
* Algorithmic models
* Design constraints and restrictions
* User interface design
* Test cases and expected results

In short, this document is meant to equip the reader with a solid understanding of the inner workings of Dungeon Warrior.

## Goals and Objectives

Dungeon Warrior is a single, comprehensive programming project using the C++ programming language. The goal is a proof of concept program to demonstrate learning objectives learned throughout American Sentinel University’s Bachelor of Science in Computer Science Game Programming Specialization degree program. Dungeon Warrior will incorporate the learning objectives from:

* CS130 – Introduction to Computer Programming
* CS205 – Intermediate Computer Programming
* CS221 – Software Engineering
* GP210 – Introduction to Game Design
* GP221 – Introduction to Game Programming
* GP312 – Computer Graphics Programming
* GP435 – Artificial Intelligence for Gaming

The objectives of Dungeon Warrior:

* Apply software engineering techniques to a larger-scale problem
* Integrate appropriate computer science theory, concepts, and methods
* Demonstrate proper documentation
* Display comprehensive programming knowledge

## Definitions, Acronyms, and Abbreviations

* **ADT –** Abstract Data Type. A collection of data values together with a set of well-specified operations on that data.
* **AI** – Artificial Intelligence.
* **API** – Application Program Interface
* **Collision** – Determining if an object has intersected another object or overlapped relevant background scenery.
* **DirectX** - a collection of APIs for handling tasks related to multimedia, especially game programming and video, on Microsoft platforms.
* **Object** – Is a data structure that has state (data) and behavior (code). Objects correspond to things found in the real world.
* **OOP** – Object Oriented Programming. Programming language model organized around objects rather than “actions” and data rather than logic.
* **OpenGL** - Open Graphics Library (OpenGL) is a cross-language, cross-platform API for rendering 2D and 3D vector graphics.
* **Scholarship** – Academic study or achievement; learning of a high level
* **SDD** – Software Design Document.
* **UML** – Unified Modeling Language. For definition and uses, see <http://www.uml.org/what-is-uml.htm>

## References

Christopho. (2016, January 25). Zelda ALTTP resource pack for Solarus. Retrieved June 29, 2016, from <https://github.com/christopho/solarus-alttp-pack>

Customan. (2012, November 20). Folder Games Icon. Retrieved July 18, 2016, from <http://www.iconarchive.com/show/christmas-icons-by-custo-man/Folder-Games-icon.html>

Morrison, M. (2005). Beginning game programming. Indianapolis, IN: SAMS.

Schell, J. (2008). *The art of game design: A book of lenses*. Amsterdam: Elsevier/Morgan Kaufmann.

## License

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(3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and

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# Design Overview

## Introduction

The Design Overview is section to introduce and give a brief overview of the design. The System Architecture is a way to give the overall view of a system and to place it into context with external systems. This allows for the reader and user of the document to orient themselves to the design and see a summary before proceeding into the details of the design.

## Technologies Used

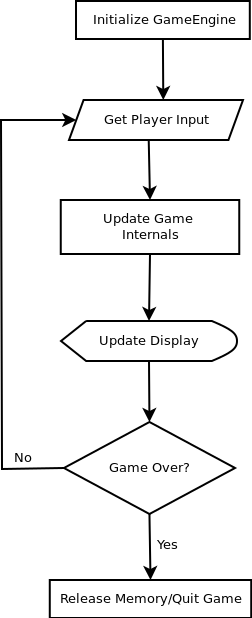
### Hardware

* Hewlett-Packard ProBook 640G1
  + Intel® Core™ i3-4000M
  + 8 GB Ram
  + Windows 7 Enterprise SP1 (64-bit)
* Lenovo X1 Carbon
  + Intel® Core™ i7-5667U
  + 8 GB Ram
  + Ubuntu 16.04 LTS (64-bit)
* Alienware Mx11-R2
  + Intel® Core™ i7
  + 8 GB Ram
  + Windows 7 Home Edition SP1 (64-bit)
* Custom Desktop PC
  + AMD Phenom
  + 16 GB Ram
  + Ubuntu 16.04 LTS (64-bit)

### Software

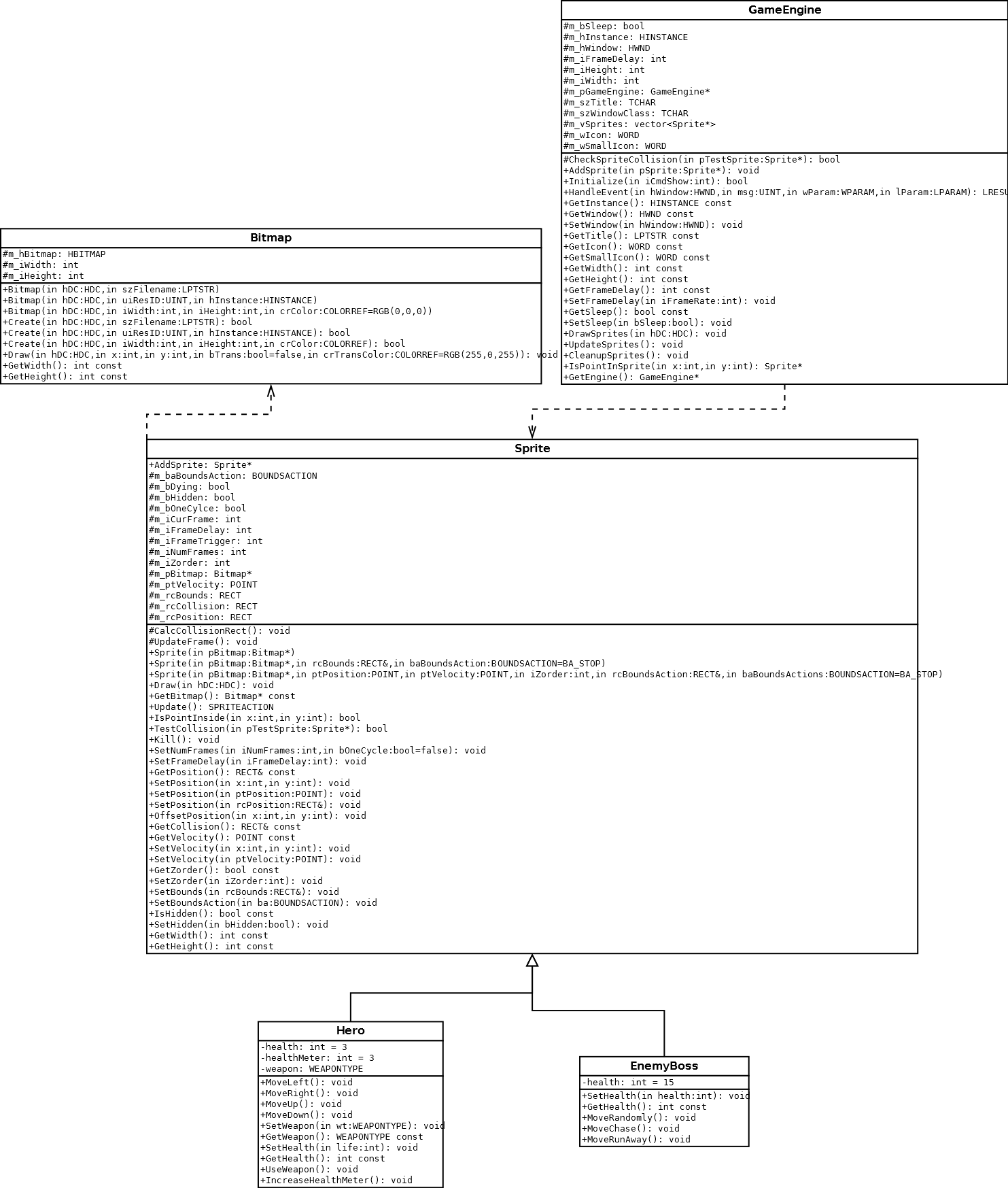
* Microsoft Visual Studio Community 2015 (Version 14.0.25421.03 Update 3)
* Microsoft Visual Studio Code
* Microsoft Office 2016 Professional Plus
* Atlassian SourceTree
* Pinta 1.6
* Microsoft Word 2013
* Syntevo GmbH SmartGit 7.1
* Dia 0.97.3
* Geany 1.27
* GitKraken
* Doxygen 1.8.11

## System Architecture

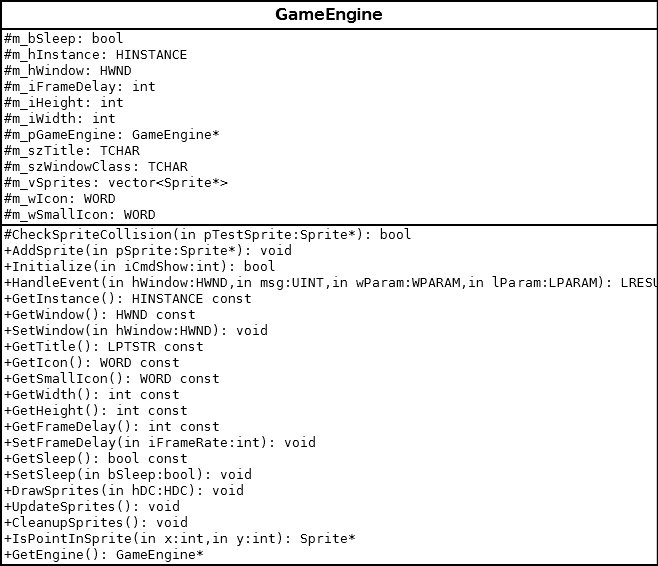


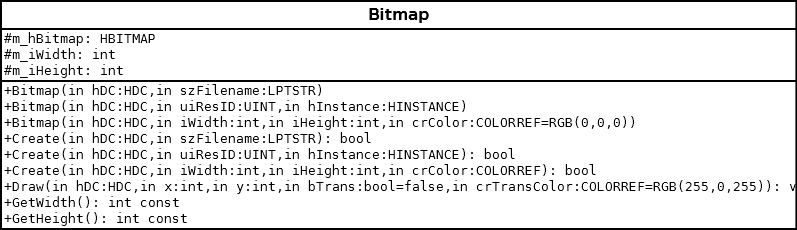
## System Interfaces and Operation

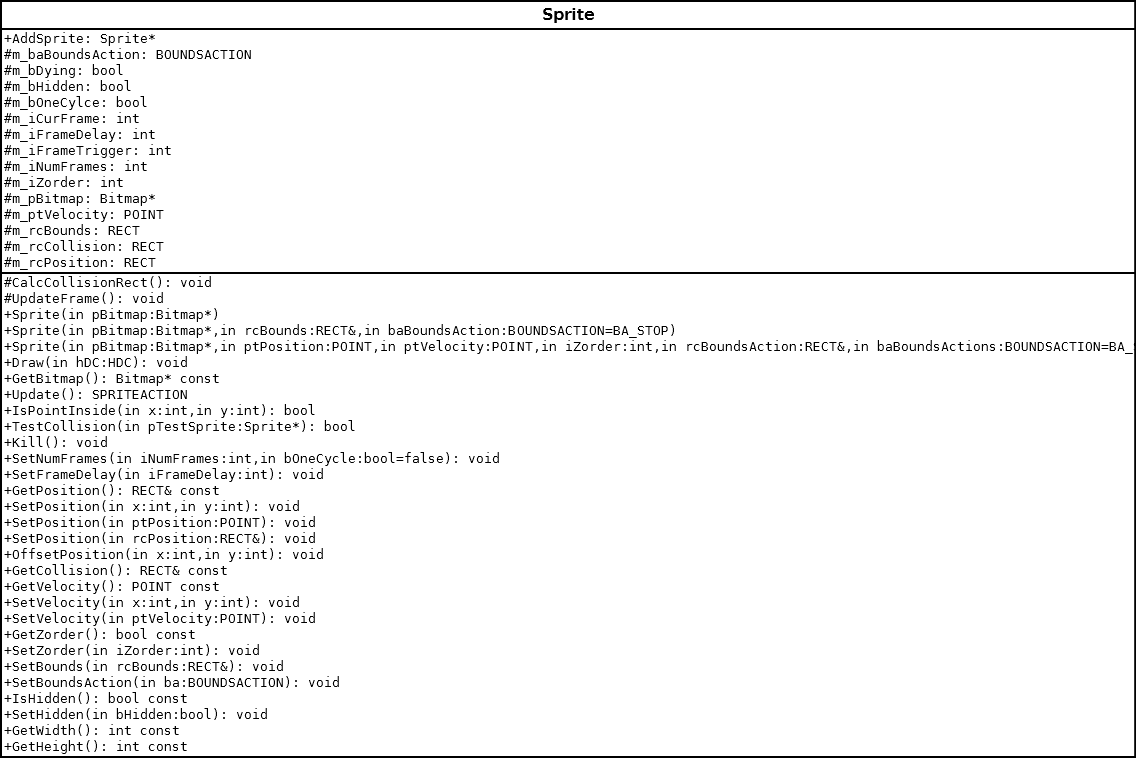
Overview of how the system interacts with one another.

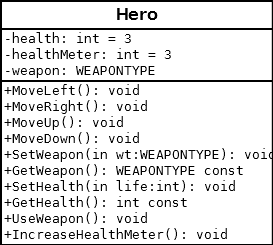
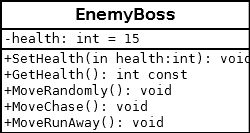


The following is a close up of each class of UML:







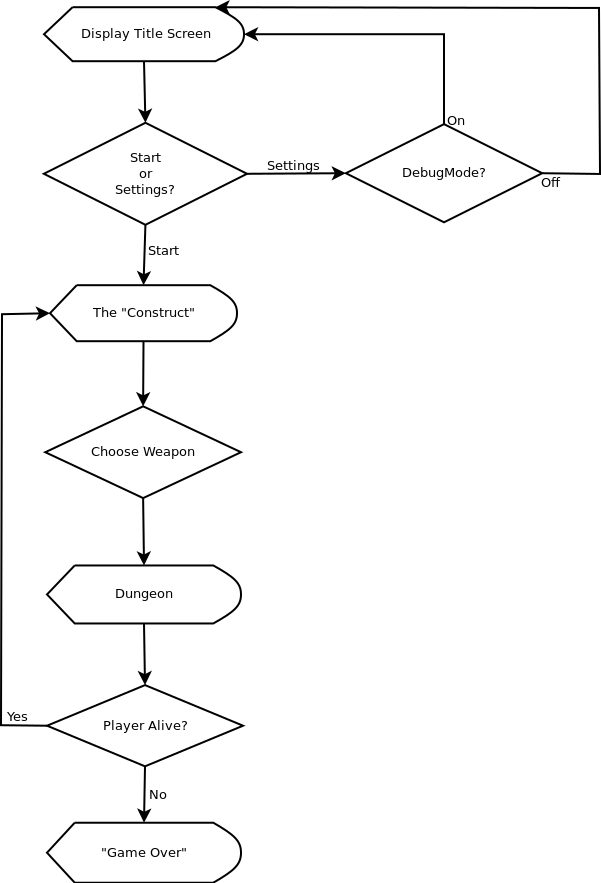
## Constraints and Assumptions

Due to the learning curve and ever changing technology of Microsoft’s DirectX API and OpenGL API, this game was programmed using just Microsoft’s Windows API. Although, DirectX or OpenGL would provide a more robust game, the eight-week time constraint on the project makes using those APIs near impossible. I would also have to test it out on more machines and see which dependencies would have to be included to ensure it runs. The assumption is that by using the Windows API, this game should run on any modern Windows version.

# User Interface Design

## Description of the User Interface

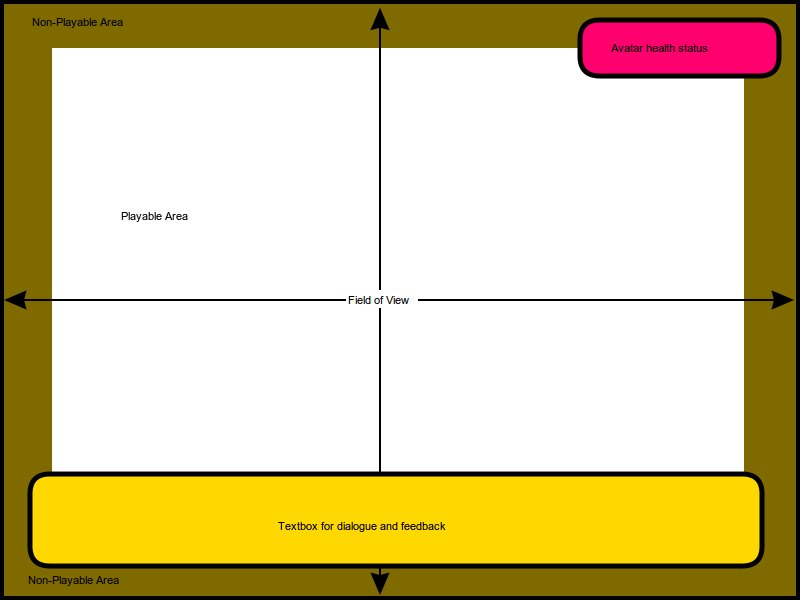
**Title Screen.** The will show a beautiful graphical background with text over the top show casing the title of the game, “Dungeon Warrior“. Towards the bottom of the title screen will be two items that will be selectable by using the arrow keys to highlight one of the items and using ‘Enter’ or ‘Space Bar’ to select it. The two items will be graphical text that states: “Start Game” or “Settings”.  
**The “Construct”.** This is where the game will start off at. The name comes from The Matrix. In The Matrix, the Construct is a virtual workspace that is used as their loading program. They are able to load virtual objects that are then used within The Matrix. This same concept applies here. When the game starts off you will be in an empty room where an old man will greet you. If you know about The Hero’s Journey concept, this old man is the Mentor. He will tell you to choose one of the three weapons in front of you, which will be a bow with arrows, a sword, and a boomerang. Once you select one and confirm your selection, you will be transported to the dungeon. The arrow keys will move the player around and the ‘Spacebar’ will be used to make selections. “This…is the Construct. It’s our loading program. We can load anything, from clothing…to equipment...weapons…training simulations…anything we need.” -Morpheus  
**Dungeon.** Inside the dungeon is where the player will battle enemies using the weapon they chose from The Construct. Once all the enemies are defeated they will be transported back to The Construct to switch weapons if they choose to. Each time the player defeats all the enemies and returns from The Construct, the dungeon will increase difficulty. More enemies or a completely different enemy or a combination of both will happen each time the play enters the dungeon. If the player is unable to defeat the enemies and dies, the game ends and will display the game over screen. The player will use the arrow keys and ‘Spacebar’ on the keyboard to control their avatar. The arrow keys will move the player around and the ‘Spacebar’ will activate the avatar’s weapon.  
**Game Over.** If the player is unable to defeat the enemies in the dungeon and dies. The game over screen will appear to let the player know how many waves of enemy they were able to defeat. From this screen they can press ‘Enter’ or ‘Spacebar’ and the game will release resources from memory and close the program.  
**Settings.** When settings are selected from the title screen, a pop-up balloon style window will appear. At the top of the window will be text that says, ‘DEBUG’. Below that will be text that will say ‘ON’ and ‘OFF’. Default when the program starts will be set to off. No matter which one is selected, the window will close and you will be presented with the Title Screen again. If debug is set to on, the frames per second will be displayed in the corner and boundary boxes around sprites will display so you can see collisions. The player will be able to select on or off using the arrow keys and confirming the selection with the spacebar.



## Interface Design Rules

The interface design rules for Dungeon Warrior are derived from The Art of Game Design. I used the Lens of Simplicity and Transcendence, Lens of The Hero’s Journey, Lens of Status, Lens of Action, Lens of Goals, Lens of Virtual Interface, and Lens of the Avatar.

## Objects and Actions



This is a general layout of how the user interface will look. Proportions may not be exact in the final product. End user will interact with the user interface and avatar using the arrow keys and space bar on the keyboard. **Field of View:** Inside of the Field of View will be a set size and the end user will not be able to change the size to ensure correct aspect ratio and view. Field of View will be contained within the Window and will not scroll.  
**Non-Playable Area:** Inside of that window will be a border. Border will use wall type graphic to give the illusion the avatar is in a room. This is depicted above with the brown/bronze color and labeled as a Non-Playable Area. This will stop the avatar from “walking” off the screen. Although depicted all the way to the edge of the Field of View, this is only an example. Some levels may be smaller and have a smaller Playable Area.  
**Playable Area:** The avatar will be able to move anywhere within the white area or Playable area. Border will prevent avatar from accessing non-playable areas. EXCEPTION: Elements may be added to the playable area to give an aesthetic look and challenge the avatar. The avatar may or may not be able to “walk” through those elements.  
**Textbox:** This portion depicted with the yellow/gold box above will not be visible all the time. This will be a popup box when the avatar is interacting with other entities. When this popup box appears, all elements within the Playable Area will pause. The main focus will be on the textbox and the end user will only be able to interact with the textbox until it is complete and goes away. Then the Playable Area will resume normal game play.  
**Avatar Health Box:** The pink box depicted in the top right corner will be sometime of floating health meter to provide the avatars health status to the end user. This will be visible at all times during game play.

# Class Documentation

## Bitmap Class Reference

Takes a bitmap and turns it into a Bitmap object that will be drawn to the screen.

#include *<*Bitmap.h*>*

### Public Member Functions

* Bitmap ()

*Empty contructor that sets width and height to 0, and handle to NULL.*

* Bitmap (HDC, LPTSTR)
* Bitmap (HDC, UINT, HINSTANCE)
* Bitmap (HDC, int, int, COLORREF crColor=RGB(0, 0, 0))
* virtual ∼Bitmap ()

*A destructor that calls the Free() helper fuction to delete the object.*

* bool Create (HDC, LPTSTR)
* bool Create (HDC, UINT, HINSTANCE)
* bool Create (HDC, int, int, COLORREF)
* void Draw (HDC, int, int, bool bTrans=false, COLORREF crTransColor=RGB(255, 0, 255))
* int GetWidth () const

*Returns the width of the bitmap.*

* int GetHeight () const

*Returns the height of the bitmap.*

* void DrawPart (HDC, int, int, int, int, int, int, BOOL, COLORREF)

### Protected Member Functions

• void Free ()

*A helper fuction that deletes the Bitmap object and releases the handle from memory.*

### Protected Attributes

* HBITMAP m\_hBitmap

*The handle to the bitmap and its copy of image bits.*

* int m\_iWidth

*The width in pixels of the bitmap.*

* int m\_iHeight

*The height in pixels of the bitmpa.*

### 4.1.1 Detailed Description

Takes a bitmap and turns it into a Bitmap object that will be drawn to the screen.

There are four different types of constructors used to create a Bitmap object. You can draw the bitmap with or without transparency. Also allows only a part of a Bitmap to be drawn. This can be use full if you have 'frames' that could allow animation or if you want to just use a tilesheet for several images.

### 4.1.2 Constructor & Destructor Documentation

#### 4.1.2.1 Bitmap::Bitmap ( HDC *hDC,* LPTSTR *szFileName* )

Constructor that

#### Parameters

|  |  |
| --- | --- |
| *hDC* | The handle to the screen context device |
| *szFileName* | The file of the bitmap the Bitmap object will be created from |

#### 4.1.2.2 Bitmap::Bitmap ( HDC *hDC,* UINT *uiResID,* HINSTANCE *hInstance* )

Constructor that

#### Parameters

|  |  |
| --- | --- |
| *hDC* | The handle to the screen context device |
| *uiResID* | The ID of the bitmap from the resource file |
| *hInstance* |  |

#### 4.1.2.3 Bitmap::Bitmap ( HDC *hDC,* int *iWidth,* int *iHeight,* COLORREF *crColor =* RGB(0, 0, 0) )

Constructor that

#### Parameters

|  |  |
| --- | --- |
| *hDC* | The handle to the screen context device |
| *iWidth* |  |

#### Parameters

|  |  |
| --- | --- |
| *iHeight* |  |
| *crColor* |  |

### 4.1.3 Member Function Documentation

#### 4.1.3.1 bool Bitmap::Create ( HDC *hDC,* LPTSTR *szFileName* )

Used to update the object with bitmap info if empty constructor was used.

#### Parameters

|  |  |
| --- | --- |
| *hDC* | The handle to the screen context device |
| *szFileName* | The file of the bitmap the Bitmap object will be created from |

#### 4.1.3.2 bool Bitmap::Create ( HDC *hDC,* UINT *uiResID,* HINSTANCE *hInstance* )

Used to update the object with bitmap info if empty constructor was used.

#### Parameters

|  |  |
| --- | --- |
| *hDC* | The handle to the screen context device |
| *uiResID* | The ID of the bitmap from the resource file |
| *hInstance* |  |

#### 4.1.3.3 bool Bitmap::Create ( HDC *hDC,* int *iWidth,* int *iHeight,* COLORREF *crColor* )

Used to update the object with bitmap info if empty constructor was used.

#### Parameters

|  |  |
| --- | --- |
| *hDC* | The handle to the screen context device |
| *iWidth* |  |
| *iHeight* |  |
| *crColor* |  |

#### 4.1.4.4 void Bitmap::Draw ( HDC *hDC,* int *x,* int *y,* bool *bTrans =* false*,* COLORREF *crTransColor =* RGB(255, 0, 255) **)**

Draws the bitmap to the screen

#### Parameters

|  |  |
| --- | --- |
| *hDC* | The handle to the screen context the bitmap will be drawn on |
| *X* | The X coordinate of the screen where to start drawing the bitmap |
| *Y* | The Y coordinate of the screen where to start drawing the bitmap |
| *bTrans* | If true, the bitmap has transparency. Default is no transparency |
| *crTransColor* | The color that will not be drawn to the screen to give transparency |

#### 4.1.4.5 void Bitmap::DrawPart ( HDC *hDC,* int *x,* int *y,* int *xPart,* int *yPart,* int *wPart,* int *hPart,* BOOL *bTrans,* COLORREF *crTransColor* )

Only draws part of a bitmap to the screen. Can be used for tilesheets or animation frames.

#### Parameters

|  |  |
| --- | --- |
| *hDC* | The handle to the screen context the bitmap will be drawn on |
| *X* | The X coordinate of the screen where to start drawing the bitmap |
| *Y* | The Y coordinate of the screen where to start drawing the bitmap |
| *xPart* | The X pixel of the bitmap to start drawing |
| *yPart* | The Y pixel of the bitmap to start drawing |
| *wPart* | The width in pixels used to draw from xPart |
| *hPart* | The height in pixels used to draw from yPart |
| *bTrans* | If true, the bitmap has transparency. Default is no transparency |
| *crTransColor* | The color that will not be drawn to the screen to give transparency |

The documentation for this class was generated from the following files:

* seniorcapstone/CapstoneProject/CapstoneProject/Bitmap.h
* seniorcapstone/CapstoneProject/CapstoneProject/Bitmap.cpp

## 4.2 EnemyBoss Class Reference

Extends the Sprite class to give enemies extra variables and methods special to them.

#include *<*EnemyBoss.h*>*

Inherits Sprite.

### Public Member Functions

* EnemyBoss (Bitmap ∗, RECT &, BOUNDSACTION)
* ∼EnemyBoss ()

*Empty.*

* void SetHealth (int)
* int GetHealth () const

*Gets the how much health is left of the enemy.*

* void MoveRandomly (int, int)
* void MoveChase (Sprite ∗)
* void MoveRunAway (Sprite ∗)

### Additional Inherited Members

### 4.2.1 Detailed Description

Extends the Sprite class to give enemies extra variables and methods special to them.

This class extends the Sprite class to give enemies health and movements.

### 4.2.2 Constructor & Destructor Documentation

#### 4.2.2.1 EnemyBoss::EnemyBoss ( Bitmap ∗ *pBitmap,* RECT & *rcBounds,* BOUNDSACTION *baBoundsAction =* BA\_STOP )

Creates an enemy sprite using the Bitmap/Sprite constructor

#### Parameters

|  |  |
| --- | --- |
| *pBitmap* | A pointer to the bitmap image |
| *rcBounds* | A rectangle to contain the movements of the sprite within it |
| *baBoundsAction* | The action that will be taken when the sprite hits the outter edge of the rcBounds rectangle |

**See also**

Sprite

### 4.2.3 Member Function Documentation

#### 4.2.3.1 void EnemyBoss::MoveChase ( Sprite ∗ *pSpriteToChase* )

Will have the sprite chase the Hero sprite\

#### Parameters

|  |  |
| --- | --- |
| *pSpriteToChase* | The pointer of the sprite you want this sprite to chase |

#### 4.2.3.2 void EnemyBoss::MoveRandomly ( int *x,* int *y* )

Will have the sprite move randomly on the screen

#### Parameters

|  |  |
| --- | --- |
| *x* | Width of the area you want the sprite to move in |
| *y* | Height of the area you want the sprite to move in |

#### 4.2.3.3 void EnemyBoss::MoveRunAway ( Sprite ∗ *pAvoidSprite* )

Will have the sprite avoid another sprite

#### Parameters

|  |  |
| --- | --- |
| *pAvoidSprite* | The pointer of the Sprite to avoid |

#### 4.2.4.4 void EnemyBoss::SetHealth ( int *iHealth* )

Sets the health of the enemy so it can take multiple collisions before dying

#### Parameters

|  |  |
| --- | --- |
| *iHealth* | The health in which you want the enemy to have |

The documentation for this class was generated from the following files:

* seniorcapstone/CapstoneProject/CapstoneProject/EnemyBoss.h
* seniorcapstone/CapstoneProject/CapstoneProject/EnemyBoss.cpp

## 4.3 GameEngine Class Reference

The GameEngine class is used to encapsulate Window types, functions, and WinMain.

#include *<*GameEngine.h*>*

### Public Member Functions

* GameEngine (HINSTANCE, LPTSTR, LPTSTR, WORD, WORD, int, int)
* virtual ∼GameEngine ()

*Changes the screen resolution back to what it was originally.*

* bool Initialize (int)
* LRESULT HandleEvent (HWND, UINT, WPARAM, LPARAM)
* void AddLoadingSprite (Sprite ∗)
* void AddConstructSprite (Sprite ∗)
* void AddDungeonSprite (Sprite ∗) • void DrawLoadingSprites (HDC)
* void DrawConstructSprites (HDC)
* void DrawDungeonSprites (HDC)
* void UpdateLoadingSprites ()

*Expands the Sprite vector if necessary, updates the sprites positions, checks to see if a sprite was added or dying, and finally checks for collisions.*

* void UpdateConstructSprites ()

*Expands the Sprite vector if necessary, updates the sprites positions, checks to see if a sprite was added or dying, and finally checks for collisions.*

* void UpdateDungeonSprites ()

*Expands the Sprite vector if necessary, updates the sprites positions, checks to see if a sprite was added or dying, and finally checks for collisions.*

* void CleanupSprites ()

*Transverses the Sprite vector to delete Sprite objects from memory.*

* Sprite ∗ IsPointInSprite (int, int)
* HINSTANCE GetInstance () const

*Returns the handle of the instance.*

* HWND GetWindow () const

*Returns the handle of the window.*

* void SetWindow (HWND)
* LPTSTR GetTitle ()

*returns the string of the game title*

* WORD GetIcon () const

*returns the icon that will be shown in the task bar*

* WORD GetSmallIcon () const

*returns the little icon that will be shown in the title bar*

* int GetWidth () const *returns the width of the of the window*
* int GetHeight () const *returns the height of the window*
* int GetFrameDelay () const *returns the an interger value used to set a frame delay to slow the game down*
* void SetFrameRate (int)
* bool GetSleep () const

*Returns true if the game is paused.*

* void SetSleep (bool)
* void SetScreenResolution ()

*Sets the screen resolution to 800x600.*

### Static Public Member Functions

* static GameEngine ∗ GetEngine ()

*Returns the pointer of the GameEngine.*

**Protected Member Functions**

* bool CheckSpriteCollision (Sprite ∗)

### Protected Attributes

* HINSTANCE m\_hInstance

*Stores the handle to the instance of the GameEngine object.*

* HWND m\_hWindow

*Handle to the window.*

* TCHAR m\_szWindowClass [32]

*Used to store the name of the WindowClass that will register with Task Manager.*

* TCHAR m\_szTitle [32]

*Used to store the name of the title that will be displayed in the title bar of the window.*

* WORD m\_wIcon

*Used to hold the icon that will display on the task bar.*

* WORD m\_wSmallIcon

*Used to hold the icon that will display on the title bar of the window.*

* int m\_iWidth

*The width in pixels of the game size. NOT the window size.*

* int m\_iHeight

*The Height in pixels of the game size. NOT the window size.*

* int m\_iFrameDelay

*Used to slow down the GameEngine so humans can see what is happening on screen.*

* bool m\_bSleep

*Used to hold the status of the GameEngine. To pause or unpause.*

* vector*<* Sprite ∗*>* m\_vLoadingSprites
  1. *vector to hold all the sprites. Easier to cycle through a vector to determine Sprites status.*
* vector*<* Sprite ∗*>* m\_vConstructSprites
  1. *vector to hold all the sprites. Easier to cycle through a vector to determine Sprites status.*
* vector*<* Sprite ∗*>* m\_vDungeonSprites
  1. *vector to hold all the sprites. Easier to cycle through a vector to determine Sprites status.*
* DEVMODE m\_devmode

*Data structure containing info about the display device. Used to change screen resolution.*

* long m\_lResult

*Holds the results of the DEVMODE changes.*

### Static Protected Attributes

• static GameEngine ∗ m\_pGameEngine = NULL

*The pointer to the GameEngine object.*

### 4.3.1 Detailed Description

The GameEngine class is used to encapsulate Window types, functions, and WinMain.

Creates a static pointer to itself. Sets up the window class, the window title, icons, and dimensions of the screen. Uses a loop to cycle through sprite updates and draw them. Sets the timing of the game and keeps status of the game. Handles keyboard input.

### 4.3.2 Constructor & Destructor Documentation

#### 4.3.2.1 GameEngine::GameEngine ( HINSTANCE *hInstance,* LPTSTR *szWindowClass,* LPTSTR *szTitle,* WORD *wIcon,* WORD *wSmallIcon,* int *iWidth =* 800*,* int *iHeight =* 640 )

Creates the game window and sets the window parameters. Changes the screen resolution to 800x600.

#### Parameters

|  |  |
| --- | --- |
| *hInstance* | A handle to an instance. This is the base address of the module in memory. |
| *szWindowClass* | The name of the Window class that is registered to Task Manager |
| *wIcon* | The name of the icon to use from resources file. Big icon that will show in task bar. |
| *wSmallIcon* | The name of the icon to use from the resources file. Little icon that will show in the title bar of the window. |
| *iWidth* | The width of the game in pixels. NOT the window size. |
| *iHeight* | The height of the game in pixels. NOT the window size. |

### 4.3.3 Member Function Documentation

#### 4.3.3.1 void GameEngine::AddConstructSprite ( Sprite ∗ *pSprite* )

Pushes a Sprite object into the Sprite vector

#### Parameters

|  |  |
| --- | --- |
| *A* | pointer to the Sprite that will be added to the vector |

**See also** m\_vSprites

#### 4.3.3.2 void GameEngine::AddDungeonSprite ( Sprite ∗ *pSprite* )

Pushes a Sprite object into the Sprite vector

#### Parameters

|  |  |
| --- | --- |
| *A* | pointer to the Sprite that will be added to the vector |

**See also** m\_vSprites

#### 4.3.3.3 void GameEngine::AddLoadingSprite ( Sprite ∗ *pSprite* )

Pushes a Sprite object into the Sprite vector

#### Parameters

|  |  |
| --- | --- |
| *A* | pointer to the Sprite that will be added to the vector |

**See also** m\_vSprites

#### 4.3.4.4 bool GameEngine::CheckSpriteCollision ( Sprite ∗ *pTestSprite* ) [protected]

Checks the Sprite object that is passed to it to determine if it has collided with another sprite or boundary

#### Parameters

|  |  |
| --- | --- |
| *pTestSprite* | A pointer of the Sprite to be tested |

##### 4.3.4.5 void GameEngine::DrawConstructSprites ( HDC *hDC* )

Transverses the Sprite vector calling each Sprite's Draw function in the Construct level **Parameters**

|  |  |
| --- | --- |
| *hDC* | Handle to the device context. |

#### 4.3.3.6 void GameEngine::DrawDungeonSprites ( HDC *hDC* )

Transverses the Sprite vector calling each Sprite's Draw function in the dungeon level.

#### Parameters

|  |  |
| --- | --- |
| *hDC* | Handle to the device context. |

#### 4.3.3.7 void GameEngine::DrawLoadingSprites ( HDC *hDC* )

Transverses the Sprite vector calling each Sprite's Draw function on the loading screen

#### Parameters

|  |  |
| --- | --- |
| *hDC* | Handle to the device context. |

##### 4.3.3.8 LRESULT GameEngine::HandleEvent ( HWND *hWindow,* UINT *msg,* WPARAM *wParam,* LPARAM *lParam* )

Routes Windows messages to GameEngine member functions. If message isn't used by GameEngine, it is passed back to Windows for handling.

#### Parameters

|  |  |
| --- | --- |
| *hWindow* | The handle to the window |
| *msg* | The message that is being passed |
| *wParam* | A parameter for which key is being pressed in keyboard messages |
| *lParam* | Not used. Will be passed back to Windows |

##### 4.3.3.9 bool GameEngine::Initialize ( int *iCmdShow* )

Used to setup the window and put the focus on it. Tests the results and if everything passes true that was loaded the game continues. If something fails, the game will terminate with an error.

#### Parameters

|  |  |
| --- | --- |
| *iCmdShow* | Sets how the window should be shown |

#### See also

Microsoft's MSDN site for iCmdShow values: <https://goo.gl/fIHb60>

#### 4.3.3.10 Sprite ∗ GameEngine::IsPointInSprite ( int *x,* int *y* )

Transverses the Sprite vector to see if the given point is within any of the Sprites

#### Parameters

|  |  |
| --- | --- |
| *x* | The X coordinate that will be checked |
| *y* | The Y coordinate that will be checked |

#### 4.3.3.11 void GameEngine::SetFrameRate ( int *iFrameRate* )

Used to set how fast the game should update on the screen

#### Parameters

|  |  |
| --- | --- |
| *iFrameRate* | This is used to divide 1000ms |

#### 4.3.3.12 void GameEngine::SetSleep ( bool *bSleep* )

If the game is paused, set sleep to true.

#### Parameters

|  |  |
| --- | --- |
| *bSleep* | True if the game is paused |

#### 4.3.3.13 void GameEngine::SetWindow ( HWND *hWindow* )

Sets the handle of the window

#### Parameters

|  |  |
| --- | --- |
| *hWnd* | A handle to the window |

The documentation for this class was generated from the following files:

* seniorcapstone/CapstoneProject/CapstoneProject/GameEngine.h
* seniorcapstone/CapstoneProject/CapstoneProject/GameEngine.cpp

## 4.4 Hero Class Reference

Extends the Sprite class to give the hero extra variables and methods special to it.

#include *<*Hero.h*>*

Inherits Sprite.

### Public Member Functions

* Hero (Bitmap ∗, RECT &, BOUNDSACTION)

*All the bitmaps that are used by the Hero.*

* ∼Hero ()

*Empty.*

* void MoveLeft ()

*Changes the Sprite's velocity to move left on the screen and associated bitmap.*

* void MoveRight ()

*Changes the Sprite's velocity to move right on the screen and associated bitmap.*

* void MoveUp ()

*Changes the Sprite's velocity to move up on the screen and associated bitmap.*

* void MoveDown ()

*Changes the Sprite's velocity to move down on the screen and associated bitmap.*

* void SetWeapon (WEAPONTYPE)
* void SetHealth (int)
* int GetHealth () const
* Sprite ∗ UseWeapon ()
* void IncreaseHealthMeter ()

*Used to increase the health meter and refill the Sprite to full health.*

* WEAPONTYPE GetWeapon () const
* FACINGDIRECTION GetDirection () const
* void SetDirection (FACINGDIRECTION)

**Additional Inherited Members**

### 4.4.1 Detailed Description

Extends the Sprite class to give the hero extra variables and methods special to it.

This class extends the Sprite class to give the hero health, weapon choice and movements.

### 4.4.2 Constructor & Destructor Documentation

#### 4.4.2.1 Hero::Hero ( Bitmap ∗ *pBitmap,* RECT & *rcBounds,* BOUNDSACTION *baBoundsAction =* BA\_STOP )

All the bitmaps that are used by the Hero.

Creates an enemy sprite using the Bitmap/Sprite constructor

#### Parameters

|  |  |
| --- | --- |
| *pBitmap* | A pointer to the bitmap image |
| *rcBounds* | A rectangle to contain the movements of the sprite within it |
| *baBoundsAction* | The action that will be taken when the sprite hits the outter edge of the rcBounds rectangle |

**See also**

Sprite

### 4.4.3 Member Function Documentation

#### 4.4.3.1 FACINGDIRECTION Hero::GetDirection ( ) const

Returns the direction in which the hero is facing

**Returns**

m\_fdDirection as a WORD

#### See also

FACINGDIRECTION

##### 4.4.3.2 int Hero::GetHealth ( ) const

Returns how much health the sprite has left before dying

**Returns** m\_iHealth as an integer

#### 4.4.3.3 WEAPONTYPE Hero::GetWeapon ( ) const

Returns which weapon the hero is currently holding

**Returns**

m\_wtWeapon as a WORD

#### See also

WEAPONTYPE

#### 4.4.3.4 void Hero::SetDirection ( FACINGDIRECTION *fdDirection* )

Sets the direction the hero is facing

#### Parameters

|  |  |
| --- | --- |
| *fdDirection* | The direction to set the member variable to |

#### 4.4.3.5 void Hero::SetHealth ( int *iHealth* )

Sets the health of the hero

#### Parameters

|  |  |
| --- | --- |
| *iHealth* | The health you want the hero to have but can't be more than the m\_iHealthMeter |

#### 4.4.3.6 void Hero::SetWeapon ( WEAPONTYPE *wtWeapon* )

Sets the weapon type that the hero will use in game play

#### Parameters

|  |  |
| --- | --- |
| *wtWeapon* | The weapon type to be stored |

#### See also

WEAPONTYPE

##### 4.4.3.7 Sprite ∗ Hero::UseWeapon ( )

Will change the sprites animation to show weapon usage and will also show it has the hitter in collision detection. This will make sure that the hero sprite doesn't lose health or die while weapon is in use.

The documentation for this class was generated from the following files:

* seniorcapstone/CapstoneProject/CapstoneProject/Hero.h
* seniorcapstone/CapstoneProject/CapstoneProject/Hero.cpp

## 4.5 Sprite Class Reference

Takes a bitmap and turns it into a sprite with position, velocity, z-order, bounding rect, collision, and visiblity.

#include *<*Sprite.h*>*

Inherited by EnemyBoss, and Hero.

### Public Member Functions

* Sprite (Bitmap ∗)
* Sprite (Bitmap ∗, RECT &, BOUNDSACTION baBoundsAction=BA\_STOP)
* Sprite (Bitmap ∗, POINT, POINT, int, RECT &, BOUNDSACTION baBoundsAction=BA\_STOP)
* virtual ∼Sprite ()

*Empty destructor, nothing special here.*

* virtual SPRITEACTION Update ()
* void Draw (HDC)
* bool IsPointInside (int, int)
* bool TestCollision (Sprite ∗)
* void Kill ()

*Sets the sprite's member variable to dying.*

* Bitmap ∗ GetBitmap () const
* void SetNumFrames (int, bool bOneCycle=false)
* void SetFrameDelay (int)

*How long the sprite will stay on one frame before switching to the next frame.*

* void SetBitmap (Bitmap ∗)
* RECT & GetPosition ()

*Returns the position of the sprite by using a rectangle around the frame of the bitmap.*

* void SetPosition (int, int)
* void SetPosition (POINT)
* void SetPosition (RECT &)
* void OffsetPosition (int, int)
* RECT & GetCollision ()

*Returns the smaller collision rectangle that is around the sprite.*

* POINT GetVelocity ()

*Returns the velocity of the sprite in the terms of a POINT.*

* void SetVelocity (int, int)
* void SetVelocity (POINT)
* bool GetZorder () const

*Returns if the sprite has a Z-order that is used in layering.*

* void SetZorder (int)
* void SetBounds (RECT &)
* void SetBoundsAction (BOUNDSACTION)
* bool IsHidden () const

*Returns true if the spirte is hidden from the screen.*

* void SetHidden (bool)
* int GetWidth () const

*Returns the width of the bitmap/sprite.*

* int GetHeight () const

*Returns the height of the bitmap/sprite.*

### Public Attributes

• Sprite ∗ AddSprite

*A pointer to this sprite object.*

### Protected Member Functions

* void UpdateFrame ()

*Used to change from the current frame of animation to the next frame.*

* virtual void CalcCollisionRect ()

*Calculates the collision rectangle to be one-sixth smaller than the position rectangle using the X and Y dimensions of the sprite.*

### Protected Attributes

* Bitmap ∗ m\_pBitmap

*Pointer to the bitmap used to create the sprite.*

* int m\_iNumFrames

*How many frames are in the bitmap to create animation for the sprite.*

* int m\_iCurFrame

*Used to specify the current frame of the bitmap when animation is used.*

* int m\_iFrameDelay

*How long you the game needs to wait before changing to the next frame of animation.*

* int m\_iFrameTrigger
  1. *counter that is compated to the delay that will trigger the next frame.*
* int m\_iZorder

*Used if you have to layer bitmaps or spirtes on top of each other.*

* POINT m\_ptVelocity

*Used in caluclations to move the sprite around the screen.*

* RECT m\_rcPosition

*The rectangle around the bitmap that is the position of the sprite.*

* RECT m\_rcCollision
  1. *slightly smaller rectangle used for in collision detection calculations.*
* RECT m\_rcBounds

*The rectangle that is usually larger than the sprite that will contain the movements of the sprite within this rectangle.*

* BOUNDSACTION m\_baBoundsAction

*Holds the current BOUNDSACTION assigned to the sprite.*

* bool m\_bHidden

*Used to show or hide the sprite on the screen.*

* bool m\_bDying

*Used to indicate if the sprite is dying.*

* bool m\_bOneCycle

*Used to state if the sprites animation will run once or loop.*

### 4.5.1 Detailed Description

Takes a bitmap and turns it into a sprite with position, velocity, z-order, bounding rect, collision, and visiblity.

This class depends on Bitmap to function. Does not extend Bitmap. There are three different types of constructors used to create a sprite. This class controls how the sprite moves, how the sprite will interact with its boundries. It will either stop, wrap, bounce, or die at the boundry. There are also three SPRITEACTIONs that set what the sprite is doing.

### 4.5.2 Constructor & Destructor Documentation

#### 4.5.2.1 Sprite::Sprite ( Bitmap ∗ *pBitmap* )

Creates a generic sprite using the Bitmap constructor.

#### Parameters

|  |  |
| --- | --- |
| *pBitmap* | A pointer to the bitmap object |

#### See also

Bitmap

#### 4.5.2.2 Sprite::Sprite ( Bitmap ∗ *pBitmap,* RECT & *rcBounds,* BOUNDSACTION *baBoundsAction =* BA\_STOP )

Creates a sprite using the Bitmap constructor but adds additional attributes.

#### Parameters

|  |  |
| --- | --- |
| *pBitmap* | A pointer to the bitmap object |
| *rcBounds* | A rectangle to contain the movements of the sprite within it |
| *baBoundsAction* | The action that will be taken when the sprite hits the outter edge of the rcBounds rectangle. Default is for the sprite to stop. |

#### See also

Bitmap

#### 4.5.2.3 Sprite::Sprite ( Bitmap ∗ *pBitmap,* POINT *ptPosition,* POINT *ptVelocity,* int *iZOrder,* RECT & *rcBounds,* BOUNDSACTION *baBoundsAction =* BA\_STOP )

Creates a sprite using the Bitmap constructor but adds additional attributes.

#### Parameters

|  |  |
| --- | --- |
| *pBitmap* | A pointer to the bitmap object |
| *ptPosition* | Sets a point of where the sprite will be positioned on the screen |
| *ptVelocity* | Sets the velocity of the sprite to move |
| *iZOrder* | Sets what layer the sprite needs to be if there will be over lapping of sprites |
| *rcBounds* | A rectangle to contain the movements of the sprite within it |
| *baBoundsAction* | The action that will be taken when the sprite hits the outter edge of the rcBounds rectangle. Default is for the sprite to stop. |

**See also**

Bitmap

### 4.5.3 Member Function Documentation

#### 4.5.3.1 void Sprite::Draw ( HDC *hDC* )

Checks the hidden status and current frame, then draw appropriate image to the screen.

#### Parameters

|  |  |
| --- | --- |
| *hDC* | The handle to the display context of where to draw the image. |

#### 4.5.3.2 Bitmap ∗ Sprite::GetBitmap ( ) const

Pointer to the Bitmap of the sprite

#### See also

Bitmap

#### 4.5.3.3 bool Sprite::IsPointInside ( int *x,* int *y* )

Determines if a given point, in the terms of X and Y, are inside a specified area.

#### Parameters

|  |  |
| --- | --- |
| *x* | coordinate X |
| *y* | coordinate Y |

#### 4.5.4.4 void Sprite::OffsetPosition ( int *x,* int *y* )

Used to offset the position of a sprite by using X and Y pixels

#### Parameters

|  |  |
| --- | --- |
| *X* | Number of X pixels used to offset sprite horizontally |
| *Y* | Number of Y pixels used to offset sprite vertically |

#### 4.5.4.5 void Sprite::SetBitmap ( Bitmap ∗ *pBitmap* )

Used to change the Bitmap image that the sprite uses.

#### Parameters

|  |  |
| --- | --- |
| *pBitmap* | The pointer to the bitmap |

#### See also

Bitmap

##### 4.5.3.6 void Sprite::SetBounds ( RECT & *rcBounds* )

Sets a rectangle that is used to allow the movement of the sprite within the rectangle **Parameters**

|  |  |
| --- | --- |
| *rcBounds* | The rectangle that will be set around the sprite |

#### 4.5.3.7 void Sprite::SetBoundsAction ( BOUNDSACTION *ba* )

Sets the bounds action of the sprite. Sprite will either stop, bounce back, or wrap to the other side of the screen.

#### Parameters

|  |  |
| --- | --- |
| *baBoundsAction* | The action you want to set to the sprite |

#### See also

BOUNDSACTION

##### 4.5.3.8 void Sprite::SetHidden ( bool *bHidden* )

Used to show or hide the sprite.

#### Parameters

|  |  |
| --- | --- |
| *bHidden* | If true, the sprite will not display on the screen |

#### 4.5.3.9 void Sprite::SetNumFrames ( int *iNumFrames,* bool *bOneCycle =* false )

Used to set how many frames to use for sprite animation.

#### Parameters

|  |  |
| --- | --- |
| *iNumFrames* | how many frames there are |
| *bOneCycle* | Used to determine if the animation should loop. Default is to loop. |

#### 4.5.3.10 void Sprite::SetPosition ( int *x,* int *y* )

Sets the position of the sprite on the screen using X and Y coordinates.

#### Parameters

|  |  |  |
| --- | --- | --- |
| *X* | The X coordinate |  |
| *Y* | The Y coordinate |

#### 4.5.3.11 void Sprite::SetPosition ( POINT *ptPosition* )

Sets the position of the sprite on the screen using the type POINT.

#### Parameters

|  |  |
| --- | --- |
| *ptPosition* | The position of the sprite using a POINT type. |

#### 4.5.3.12 void Sprite::SetPosition ( RECT & *rcPosition* )

Sets the position of the sprite on the screen using a rectangle

#### Parameters

|  |  |
| --- | --- |
| *rcPosition* | The positions of the rectangle |

###### 4.5.3.13 void Sprite::SetVelocity ( int *x,* int *y* )

Sets the velocity of the spirte by using X and Y pixels

#### Parameters

|  |  |
| --- | --- |
| *X* | The number of pixels you need the sprite to move horizontally every update |
| *Y* | The number of pixels you need the sprite to move vertically every update |

#### 4.5.3.14 void Sprite::SetVelocity ( POINT *ptVelocity* )

Sets the velocity of the sprite by using a POINT type

#### Parameters

|  |  |
| --- | --- |
| *ptVelocity* |  |

#### 4.5.3.15 void Sprite::SetZorder ( int *iZOrder* )

Sets the Z-order of the sprite in layered sprites

#### Parameters

|  |  |
| --- | --- |
| *iZOrder* | A number used to set the which layer you want the sprite on |

#### 4.5.3.16 bool Sprite::TestCollision ( Sprite ∗ *pTestSprite* )

Returns true if the Sprite runs into its boundry rectangle.

#### Parameters

|  |  |
| --- | --- |
| *pTestSprite* | pointer to the sprite that needs to be tested |

##### 4.5.3.17 SPRITEACTION Sprite::Update ( ) [virtual]

Determines the current status of the sprite and takes action on what needs to be done next. If the sprite is dying, it will KILL the sprite. Will check the BOUNDSACTION and update velocity, bounce it, or wrap it.

#### See also

SPRITEACTION

BOUNDSACTION

The documentation for this class was generated from the following files:

* seniorcapstone/CapstoneProject/CapstoneProject/Sprite.h
* seniorcapstone/CapstoneProject/CapstoneProject/Sprite.cpp