

Road To Zero

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Chapter 1

Class Index

1.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

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Game	A class which acts as the central class for the game, by containing all other classes and implementing the game loop	34
HexMap	A class which defines a hex map of hex tiles	43
HexTile	A class which defines a hex tile of the hex map	63
Message	A structure which defines a standard message format	80
MessageHub	A class which acts as a central hub for inter-object message traffic	81

Chapter 2

File Index

2.1 File List

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Chapter 3

Class Documentation

3.1 AssetsManager Class Reference

A class which manages visual and sound assets.

```
#include <AssetsManager.h>
```

Public Member Functions

- [AssetsManager](#) (void)
Constructor for the [AssetsManager](#) class.
- void [loadFont](#) (std::string, std::string)
Method to load a font and insert it into the font map.
- void [loadTexture](#) (std::string, std::string)
Method to load a texture and insert it into the texture map.
- void [loadSound](#) (std::string, std::string)
Method to load a sound and insert it into the sound map. Automatically creates a corresponding sf::SoundBuffer.
- void [loadTrack](#) (std::string, std::string)
Method to load a track (sf::Music) and insert it into the track map.
- sf::Font * [getFont](#) (std::string)
Method to get font associated with given font key.
- sf::Texture * [getTexture](#) (std::string)
Method to get texture associated with given texture key.
- sf::SoundBuffer * [getSoundBuffer](#) (std::string)
Method to get soundbuffer associated with given sound key.
- sf::Sound * [getSound](#) (std::string)
Method to get sound associated with given sound key.
- void [playTrack](#) (void)
Method to play the current track.
- void [pauseTrack](#) (void)
Method to pause the current track.
- void [stopTrack](#) (void)
Method to stop the current track.
- void [nextTrack](#) (void)
Method to advance to the next track. Wraps around if the end of the track map is reached.

- void [previousTrack](#) (void)
Method to return to the previous track. Wraps around if the beginning of the track map is reached.
- std::string [getCurrentTrackKey](#) (void)
Method to get track key for current track.
- sf::SoundSource::Status [getTrackStatus](#) (void)
Method to get the status of the current track.
- void [clear](#) (void)
Method to clear all loaded assets.
- [~AssetsManager](#) (void)
Destructor for the [AssetsManager](#) class.

Public Attributes

- std::map< std::string, sf::Font * > [font_map](#)
A map of pointers to loaded fonts.
- std::map< std::string, sf::Texture * > [texture_map](#)
A map of pointers to loaded textures.
- std::map< std::string, sf::SoundBuffer * > [soundbuffer_map](#)
A map of pointers to sound buffers.
- std::map< std::string, sf::Sound * > [sound_map](#)
A map of pointers to loaded sounds.
- std::map< std::string, sf::Music * >::iterator [current_track](#)
A map iterator which corresponds to the current track (i.e., the track currently being played).
- std::map< std::string, sf::Music * > [track_map](#)
A map of pointers to opened tracks (i.e. sf::Music).

Private Member Functions

- void [__loadSoundBuffer](#) (std::string, std::string)
Helper method to load a soundbuffer and insert it into the soundbuffer map. Should only be called by [loadSound\(\)](#), to create an sf::SoundBuffer corresponding to the loaded sf::Sound.

3.1.1 Detailed Description

A class which manages visual and sound assets.

3.1.2 Constructor & Destructor Documentation

3.1.2.1 AssetsManager()

```
AssetsManager::AssetsManager (
    void )
```

Constructor for the [AssetsManager](#) class.

```
110 {
111     //...
112
113     std::cout << "AssetsManager constructed at " << this << std::endl;
114
115     return;
116 } /* AssetsManager() */
```


3.1.2.2 ~AssetsManager()

```
AssetsManager::~AssetsManager (
    void )
```

Destructor for the [AssetsManager](#) class.

```
739 {
740     this->clear();
741
742     std::cout << "AssetsManager at " << this << " destroyed" << std::endl;
743
744     return;
745 } /* ~AssetsManager() */
```

3.1.3 Member Function Documentation

3.1.3.1 __loadSoundBuffer()

```
void AssetsManager::__loadSoundBuffer (
    std::string path_2_sound,
    std::string sound_key ) [private]
```

Helper method to load a soundbuffer and insert it into the soundbuffer map. Should only be called by [loadSound\(\)](#), to create an `sf::SoundBuffer` corresponding to the loaded `sf::Sound`.

Parameters

<i>path_2_sound</i>	A path (either relative or absolute) to the sound file.
<i>sound_key</i>	A key associated with the sound (for indexing into the soundbuffer map).

```
47 {
48     // 1. check key, throw error if already in use
49     if (this->soundbuffer_map.count(sound_key) > 0) {
50         std::string error_str = "ERROR AssetsManager::__loadSoundBuffer() sound key ";
51         error_str += sound_key;
52         error_str += " is already in use";
53
54         this->clear();
55
56         #ifdef _WIN32
57             std::cout << error_str << std::endl;
58         #endif /* _WIN32 */
59
60         throw std::runtime_error(error_str);
61     }
62
63
64     // 2. load from file, throw error on fail
65     sf::SoundBuffer* soundbuffer_ptr = new sf::SoundBuffer();
66
67     if (not soundbuffer_ptr->loadFromFile(path_2_sound)) {
68         std::string error_str = "ERROR AssetsManager::__loadSoundBuffer() could not load ";
69         error_str += "soundbuffer at ";
70         error_str += path_2_sound;
71
72         this->clear();
73
74         #ifdef _WIN32
75             std::cout << error_str << std::endl;
76         #endif /* _WIN32 */
77
78         throw std::runtime_error(error_str);
79     }
80
81 }
```

```

82 // 3. insert into soundbuffer map
83 this->soundbuffer_map.insert(
84     std::pair<std::string, sf::SoundBuffer*>(sound_key, soundbuffer_ptr)
85 );
86
87 std::cout << "SoundBuffer " << sound_key << " inserted into soundbuffer map" <<
88     std::endl;
89
90 return;
91 } /* __loadSoundBuffer() */

```

3.1.3.2 clear()

```

void AssetsManager::clear (
    void )

```

Method to clear all loaded assets.

```

646 {
647     // 1. clear fonts
648     std::map<std::string, sf::Font*>::iterator font_iter;
649     for (
650         font_iter = this->font_map.begin();
651         font_iter != this->font_map.end();
652         font_iter++
653     ) {
654         delete font_iter->second;
655
656         std::cout << "Font " << font_iter->first << " deleted from font map" <<
657             std::endl;
658     }
659     this->font_map.clear();
660
661     // 2. clear textures
662     std::map<std::string, sf::Texture*>::iterator texture_iter;
663     for (
664         texture_iter = this->texture_map.begin();
665         texture_iter != this->texture_map.end();
666         texture_iter++
667     ) {
668         delete texture_iter->second;
669
670         std::cout << "Texture " << texture_iter->first << " deleted from texture map" <<
671             std::endl;
672     }
673     this->texture_map.clear();
674
675     // 3. clear sound buffers
676     std::map<std::string, sf::SoundBuffer*>::iterator soundbuffer_iter;
677     for (
678         soundbuffer_iter = this->soundbuffer_map.begin();
679         soundbuffer_iter != this->soundbuffer_map.end();
680         soundbuffer_iter++
681     ) {
682         delete soundbuffer_iter->second;
683
684         std::cout << "SoundBuffer " << soundbuffer_iter->first <<
685             " deleted from soundbuffer map" << std::endl;
686     }
687     this->soundbuffer_map.clear();
688
689     // 4. clear sounds
690     std::map<std::string, sf::Sound*>::iterator sound_iter;
691     for (
692         sound_iter = this->sound_map.begin();
693         sound_iter != this->sound_map.end();
694         sound_iter++
695     ) {
696         sound_iter->second->stop();
697         delete sound_iter->second;
698
699         std::cout << "Sound " << sound_iter->first << " deleted from sound map" <<
700             std::endl;
701     }
702     this->sound_map.clear();
703
704 }

```

```

707
708 // 5. clear tracks
709 std::map<std::string, sf::Music*>::iterator track_iter;
710 for (
711     track_iter = this->track_map.begin();
712     track_iter != this->track_map.end();
713     track_iter++)
714 {
715     track_iter->second->stop();
716     delete track_iter->second;
717
718     std::cout << "Track " << track_iter->first << " deleted from track map" <<
719         std::endl;
720 }
721 this->track_map.clear();
722
723 return;
724 } /* clear() */

```

3.1.3.3 getCurrentTrackKey()

```

std::string AssetsManager::getCurrentTrackKey (
    void )

```

Method to get track key for current track.

Returns

The track key for the current track.

```

610 {
611     return this->current_track->first;
612 } /* getCurrentTrackKey() */

```

3.1.3.4 getFont()

```

sf::Font * AssetsManager::getFont (
    std::string font_key )

```

Method to get font associated with given font key.

Parameters

<i>font_key</i>	A key associated with the font (for indexing into the font map).
-----------------	--

Returns

A pointer to the corresponding font.

```

351 {
352     // 1. check key, throw error if not found
353     if (this->font_map.count(font_key) <= 0) {
354         std::string error_str = "ERROR AssetsManager::getFont() font key ";
355         error_str += font_key;
356         error_str += " is not contained in font map";
357
358         this->clear();
359
360         #ifdef _WIN32

```

```

361         std::cout << error_str << std::endl;
362     #endif /* _WIN32 */
363
364     throw std::runtime_error(error_str);
365 }
366
367 return this->font_map[font_key];
368 } /* getFont() */

```

3.1.3.5 getSound()

```

sf::Sound * AssetsManager::getSound (
    std::string sound_key )

```

Method to get sound associated with given sound key.

Parameters

<i>sound_key</i>	A key associated with the sound (for indexing into the sound map).
------------------	--

Returns

A pointer to the corresponding sound.

```

461 {
462     // 1. check key, throw error if not found
463     if (this->sound_map.count(sound_key) <= 0) {
464         std::string error_str = "ERROR AssetsManager::getSound() sound key ";
465         error_str += sound_key;
466         error_str += " is not contained in sound map";
467
468         this->clear();
469
470         #ifdef _WIN32
471             std::cout << error_str << std::endl;
472         #endif /* _WIN32 */
473
474         throw std::runtime_error(error_str);
475     }
476
477     return this->sound_map[sound_key];
478 } /* getSound() */

```

3.1.3.6 getSoundBuffer()

```

sf::SoundBuffer * AssetsManager::getSoundBuffer (
    std::string sound_key )

```

Method to get soundbuffer associated with given sound key.

Parameters

<i>sound_key</i>	A key associated with the soundbuffer (for indexing into the soundbuffer map).
------------------	--

Returns

A pointer to the corresponding soundbuffer.

```

425 {
426     // 1. check key, throw error if not found
427     if (this->soundbuffer_map.count(sound_key) <= 0) {
428         std::string error_str = "ERROR AssetsManager::getSoundBuffer() sound key ";
429         error_str += sound_key;
430         error_str += " is not contained in soundbuffer map";
431
432         this->clear();
433
434         #ifdef _WIN32
435             std::cout << error_str << std::endl;
436         #endif /* _WIN32 */
437
438         throw std::runtime_error(error_str);
439     }
440
441     return this->soundbuffer_map[sound_key];
442 } /* getSoundBuffer() */

```

3.1.3.7 getTexture()

```

sf::Texture * AssetsManager::getTexture (
    std::string texture_key )

```

Method to get texture associated with given texture key.

Parameters

<i>texture_key</i>	A key associated with the texture (for indexing into the texture map).
--------------------	--

Returns

A pointer to the corresponding texture.

```

388 {
389     // 1. check key, throw error if not found
390     if (this->texture_map.count(texture_key) <= 0) {
391         std::string error_str = "ERROR AssetsManager::getTexture() texture key ";
392         error_str += texture_key;
393         error_str += " is not contained in texture map";
394
395         this->clear();
396
397         #ifdef _WIN32
398             std::cout << error_str << std::endl;
399         #endif /* _WIN32 */
400
401         throw std::runtime_error(error_str);
402     }
403
404     return this->texture_map[texture_key];
405 } /* getTexture() */

```

3.1.3.8 getTrackStatus()

```

sf::SoundSource::Status AssetsManager::getTrackStatus (
    void )

```

Method to get the status of the current track.

Returns

The status of the current track.

```
629 {
630     return this->current_track->second->getStatus();
631 } /* getTrackStatus */
```

3.1.3.9 loadFont()

```
void AssetsManager::loadFont (
    std::string path_2_font,
    std::string font_key )
```

Method to load a font and insert it into the font map.

Parameters

<i>path_2_font</i>	A path (either relative or absolute) to the font file.
<i>font_key</i>	A key associated with the font (for indexing into the font map).

```
135 {
136     // 1. check key, throw error if already in use
137     if (this->font_map.count(font_key) > 0) {
138         std::string error_str = "ERROR AssetsManager::loadFont() font key ";
139         error_str += font_key;
140         error_str += " is already in use";
141
142         this->clear();
143
144         #ifdef _WIN32
145             std::cout << error_str << std::endl;
146         #endif /* _WIN32 */
147
148         throw std::runtime_error(error_str);
149     }
150
151     // 2. load from file, throw error on fail
152     sf::Font* font_ptr = new sf::Font();
153
154     if (not font_ptr->loadFromFile(path_2_font)) {
155         std::string error_str = "ERROR AssetsManager::loadFont() could not load ";
156         error_str += "font at ";
157         error_str += path_2_font;
158
159         this->clear();
160
161         #ifdef _WIN32
162             std::cout << error_str << std::endl;
163         #endif /* _WIN32 */
164
165         throw std::runtime_error(error_str);
166     }
167
168     // 3. insert into font map
169     this->font_map.insert(std::pair<std::string, sf::Font*>(font_key, font_ptr));
170
171     std::cout << "Font " << font_key << " inserted into font map" << std::endl;
172
173     return;
174 } /* loadFont() */
```

3.1.3.10 loadSound()

```
void AssetsManager::loadSound (
```

```
std::string path_2_sound,
std::string sound_key )
```

Method to load a sound and insert it into the sound map. Automatically creates a corresponding sf::SoundBuffer.

Parameters

<i>path_2_sound</i>	A path (either relative or absolute) to the sound file.
<i>sound_key</i>	A key associated with the sound (for indexing into the sound map).

```
259 {
260     // 1. create an associated sf::SoundBuffer
261     this->__loadSoundBuffer(path_2_sound, sound_key);
262
263     // 2. associate sf::Sound with sf::SoundBuffer
264     sf::Sound* sound_ptr = new sf::Sound();
265     sound_ptr->setBuffer(*(this->soundbuffer_map[sound_key]));
266
267     // 3. insert into sound map
268     this->sound_map.insert(std::pair<std::string, sf::Sound*>(sound_key, sound_ptr));
269
270     std::cout << "Sound " << sound_key << " inserted into sound map" << std::endl;
271
272     return;
273 } /* loadSound() */
```

3.1.3.11 loadTexture()

```
void AssetsManager::loadTexture (
    std::string path_2_texture,
    std::string texture_key )
```

Method to load a texture and insert it into the texture map.

Parameters

<i>path_2_texture</i>	A path (either relative or absolute) to the texture file.
<i>texture_key</i>	A key associated with the texture (for indexing into the texture map).

```
196 {
197     // 1. check key, throw error if already in use
198     if (this->texture_map.count(texture_key) > 0) {
199         std::string error_str = "ERROR AssetsManager::loadTexture() texture key ";
200         error_str += texture_key;
201         error_str += " is already in use";
202
203         this->clear();
204
205         #ifdef _WIN32
206             std::cout << error_str << std::endl;
207         #endif /* _WIN32 */
208
209         throw std::runtime_error(error_str);
210     }
211
212     // 2. load from file, throw error on fail
213     sf::Texture* texture_ptr = new sf::Texture();
214
215     if (not texture_ptr->loadFromFile(path_2_texture)) {
216         std::string error_str = "ERROR AssetsManager::loadTexture() could not load ";
217         error_str += "texture at ";
218         error_str += path_2_texture;
219
220         this->clear();
221
222         #ifdef _WIN32
223             std::cout << error_str << std::endl;
224         #endif
```

```

225         #endif /* _WIN32 */
226
227         throw std::runtime_error(error_str);
228     }
229
230
231     // 3. insert into texture map
232     this->texture_map.insert(
233         std::pair<std::string, sf::Texture*>(texture_key, texture_ptr)
234     );
235
236     std::cout << "Texture " << texture_key << " inserted into texture map" << std::endl;
237
238     return;
239 } /* loadTexture() */

```

3.1.3.12 loadTrack()

```

void AssetsManager::loadTrack (
    std::string path_2_track,
    std::string track_key )

```

Method to load a track (sf::Music) and insert it into the track map.

Parameters

<i>path_2_track</i>	A path (either relative or absolute) to the track file.
<i>track_key</i>	A key associated with the track (for indexing into the track map).

```

292 {
293     // 1. check key, throw error if already in use
294     if (this->track_map.count(track_key) > 0) {
295         std::string error_str = "ERROR AssetsManager::loadTrack() track key ";
296         error_str += track_key;
297         error_str += " is already in use";
298
299         this->clear();
300
301         #ifdef _WIN32
302             std::cout << error_str << std::endl;
303         #endif /* _WIN32 */
304
305         throw std::runtime_error(error_str);
306     }
307
308     // 2. open from file, throw error on fail
309     sf::Music* track_ptr = new sf::Music();
310
311     if (not track_ptr->openFromFile(path_2_track)) {
312         std::string error_str = "ERROR AssetsManager::loadTrack() could not open ";
313         error_str += "track at ";
314         error_str += path_2_track;
315
316         this->clear();
317
318         #ifdef _WIN32
319             std::cout << error_str << std::endl;
320         #endif /* _WIN32 */
321
322         throw std::runtime_error(error_str);
323     }
324
325     // 3. insert into track map
326     this->track_map.insert(std::pair<std::string, sf::Music*>(track_key, track_ptr));
327     this->current_track = this->track_map.begin();
328
329     std::cout << "Track " << track_key << " inserted into track map" << std::endl;
330
331     return;
332 } /* loadTrack() */

```


3.1.3.13 nextTrack()

```
void AssetsManager::nextTrack (
    void )
```

Method to advance to the next track. Wraps around if the end of the track map is reached.

```
551 {
552     // 1. stop current track
553     this->stopTrack();
554
555     // 2. increment current track
556     this->current_track++;
557
558     // 3. handle wrap around
559     if (this->current_track == this->track_map.end()) {
560         this->current_track = this->track_map.begin();
561     }
562
563     return;
564 } /* nextTrack() */
```

3.1.3.14 pauseTrack()

```
void AssetsManager::pauseTrack (
    void )
```

Method to pause the current track.

```
512 {
513     this->current_track->second->pause();
514
515     return;
516 } /* pauseTrack() */
```

3.1.3.15 playTrack()

```
void AssetsManager::playTrack (
    void )
```

Method to play the current track.

```
493 {
494     this->current_track->second->play();
495
496     return;
497 } /* playTrack() */
```

3.1.3.16 previousTrack()

```
void AssetsManager::previousTrack (
    void )
```

Method to return to the previous track. Wraps around if the beginning of the track map is reached.

```
580 {
581     // 1. stop current track
582     this->stopTrack();
583
584     // 2. handle wrap around
585     if (this->current_track == this->track_map.begin()) {
586         this->current_track = this->track_map.end();
587     }
588
589     // 3. decrement current track
590     this->current_track--;
591
592     return;
593 } /* previousTrack() */
```

3.1.3.17 stopTrack()

```
void AssetsManager::stopTrack (
    void )
```

Method to stop the current track.

```
531 {
532     this->current_track->second->stop();
533
534     return;
535 } /* stopTrack() */
```

3.1.4 Member Data Documentation

3.1.4.1 current_track

```
std::map<std::string, sf::Music*>::iterator AssetsManager::current_track
```

A map iterator which corresponds to the current track (i.e., the track currently being played).

3.1.4.2 font_map

```
std::map<std::string, sf::Font*> AssetsManager::font_map
```

A map of pointers to loaded fonts.

3.1.4.3 sound_map

```
std::map<std::string, sf::Sound*> AssetsManager::sound_map
```

A map of pointers to loaded sounds.

3.1.4.4 soundbuffer_map

```
std::map<std::string, sf::SoundBuffer*> AssetsManager::soundbuffer_map
```

A map of pointers to sound buffers.

3.1.4.5 texture_map

```
std::map<std::string, sf::Texture*> AssetsManager::texture_map
```

A map of pointers to loaded textures.

3.1.4.6 track_map

```
std::map<std::string, sf::Music*> AssetsManager::track_map
```

A map of pointers to opened tracks (i.e. sf::Music).

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

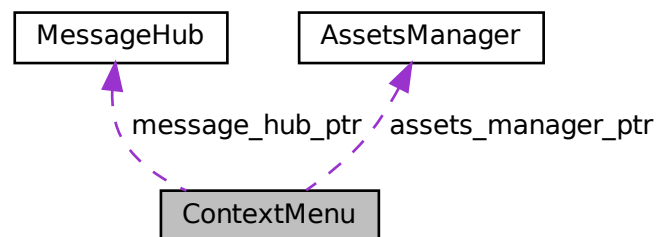
- header/ESC_core/[AssetsManager.h](#)
- source/ESC_core/[AssetsManager.cpp](#)

3.2 ContextMenu Class Reference

A class which defines a context menu for the game.

```
#include <ContextMenu.h>
```

Collaboration diagram for ContextMenu:



Public Member Functions

- [ContextMenu](#) (sf::Event *, sf::RenderWindow *, [AssetsManager](#) *, [MessageHub](#) *)
Constructor for the [ContextMenu](#) class.
- void [processEvent](#) (void)
Method to processEvent [ContextMenu](#). To be called once per event.
- void [processMessage](#) (void)
Method to processMessage [ContextMenu](#). To be called once per message.
- void [draw](#) (void)
Method to draw the hex tile to the render window. To be called once per frame.
- [~ContextMenu](#) (void)
Destructor for the [ContextMenu](#) class.

Public Attributes

- [ConsoleState console_state](#)
The current state of the console screen.
- [bool game_menu_up](#)
Indicates whether or not the game menu is up.
- [int frame](#)
The current frame of this object.
- [double position_x](#)
The position of the object.
- [double position_y](#)
The position of the object.
- [std::string console_string](#)
The string to be printed to the console screen.
- [sf::RectangleShape menu_frame](#)
The frame of the context menu.
- [sf::RectangleShape visual_screen](#)
The context menu screen for visuals.
- [sf::ConvexShape visual_screen_frame_top](#)
The top framing of the visual screen.
- [sf::ConvexShape visual_screen_frame_left](#)
The left framing of the visual screen.
- [sf::ConvexShape visual_screen_frame_bottom](#)
The bottom framing of the visual screen.
- [sf::ConvexShape visual_screen_frame_right](#)
The right framing of the visual screen.
- [sf::RectangleShape console_screen](#)
The context menu console screen (for animated text output).
- [sf::ConvexShape console_screen_frame_top](#)
The top framing of the console screen.
- [sf::ConvexShape console_screen_frame_left](#)
The left framing of the console screen.
- [sf::ConvexShape console_screen_frame_bottom](#)
The bottom framing of the console screen.
- [sf::ConvexShape console_screen_frame_right](#)
The right framing of the console screen.

Private Member Functions

- [void __setUpMenuFrame \(void\)](#)
Helper method to set up context menu frame (drawable).
- [void __setUpVisualScreen \(void\)](#)
Helper method to set up context menu visual screen (drawable).
- [void __setUpVisualScreenFrame \(void\)](#)
Helper method to set up framing for context menu visual screen (drawable).
- [void __drawVisualScreenFrame \(void\)](#)
Helper method to draw visual screen frame.
- [void __setUpConsoleScreen \(void\)](#)
Helper method to set up context menu console screen (drawable).
- [void __setUpConsoleScreenFrame \(void\)](#)

- Helper method to set up framing for context menu console screen (drawable).*
 - void [__drawConsoleScreenFrame](#) (void)
- Helper method to draw console screen frame.*
 - void [__setConsoleState](#) (ConsoleState)
- Helper method to set state of console screen and update string if necessary.*
 - void [__setConsoleString](#) (void)
- Helper method to set console string depending on console state.*
 - void [__drawConsoleText](#) (void)
- Helper method to draw animated text to context menu console screen.*
 - void [__handleKeyPressEvents](#) (void)
- Helper method to handle key press events.*
 - void [__handleMouseButtonEvents](#) (void)
- Helper method to handle mouse button events.*
 - void [__sendQuitGameMessage](#) (void)
- Helper method to format and send a quit game message.*
 - void [__sendRestartGameMessage](#) (void)
- Helper method to format and send a restart game message.*

Private Attributes

- sf::Event * [event_ptr](#)
A pointer to the event class.
- sf::RenderWindow * [render_window_ptr](#)
A pointer to the render window.
- [AssetsManager](#) * [assets_manager_ptr](#)
A pointer to the assets manager.
- [MessageHub](#) * [message_hub_ptr](#)
A pointer to the message hub.

3.2.1 Detailed Description

A class which defines a context menu for the game.

3.2.2 Constructor & Destructor Documentation

3.2.2.1 ContextMenu()

```
ContextMenu::ContextMenu (
    sf::Event * event_ptr,
    sf::RenderWindow * render_window_ptr,
    AssetsManager * assets_manager_ptr,
    MessageHub * message_hub_ptr )
```

Constructor for the [ContextMenu](#) class.

Parameters

<i>event_ptr</i>	Pointer to the event class.
<i>render_window_ptr</i>	Pointer to the render window.
<i>assets_manager_ptr</i>	Pointer to the assets manager.
<i>message_hub_ptr</i>	Pointer to the message hub.

```

780 {
781     // 1. set attributes
782
783     // 1.1. private
784     this->event_ptr = event_ptr;
785     this->render_window_ptr = render_window_ptr;
786
787     this->assets_manager_ptr = assets_manager_ptr;
788     this->message_hub_ptr = message_hub_ptr;
789
790     // 1.2. public
791     this->console_state = ConsoleState :: NONE;
792     this->__setConsoleState(ConsoleState :: READY);
793
794     this->game_menu_up = false;
795
796     this->frame = 0;
797
798     this->position_x = GAME_WIDTH;
799     this->position_y = 0;
800
801     // 2. set up and position drawable attributes
802     this->__setUpMenuFrame();
803     this->__setUpVisualScreen();
804     this->__setUpVisualScreenFrame();
805     this->__setUpConsoleScreen();
806     this->__setUpConsoleScreenFrame();
807
808     std::cout << "ContextMenu constructed at " << this << std::endl;
809
810     return;
811 } /* ContextMenu() */

```

3.2.2.2 ~ContextMenu()

```

ContextMenu::~ContextMenu (
    void )

```

Destructor for the [ContextMenu](#) class.

```

950 {
951     std::cout << "ContextMenu at " << this << " destroyed" << std::endl;
952
953     return;
954 } /* ~ContextMenu() */

```

3.2.3 Member Function Documentation

3.2.3.1 __drawConsoleScreenFrame()

```

void ContextMenu::__drawConsoleScreenFrame (
    void ) [private]

```

Helper method to draw console screen frame.

```

433 {

```

```

434     this->render_window_ptr->draw(this->console_screen_frame_top);
435     this->render_window_ptr->draw(this->console_screen_frame_left);
436     this->render_window_ptr->draw(this->console_screen_frame_bottom);
437     this->render_window_ptr->draw(this->console_screen_frame_right);
438
439     return;
440 } /* __drawContextScreenFrame() */

```

3.2.3.2 __drawConsoleText()

```

void ContextMenu::__drawConsoleText (
    void ) [private]

```

Helper method to draw animated text to context menu console screen.

```

548 {
549     // 1. set up console text (drawable)
550     sf::Text console_text(
551         this->console_string,
552         *(assets_manager_ptr->getFont("Glass_TTY_VT220")),
553         16
554     );
555
556     console_text.setFillColor(MONOCROME_TEXT_GREEN);
557
558     console_text.setPosition(
559         this->position_x - 50 - 300 + 16,
560         this->position_y + GAME_HEIGHT - 50 - 340 + 16
561     );
562
563
564     // 2. draw console text
565     this->render_window_ptr->draw(console_text);
566
567
568     // 3. assemble and draw blinking console cursor
569     if ((this->frame % FRAMES_PER_SECOND) > FRAMES_PER_SECOND / 2) {
570         sf::RectangleShape console_cursor(sf::Vector2f(10, 16));
571
572         console_cursor.setFillColor(MONOCROME_TEXT_GREEN);
573
574         console_cursor.setPosition(
575             console_text.getPosition().x,
576             console_text.getPosition().y + console_text.getLocalBounds().height + 10
577         );
578
579         this->render_window_ptr->draw(console_cursor);
580     }
581
582     // 4. updating frame count if console is in menu state
583     if (this->console_state == ConsoleState::MENU) {
584         std::string frame_count_string = "FRAME: ";
585         frame_count_string += std::to_string(this->frame);
586
587         sf::Text frame_count_text(
588             frame_count_string,
589             *(assets_manager_ptr->getFont("Glass_TTY_VT220")),
590             16
591         );
592
593         frame_count_text.setFillColor(MONOCROME_TEXT_GREEN);
594
595         frame_count_text.setPosition(
596             console_text.getPosition().x,
597             console_text.getPosition().y + console_text.getLocalBounds().height - 10
598         );
599
600         this->render_window_ptr->draw(frame_count_text);
601     }
602
603     return;
604 } /* __drawConsoleText() */

```

3.2.3.3 __drawVisualScreenFrame()

```
void ContextMenu::__drawVisualScreenFrame (
    void ) [private]
```

Helper method to draw visual screen frame.

```
208 {
209     this->render_window_ptr->draw(this->visual_screen_frame_top);
210     this->render_window_ptr->draw(this->visual_screen_frame_left);
211     this->render_window_ptr->draw(this->visual_screen_frame_bottom);
212     this->render_window_ptr->draw(this->visual_screen_frame_right);
213
214     return;
215 } /* __drawVisualScreenFrame() */
```

3.2.3.4 __handleKeyPressEvents()

```
void ContextMenu::__handleKeyPressEvents (
    void ) [private]
```

Helper method to handle key press events.

```
619 {
620     switch (this->event_ptr->key.code) {
621         case (sf::Keyboard::Escape): {
622             if (this->console_state == ConsoleState :: MENU) {
623                 this->__setConsoleState(ConsoleState :: READY);
624             }
625
626             else {
627                 this->__setConsoleState(ConsoleState :: MENU);
628             }
629
630             break;
631         }
632
633         case (sf::Keyboard::Q): {
634             if (this->console_state == ConsoleState :: MENU) {
635                 this->__sendQuitGameMessage();
636             }
637
638             }
639
640         case (sf::Keyboard::R): {
641             if (this->console_state == ConsoleState :: MENU) {
642                 this->__sendRestartGameMessage();
643             }
644
645             }
646
647         default: {
648             // do nothing!
649
650             break;
651         }
652     }
653 }
654
655 return;
656 } /* __handleKeyPressEvents() */
```

3.2.3.5 __handleMouseButtonEvents()

```
void ContextMenu::__handleMouseButtonEvents (
    void ) [private]
```

Helper method to handle mouse button events.


```

671 {
672     switch (this->event_ptr->mouseButton.button) {
673         case (sf::Mouse::Left): {
674             //...
675             break;
676         }
677     }
678
679     case (sf::Mouse::Right): {
680         //...
681         break;
682     }
683
684     default: {
685         // do nothing!
686         break;
687     }
688 }
689
690 return;
691 }
692
693 /* __handleMouseButtonEvents() */

```

3.2.3.6 __sendQuitGameMessage()

```

void ContextMenu::__sendQuitGameMessage (
    void ) [private]

```

Helper method to format and send a quit game message.

```

710 {
711     Message quit_game_message;
712
713     quit_game_message.channel = GAME_CHANNEL;
714     quit_game_message.subject = "quit game";
715
716     this->message_hub_ptr->sendMessage(quit_game_message);
717
718     return;
719 } /* __sendQuitGameMessage() */

```

3.2.3.7 __sendRestartGameMessage()

```

void ContextMenu::__sendRestartGameMessage (
    void ) [private]

```

Helper method to format and send a restart game message.

```

734 {
735     Message restart_game_message;
736
737     restart_game_message.channel = GAME_CHANNEL;
738     restart_game_message.subject = "restart game";
739
740     this->message_hub_ptr->sendMessage(restart_game_message);
741
742     return;
743 } /* __sendRestartGameMessage() */

```

3.2.3.8 __setConsoleState()

```

void ContextMenu::__setConsoleState (
    ConsoleState console_state ) [private]

```

Helper method to set state of console screen and update string if necessary.

Parameters

<code>console_state</code>	The state (ConsoleState) to set the console to.
----------------------------	---

```

457 {
458     // 1. if no change, do nothing
459     if (this->console_state == console_state) {
460         return;
461     }
462
463     // 2. update console state, set console string accordingly
464     this->console_state = console_state;
465     this->__setConsoleString();
466
467     return;
468 } /* __setConsoleState() */

```

3.2.3.9 __setConsoleString()

```

void ContextMenu::__setConsoleString (
    void ) [private]

```

Helper method to set console string depending on console state.

```

483 {
484     this->console_string.clear();
485
486     switch (this->console_state) {
487         case (ConsoleState :: MENU): {
488             // 32 char x 17 line console "-----\n";
489             this->console_string = "          **** MENU **** \n";
490             this->console_string += " \n";
491             this->console_string += "[T]:  TUTORIAL \n";
492             this->console_string += " \n";
493             this->console_string += "[R]:  RESTART \n";
494             this->console_string += " \n";
495             this->console_string += " \n";
496             this->console_string += " \n";
497             this->console_string += " \n";
498             this->console_string += " \n";
499             this->console_string += " \n";
500             this->console_string += " \n";
501             this->console_string += "[Q]:  QUIT \n";
502             this->console_string += " \n";
503             this->console_string += "[ESC]: CLOSE MENU \n";
504             this->console_string += " \n";
505
506             break;
507         }
508
509
510         case (ConsoleState :: TILE): {
511             // take console string from tile state message
512
513             break;
514         }
515
516
517         default: {
518             // 32 char x 17 line console "-----\n";
519             this->console_string = "          **** RTZ 64 CONTEXT V12 **** \n";
520             this->console_string += " \n";
521             this->console_string += "64K RAM SYSTEM  38911 BYTES FREE\n";
522             this->console_string += " \n";
523             this->console_string += "[ESC]:          MENU \n";
524             this->console_string += "[LEFT CLICK]: TILE INFO/OPTIONS \n";
525             this->console_string += " \n";
526             this->console_string += "READY. \n";
527
528             break;
529         }
530     }
531
532     return;
533 } /* __setConsoleString() */

```

3.2.3.10 __setUpConsoleScreen()

```
void ContextMenu::__setUpConsoleScreen (
    void ) [private]
```

Helper method to set up context menu console screen (drawable).

```
230 {
231     this->console_screen.setSize(sf::Vector2f(300, 340));
232     this->console_screen.setOrigin(300, 340);
233     this->console_screen.setPosition(
234         this->position_x - 50,
235         this->position_y + GAME_HEIGHT - 50
236     );
237     this->console_screen.setFillColor(MONOCHROME_SCREEN_BACKGROUND);
238
239     return;
240 } /* __setUpConsoleScreen() */
```

3.2.3.11 __setUpConsoleScreenFrame()

```
void ContextMenu::__setUpConsoleScreenFrame (
    void ) [private]
```

Helper method to set up framing for context menu console screen (drawable).

```
255 {
256     int n_points = 4;
257
258     // 1. top framing
259     this->console_screen_frame_top.setPointCount(n_points);
260
261     this->console_screen_frame_top.setPoint(
262         0,
263         sf::Vector2f(
264             this->position_x - 50,
265             this->position_y + GAME_HEIGHT - 50 - 340
266         )
267     );
268     this->console_screen_frame_top.setPoint(
269         1,
270         sf::Vector2f(
271             this->position_x - 50 + 16,
272             this->position_y + GAME_HEIGHT - 50 - 340 - 16
273         )
274     );
275     this->console_screen_frame_top.setPoint(
276         2,
277         sf::Vector2f(
278             this->position_x - 350 - 16,
279             this->position_y + GAME_HEIGHT - 50 - 340 - 16
280         )
281     );
282     this->console_screen_frame_top.setPoint(
283         3,
284         sf::Vector2f(
285             this->position_x - 350,
286             this->position_y + GAME_HEIGHT - 50 - 340
287         )
288     );
289
290     this->console_screen_frame_top.setFillColor(VISUAL_SCREEN_FRAME_GREY);
291
292     this->console_screen_frame_top.setOutlineThickness(2);
293     this->console_screen_frame_top.setOutlineColor(sf::Color(0, 0, 0, 255));
294
295     this->console_screen_frame_top.move(0, -2);
296
297
298     // 2. left framing
299     this->console_screen_frame_left.setPointCount(n_points);
300
301     this->console_screen_frame_left.setPoint(
302         0,
303         sf::Vector2f(
304             this->position_x - 350,
305             this->position_y + GAME_HEIGHT - 50 - 340
```

```

306         )
307     );
308     this->console_screen_frame_left.setPoint(
309         1,
310         sf::Vector2f(
311             this->position_x - 350 - 16,
312             this->position_y + GAME_HEIGHT - 50 - 340 - 16
313         )
314     );
315     this->console_screen_frame_left.setPoint(
316         2,
317         sf::Vector2f(
318             this->position_x - 350 - 16,
319             this->position_y + GAME_HEIGHT - 50 + 16
320         )
321     );
322     this->console_screen_frame_left.setPoint(
323         3,
324         sf::Vector2f(
325             this->position_x - 350,
326             this->position_y + GAME_HEIGHT - 50
327         )
328     );
329
330     this->console_screen_frame_left.setFillColors(VISUAL_SCREEN_FRAME_GREY);
331
332     this->console_screen_frame_left.setOutlineThickness(2);
333     this->console_screen_frame_left.setOutlineColor(sf::Color(0, 0, 0, 255));
334
335     this->console_screen_frame_left.move(-2, 0);
336
337
338     // 3. bottom framing
339     this->console_screen_frame_bottom.setPointCount(n_points);
340
341     this->console_screen_frame_bottom.setPoint(
342         0,
343         sf::Vector2f(
344             this->position_x - 350,
345             this->position_y + GAME_HEIGHT - 50
346         )
347     );
348     this->console_screen_frame_bottom.setPoint(
349         1,
350         sf::Vector2f(
351             this->position_x - 350 - 16,
352             this->position_y + GAME_HEIGHT - 50 + 16
353         )
354     );
355     this->console_screen_frame_bottom.setPoint(
356         2,
357         sf::Vector2f(
358             this->position_x - 50 + 16,
359             this->position_y + GAME_HEIGHT - 50 + 16
360         )
361     );
362     this->console_screen_frame_bottom.setPoint(
363         3,
364         sf::Vector2f(
365             this->position_x - 50,
366             this->position_y + GAME_HEIGHT - 50
367         )
368     );
369
370     this->console_screen_frame_bottom.setFillColors(VISUAL_SCREEN_FRAME_GREY);
371
372     this->console_screen_frame_bottom.setOutlineThickness(2);
373     this->console_screen_frame_bottom.setOutlineColor(sf::Color(0, 0, 0, 255));
374
375     this->console_screen_frame_bottom.move(0, 2);
376
377
378     // 4. right framing
379     this->console_screen_frame_right.setPointCount(n_points);
380
381     this->console_screen_frame_right.setPoint(
382         0,
383         sf::Vector2f(
384             this->position_x - 50,
385             this->position_y + GAME_HEIGHT - 50
386         )
387     );
388     this->console_screen_frame_right.setPoint(
389         1,
390         sf::Vector2f(
391             this->position_x - 50 + 16,
392             this->position_y + GAME_HEIGHT - 50 + 16

```

```

393     )
394 );
395 this->console_screen_frame_right.setPoint(
396     2,
397     sf::Vector2f(
398         this->position_x - 50 + 16,
399         this->position_y + GAME_HEIGHT - 50 - 340 - 16
400     )
401 );
402 this->console_screen_frame_right.setPoint(
403     3,
404     sf::Vector2f(
405         this->position_x - 50,
406         this->position_y + GAME_HEIGHT - 50 - 340
407     )
408 );
409
410 this->console_screen_frame_right.setFillColor(VISUAL_SCREEN_FRAME_GREY);
411
412 this->console_screen_frame_right.setOutlineThickness(2);
413 this->console_screen_frame_right.setOutlineColor(sf::Color(0, 0, 0, 255));
414
415 this->console_screen_frame_right.move(2, 0);
416
417 return;
418 } /* __setUpConsoleScreenFrame() */

```

3.2.3.12 __setUpMenuFrame()

```

void ContextMenu::__setUpMenuFrame (
    void ) [private]

```

Helper method to set up context menu frame (drawable).

```

34 {
35     this->menu_frame.setSize(sf::Vector2f(400, GAME_HEIGHT));
36     this->menu_frame.setOrigin(400, 0);
37     this->menu_frame.setPosition(this->position_x, this->position_y);
38     this->menu_frame.setFillColor(MENU_FRAME_GREY);
39
40     return;
41 } /* __setUpMenuFrame() */

```

3.2.3.13 __setUpVisualScreen()

```

void ContextMenu::__setUpVisualScreen (
    void ) [private]

```

Helper method to set up context menu visual screen (drawable).

```

56 {
57     this->visual_screen.setSize(sf::Vector2f(300, 300));
58     this->visual_screen.setOrigin(300, 0);
59     this->visual_screen.setPosition(this->position_x - 50, this->position_y + 50);
60     this->visual_screen.setFillColor(MONochrome_SCREEN_BACKGROUND);
61
62     return;
63 } /* __setUpVisualScreen() */

```

3.2.3.14 __setUpVisualScreenFrame()

```
void ContextMenu::__setUpVisualScreenFrame (
    void ) [private]
```

Helper method to set up framing for context menu visual screen (drawable).

```
78 {
79     int n_points = 4;
80
81     // 1. top framing
82     this->visual_screen_frame_top.setPointCount(n_points);
83
84     this->visual_screen_frame_top.setPoint(
85         0,
86         sf::Vector2f(this->position_x - 50, this->position_y + 50)
87     );
88     this->visual_screen_frame_top.setPoint(
89         1,
90         sf::Vector2f(this->position_x - 50 + 16, this->position_y + 50 - 16)
91     );
92     this->visual_screen_frame_top.setPoint(
93         2,
94         sf::Vector2f(this->position_x - 350 - 16, this->position_y + 50 - 16)
95     );
96     this->visual_screen_frame_top.setPoint(
97         3,
98         sf::Vector2f(this->position_x - 350, this->position_y + 50)
99     );
100
101     this->visual_screen_frame_top.setFillColor(VISUAL_SCREEN_FRAME_GREY);
102
103     this->visual_screen_frame_top.setOutlineThickness(2);
104     this->visual_screen_frame_top.setOutlineColor(sf::Color(0, 0, 0, 255));
105
106     this->visual_screen_frame_top.move(0, -2);
107
108
109     // 2. left framing
110     this->visual_screen_frame_left.setPointCount(n_points);
111
112     this->visual_screen_frame_left.setPoint(
113         0,
114         sf::Vector2f(this->position_x - 350, this->position_y + 50)
115     );
116     this->visual_screen_frame_left.setPoint(
117         1,
118         sf::Vector2f(this->position_x - 350 - 16, this->position_y + 50 - 16)
119     );
120     this->visual_screen_frame_left.setPoint(
121         2,
122         sf::Vector2f(this->position_x - 350 - 16, this->position_y + 350 + 16)
123     );
124     this->visual_screen_frame_left.setPoint(
125         3,
126         sf::Vector2f(this->position_x - 350, this->position_y + 350)
127     );
128
129     this->visual_screen_frame_left.setFillColor(VISUAL_SCREEN_FRAME_GREY);
130
131     this->visual_screen_frame_left.setOutlineThickness(2);
132     this->visual_screen_frame_left.setOutlineColor(sf::Color(0, 0, 0, 255));
133
134     this->visual_screen_frame_left.move(-2, 0);
135
136
137     // 3. bottom framing
138     this->visual_screen_frame_bottom.setPointCount(n_points);
139
140     this->visual_screen_frame_bottom.setPoint(
141         0,
142         sf::Vector2f(this->position_x - 350, this->position_y + 350)
143     );
144     this->visual_screen_frame_bottom.setPoint(
145         1,
146         sf::Vector2f(this->position_x - 350 - 16, this->position_y + 350 + 16)
147     );
148     this->visual_screen_frame_bottom.setPoint(
149         2,
150         sf::Vector2f(this->position_x - 50 + 16, this->position_y + 350 + 16)
151     );
152     this->visual_screen_frame_bottom.setPoint(
153         3,
154         sf::Vector2f(this->position_x - 50, this->position_y + 350)
155     );
156 }
```

```

156
157     this->visual_screen_frame_bottom.setFillColor(VISUAL_SCREEN_FRAME_GREY);
158
159     this->visual_screen_frame_bottom.setOutlineThickness(2);
160     this->visual_screen_frame_bottom.setOutlineColor(sf::Color(0, 0, 0, 255));
161
162     this->visual_screen_frame_bottom.move(0, 2);
163
164
165     // 4. right framing
166     this->visual_screen_frame_right.setPointCount(n_points);
167
168     this->visual_screen_frame_right.setPoint(
169         0,
170         sf::Vector2f(this->position_x - 50, this->position_y + 350)
171     );
172     this->visual_screen_frame_right.setPoint(
173         1,
174         sf::Vector2f(this->position_x - 50 + 16, this->position_y + 350 + 16)
175     );
176     this->visual_screen_frame_right.setPoint(
177         2,
178         sf::Vector2f(this->position_x - 50 + 16, this->position_y + 50 - 16)
179     );
180     this->visual_screen_frame_right.setPoint(
181         3,
182         sf::Vector2f(this->position_x - 50, this->position_y + 50)
183     );
184
185     this->visual_screen_frame_right.setFillColor(VISUAL_SCREEN_FRAME_GREY);
186
187     this->visual_screen_frame_right.setOutlineThickness(2);
188     this->visual_screen_frame_right.setOutlineColor(sf::Color(0, 0, 0, 255));
189
190     this->visual_screen_frame_right.move(2, 0);
191
192     return;
193 } /* __setUpVisualScreenFrame() */

```

3.2.3.15 draw()

```

void ContextMenu::draw (
    void )

```

Method to draw the hex tile to the render window. To be called once per frame.

```

920 {
921     // 1. menu frame
922     this->render_window_ptr->draw(this->menu_frame);
923
924     // 2. visual screen
925     this->render_window_ptr->draw(this->visual_screen);
926     this->__drawVisualScreenFrame();
927
928     // 3. console screen
929     this->render_window_ptr->draw(this->console_screen);
930     this->__drawConsoleScreenFrame();
931     this->__drawConsoleText();
932
933     this->frame++;
934     return;
935 } /* draw() */

```

3.2.3.16 processEvent()

```

void ContextMenu::processEvent (
    void )

```

Method to processEvent [ContextMenu](#). To be called once per event.

```

826 {

```

```

827     if (this->event_ptr->type == sf::Event::KeyPressed) {
828         this->__handleKeyPressEvents();
829     }
830
831     if (this->event_ptr->type == sf::Event::MouseButtonPressed) {
832         this->__handleMouseButtonEvents();
833     }
834
835     return;
836 } /* processEvent() */

```

3.2.3.17 processMessage()

```

void ContextMenu::processMessage (
    void )

```

Method to processMessage [ContextMenu](#). To be called once per message.

```

851 {
852     switch (this->console_state) {
853         case (ConsoleState :: TILE): {
854             // process no tile selected
855             if (not this->message_hub_ptr->isEmpty(NO_TILE_SELECTED_CHANNEL)) {
856                 Message no_tile_selected_message = this->message_hub_ptr->receiveMessage(
857                     NO_TILE_SELECTED_CHANNEL
858                 );
859
860                 if (no_tile_selected_message.subject == "no tile selected") {
861                     this->__setConsoleState(ConsoleState :: READY);
862                     this->message_hub_ptr->popMessage(NO_TILE_SELECTED_CHANNEL);
863                 }
864             }
865
866             // process tile state
867             if (not this->message_hub_ptr->isEmpty(TILE_STATE_CHANNEL)) {
868                 Message tile_state_message = this->message_hub_ptr->receiveMessage(
869                     TILE_STATE_CHANNEL
870                 );
871
872                 if (tile_state_message.subject == "tile state") {
873                     this->console_string = tile_state_message.string_payload;
874                     this->message_hub_ptr->popMessage(TILE_STATE_CHANNEL);
875                 }
876             }
877
878             // process tile selected (subsequent left clicks causing program to hang)
879             if (not this->message_hub_ptr->isEmpty(TILE_SELECTED_CHANNEL)) {
880                 this->message_hub_ptr->popMessage(TILE_SELECTED_CHANNEL);
881             }
882
883             break;
884         }
885
886         default: {
887             // process tile selected
888             if (not this->message_hub_ptr->isEmpty(TILE_SELECTED_CHANNEL)) {
889                 Message tile_selected_message = this->message_hub_ptr->receiveMessage(
890                     TILE_SELECTED_CHANNEL
891                 );
892
893                 if (tile_selected_message.subject == "tile selected") {
894                     this->__setConsoleState(ConsoleState :: TILE);
895                     this->message_hub_ptr->popMessage(TILE_SELECTED_CHANNEL);
896                 }
897             }
898
899             break;
900         }
901     }
902
903     return;
904 } /* processMessage() */

```

3.2.4 Member Data Documentation

3.2.4.1 assets_manager_ptr

`AssetsManager*` ContextMenu::assets_manager_ptr [private]

A pointer to the assets manager.

3.2.4.2 console_screen

`sf::RectangleShape` ContextMenu::console_screen

The context menu console screen (for animated text output).

3.2.4.3 console_screen_frame_bottom

`sf::ConvexShape` ContextMenu::console_screen_frame_bottom

The bottom framing of the console screen.

3.2.4.4 console_screen_frame_left

`sf::ConvexShape` ContextMenu::console_screen_frame_left

The left framing of the console screen.

3.2.4.5 console_screen_frame_right

`sf::ConvexShape` ContextMenu::console_screen_frame_right

The right framing of the console screen.

3.2.4.6 console_screen_frame_top

`sf::ConvexShape` ContextMenu::console_screen_frame_top

The top framing of the console screen.

3.2.4.7 console_state

`ConsoleState ContextMenu::console_state`

The current state of the console screen.

3.2.4.8 console_string

`std::string ContextMenu::console_string`

The string to be printed to the console screen.

3.2.4.9 event_ptr

`sf::Event* ContextMenu::event_ptr [private]`

A pointer to the event class.

3.2.4.10 frame

`int ContextMenu::frame`

The current frame of this object.

3.2.4.11 game_menu_up

`bool ContextMenu::game_menu_up`

Indicates whether or not the game menu is up.

3.2.4.12 menu_frame

`sf::RectangleShape ContextMenu::menu_frame`

The frame of the context menu.

3.2.4.13 message_hub_ptr

```
MessageHub* ContextMenu::message_hub_ptr [private]
```

A pointer to the message hub.

3.2.4.14 position_x

```
double ContextMenu::position_x
```

The position of the object.

3.2.4.15 position_y

```
double ContextMenu::position_y
```

The position of the object.

3.2.4.16 render_window_ptr

```
sf::RenderWindow* ContextMenu::render_window_ptr [private]
```

A pointer to the render window.

3.2.4.17 visual_screen

```
sf::RectangleShape ContextMenu::visual_screen
```

The context menu screen for visuals.

3.2.4.18 visual_screen_frame_bottom

```
sf::ConvexShape ContextMenu::visual_screen_frame_bottom
```

The bottom framing of the visual screen.

3.2.4.19 visual_screen_frame_left

```
sf::ConvexShape ContextMenu::visual_screen_frame_left
```

The left framing of the visual screen.

3.2.4.20 visual_screen_frame_right

```
sf::ConvexShape ContextMenu::visual_screen_frame_right
```

The right framing of the visual screen.

3.2.4.21 visual_screen_frame_top

```
sf::ConvexShape ContextMenu::visual_screen_frame_top
```

The top framing of the visual screen.

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

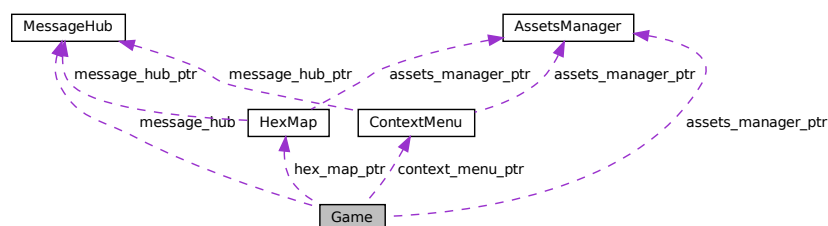
- header/[ContextMenu.h](#)
- source/[ContextMenu.cpp](#)

3.3 Game Class Reference

A class which acts as the central class for the game, by containing all other classes and implementing the game loop.

```
#include <Game.h>
```

Collaboration diagram for Game:



Public Member Functions

- [Game](#) (sf::RenderWindow *, [AssetsManager](#) *)
Constructor for the [Game](#) class.
- bool [run](#) (void)
Method to run game (defines game loop).
- [~Game](#) (void)
Destructor for the [Game](#) class.

Public Attributes

- bool [quit_game](#)
Boolean indicating whether to quit (true) or create a new [Game](#) instance (false).
- bool [game_loop_broken](#)
Boolean indicating whether or not the game loop is broken.
- bool [show_frame_clock_overlay](#)
Boolean indicating whether or not to show frame and clock overlay.
- unsigned long long int [frame](#)
The current frame of the game.
- double [time_since_start_s](#)
The time elapsed [s] since the start of the game.
- sf::Clock [clock](#)
The game clock.
- sf::Event [event](#)
The game events class.
- [MessageHub](#) [message_hub](#)
The message hub (for inter-object message traffic).
- [HexMap](#) * [hex_map_ptr](#)
Pointer to the hex map (defines game world).
- [ContextMenu](#) * [context_menu_ptr](#)
Pointer to the context menu.

Private Member Functions

- void [__toggleFrameClockOverlay](#) (void)
Helper method to toggle frame clock overlay.
- void [__drawFrameClockOverlay](#) (void)
Helper method to draw frame clock overlay.
- void [__handleKeyPressEvents](#) (void)
Helper method to handle key press events.
- void [__handleMouseButtonEvents](#) (void)
Helper method to handle mouse button events.
- void [__processEvent](#) (void)
Helper method to process [Game](#). To be called once per event.
- void [__processMessage](#) (void)
Helper method to process [Game](#). To be called once per message.
- void [__draw](#) (void)
Helper method to draw game to the render window. To be called once per frame.

Private Attributes

- `sf::RenderWindow * render_window_ptr`
A pointer to the render window.
- `AssetsManager * assets_manager_ptr`
A pointer to the assets manager.

3.3.1 Detailed Description

A class which acts as the central class for the game, by containing all other classes and implementing the game loop.

3.3.2 Constructor & Destructor Documentation

3.3.2.1 Game()

```
Game::Game (
    sf::RenderWindow * render_window_ptr,
    AssetsManager * assets_manager_ptr )
```

Constructor for the `Game` class.

```
262 {
263     // 1. set attributes
264
265     // 1.1. private
266     this->render_window_ptr = render_window_ptr;
267
268     this->assets_manager_ptr = assets_manager_ptr;
269
270     // 1.2. public
271     this->quit_game = false;
272     this->game_loop_broken = false;
273     this->show_frame_clock_overlay = false;
274
275     this->frame = 0;
276     this->time_since_start_s = 0;
277
278     this->hex_map_ptr = new HexMap(
279         6,
280         &(this->event),
281         this->render_window_ptr,
282         this->assets_manager_ptr,
283         &(this->message_hub)
284     );
285
286     this->context_menu_ptr = new ContextMenu(
287         &(this->event),
288         this->render_window_ptr,
289         this->assets_manager_ptr,
290         &(this->message_hub)
291     );
292
293     // 2. add message channel(s)
294     this->message_hub.addChannel(GAME_CHANNEL);
295
296     std::cout << "Game constructed at " << this << std::endl;
297
298     return;
299 } /* Game() */
```

3.3.2.2 ~Game()

```
Game::~~Game (
    void )
```

Destructor for the [Game](#) class.

```
376 {
377     // 1. clean up attributes
378     delete this->hex_map_ptr;
379     delete this->context_menu_ptr;
380
381     std::cout << "Game at " << this << " destroyed" << std::endl;
382
383     return;
384 } /* ~Game() */
```

3.3.3 Member Function Documentation

3.3.3.1 __draw()

```
void Game::__draw (
    void ) [private]
```

Helper method to draw game to the render window. To be called once per frame.

```
231 {
232     if (this->show_frame_clock_overlay) {
233         this->__drawFrameClockOverlay();
234     }
235
236     return;
237 } /* draw() */
```

3.3.3.2 __drawFrameClockOverlay()

```
void Game::__drawFrameClockOverlay (
    void ) [private]
```

Helper method to draw frame clock overlay.

```
59 {
60     std::string frame_clock_string = "FRAME: ";
61     frame_clock_string += std::to_string(this->frame);
62     frame_clock_string += "\nTIME SINCE START [s]: ";
63     frame_clock_string += std::to_string(this->time_since_start_s);
64
65     sf::Text frame_clock_text(
66         frame_clock_string,
67         *(this->assets_manager_ptr->getFont("DroidSansMono")),
68         16
69     );
70
71     sf::RectangleShape frame_clock_backing(
72         sf::Vector2f(
73             1.02 * frame_clock_text.getLocalBounds().width,
74             1.02 * frame_clock_text.getLocalBounds().height
75         )
76     );
77     frame_clock_backing.setFillColor(sf::Color(0, 0, 0, 255));
78
79     this->render_window_ptr->draw(frame_clock_backing);
80     this->render_window_ptr->draw(frame_clock_text);
81
82     return;
83 } /* __drawFrameClockOverlay() */
```

3.3.3.3 __handleKeyPressEvents()

```
void Game::__handleKeyPressEvents (
    void ) [private]
```

Helper method to handle key press events.

```
98 {
99     switch (this->event.key.code) {
100         case (sf::Keyboard::Tilde): {
101             this->__toggleFrameClockOverlay();
102
103             break;
104         }
105
106         default: {
107             // do nothing!
108
109             break;
110         }
111     }
112
113     return;
114 } /* __handleKeyPressEvents() */
```

3.3.3.4 __handleMouseButtonEvents()

```
void Game::__handleMouseButtonEvents (
    void ) [private]
```

Helper method to handle mouse button events.

```
129 {
130     switch (this->event.mouseButton.button) {
131         case (sf::Mouse::Left): {
132             //...
133
134             break;
135         }
136
137
138         case (sf::Mouse::Right): {
139             //...
140
141             break;
142         }
143
144
145         default: {
146             // do nothing!
147
148             break;
149         }
150     }
151
152     return;
153 } /* __handleMouseButtonEvents() */
```

3.3.3.5 __processEvent()

```
void Game::__processEvent (
    void ) [private]
```

Helper method to process [Game](#). To be called once per event.

```
169 {
170     if (this->event.type == sf::Event::Closed) {
171         this->quit_game = true;
172         this->game_loop_broken = true;
```



```

173     }
174
175     if (this->event.type == sf::Event::KeyPressed) {
176         this->__handleKeyPressEvents();
177     }
178
179     if (this->event.type == sf::Event::MouseButtonPressed) {
180         this->__handleMouseButtonEvents();
181     }
182
183     return;
184 } /* __processEvent() */

```

3.3.3.6 __processMessage()

```

void Game::__processMessage (
    void ) [private]

```

Helper method to process [Game](#). To be called once per message.

```

199 {
200     if (not this->message_hub.isEmpty(GAME_CHANNEL)) {
201         Message game_channel_message = this->message_hub.receiveMessage(GAME_CHANNEL);
202
203         if (game_channel_message.subject == "quit game") {
204             this->quit_game = true;
205             this->game_loop_broken = true;
206             this->message_hub.popMessage(GAME_CHANNEL);
207         }
208
209         if (game_channel_message.subject == "restart game") {
210             this->game_loop_broken = true;
211             this->message_hub.popMessage(GAME_CHANNEL);
212         }
213     }
214
215     return;
216 } /* __processMessage() */

```

3.3.3.7 __toggleFrameClockOverlay()

```

void Game::__toggleFrameClockOverlay (
    void ) [private]

```

Helper method to toggle frame clock overlay.

```

34 {
35     if (this->show_frame_clock_overlay) {
36         this->show_frame_clock_overlay = false;
37     }
38
39     else {
40         this->show_frame_clock_overlay = true;
41     }
42
43     return;
44 } /* __toggleFrameClockOverlay() */

```

3.3.3.8 run()

```
bool Game::run (
    void )
```

Method to run game (defines game loop).

Returns

Boolean indicating whether to quit (true) or create a new [Game](#) instance (false).

```
317 {
318     // 1. play brand animation
319     //...
320
321     // 2. show splash screen
322     //...
323
324     // 3. start game loop
325     while (not this->game_loop_broken) {
326         this->time_since_start_s = this->clock.getElapsedTime().asSeconds();
327
328         if (this->time_since_start_s >= (this->frame + 1) * SECONDS_PER_FRAME) {
329             // 6.1. process events
330             while (this->render_window_ptr->pollEvent(this->event)) {
331                 this->hex_map_ptr->processEvent();
332                 this->context_menu_ptr->processEvent();
333                 this->__processEvent();
334             }
335
336             // 6.2. process messages
337             while (this->message_hub.hasTraffic()) {
338                 this->hex_map_ptr->processMessage();
339                 this->context_menu_ptr->processMessage();
340                 this->__processMessage();
341             }
342
343             // 6.3. draw frame
344             this->render_window_ptr->clear();
345
346             this->hex_map_ptr->draw();
347             this->context_menu_ptr->draw();
348             this->__draw();
349
350             this->render_window_ptr->display();
351
352             // 6.4. increment frame
353             this->frame++;
354         }
355     }
356
357     return this->quit_game;
358 }
359
360 /* run() */
361 }
```

3.3.4 Member Data Documentation

3.3.4.1 assets_manager_ptr

```
AssetsManager* Game::assets_manager_ptr [private]
```

A pointer to the assets manager.

3.3.4.2 clock

```
sf::Clock Game::clock
```

The game clock.

3.3.4.3 context_menu_ptr

```
ContextMenu* Game::context_menu_ptr
```

Pointer to the context menu.

3.3.4.4 event

```
sf::Event Game::event
```

The game events class.

3.3.4.5 frame

```
unsigned long long int Game::frame
```

The current frame of the game.

3.3.4.6 game_loop_broken

```
bool Game::game_loop_broken
```

Boolean indicating whether or not the game loop is broken.

3.3.4.7 hex_map_ptr

```
HexMap* Game::hex_map_ptr
```

Pointer to the hex map (defines game world).

3.3.4.8 message_hub

[MessageHub](#) `Game::message_hub`

The message hub (for inter-object message traffic).

3.3.4.9 quit_game

`bool Game::quit_game`

Boolean indicating whether to quit (true) or create a new [Game](#) instance (false).

3.3.4.10 render_window_ptr

`sf::RenderWindow* Game::render_window_ptr` [private]

A pointer to the render window.

3.3.4.11 show_frame_clock_overlay

`bool Game::show_frame_clock_overlay`

Boolean indicating whether or not to show frame and clock overlay.

3.3.4.12 time_since_start_s

`double Game::time_since_start_s`

The time elapsed [s] since the start of the game.

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

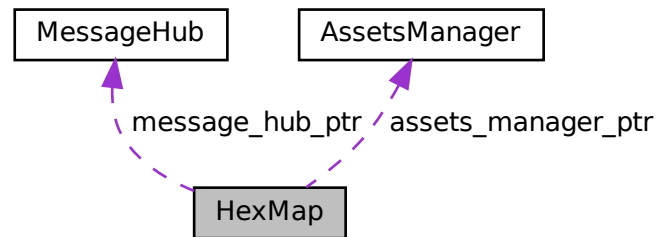
- header/[Game.h](#)
- source/[Game.cpp](#)

3.4 HexMap Class Reference

A class which defines a hex map of hex tiles.

```
#include <HexMap.h>
```

Collaboration diagram for HexMap:



Public Member Functions

- [HexMap](#) (int, sf::Event *, sf::RenderWindow *, [AssetsManager](#) *, [MessageHub](#) *)
Constructor (intended) for the [HexMap](#) class.
- void [assess](#) (void)
Method to assess the resource of the selected tile.
- void [reroll](#) (void)
Method to re-roll the hex map.
- void [toggleResourceOverlay](#) (void)
Method to toggle the hex map resource overlay.
- void [processEvent](#) (void)
Method to process [HexMap](#). To be called once per event.
- void [processMessage](#) (void)
Method to process [HexMap](#). To be called once per message.
- void [draw](#) (void)
Method to draw the hex map to the render window. To be called once per frame.
- void [clear](#) (void)
Method to clear the hex map.
- [~HexMap](#) (void)
Destructor for the [HexMap](#) class.

Public Attributes

- bool [tile_selected](#)
A boolean which indicates if a tile is currently selected.
- int [n_layers](#)
The number of layers in the hex map.
- int [n_tiles](#)
The number of tiles in the hex map.
- int [frame](#)
The current frame of this object.
- double [position_x](#)
The x position of the hex map's origin (i.e. central) tile.
- double [position_y](#)
The y position of the hex map's origin (i.e. central) tile.
- sf::RectangleShape [glass_screen](#)
To give the effect of an old glass screen over the hex map.
- std::vector< double > [tile_position_x_vec](#)
A vector of tile x positions.
- std::vector< double > [tile_position_y_vec](#)
A vector of tile y position.
- std::vector< [HexTile](#) * > [border_tiles_vec](#)
A vector of pointers to the border tiles.
- std::map< double, std::map< double, [HexTile](#) * > > [hex_map](#)
A position-indexed, nested map of hex tiles.

Private Member Functions

- void [__setUpGlassScreen](#) (void)
Helper method to set up glass screen effect (drawable).
- void [__layTiles](#) (void)
Helper method to lay the hex tiles down to generate the game world.
- std::vector< double > [__getNoise](#) (int, int=128)
Helper method to generate a vector of noise, with values mapped to the closed interval [0, 1]. Applies a random cosine series approach.
- void [__procedurallyGenerateTileTypes](#) (void)
Helper method to procedurally generate tile types and set tiles accordingly.
- std::vector< double > [__getValidMapIndexPositions](#) (double, double)
Helper method to translate given position into valid index position for a.
- std::vector< [HexTile](#) * > [__getNeighboursVector](#) ([HexTile](#) *)
Helper method to assemble a vector pointers to all neighbours of the given tile.
- [TileType](#) [__getMajorityTileType](#) ([HexTile](#) *)
Function to return majority tile type of a tile and its neighbours. If no clear majority, simply returns the type of the given tile.
- void [__smoothTileTypes](#) (void)
Helper method to smooth tile types using a majority rules approach.
- bool [__isLakeTouchingOcean](#) ([HexTile](#) *)
- void [__enforceOceanContinuity](#) (void)
Helper method to scan tiles and enforce ocean continuity. That is to say, if a lake tile is found to be in contact with an ocean tile, then it becomes ocean.
- void [__procedurallyGenerateTileResources](#) (void)
Helper method to procedurally generate tile resources and set tiles accordingly.

- void `__assembleHexMap` (void)
Helper method to assemble the hex map.
- `HexTile *` `__getSelectedTile` (void)
Helper method to get pointer to selected tile.
- void `__handleKeyPressEvents` (void)
Helper method to handle key press events.
- void `__handleMouseButtonEvents` (void)
Helper method to handle mouse button events.
- void `__sendNoTileSelectedMessage` (void)
Helper method to format and send message on no tile selected.

Private Attributes

- `sf::Event *` `event_ptr`
A pointer to the event class.
- `sf::RenderWindow *` `render_window_ptr`
A pointer to the render window.
- `AssetsManager *` `assets_manager_ptr`
A pointer to the assets manager.
- `MessageHub *` `message_hub_ptr`
A pointer to the message hub.

3.4.1 Detailed Description

A class which defines a hex map of hex tiles.

3.4.2 Constructor & Destructor Documentation

3.4.2.1 HexMap()

```
HexMap::HexMap (
    int n_layers,
    sf::Event * event_ptr,
    sf::RenderWindow * render_window_ptr,
    AssetsManager * assets_manager_ptr,
    MessageHub * message_hub_ptr )
```

Constructor (intended) for the `HexMap` class.

Parameters

<code>n_layers</code>	The number of layers in the <code>HexMap</code> .
<code>event_ptr</code>	Pointer to the event class.
<code>render_window_ptr</code>	Pointer to the render window.
<code>assets_manager_ptr</code>	Pointer to the assets manager.
<code>message_hub_ptr</code>	Pointer to the message hub.

```

972 {
973     // 1. set attributes
974
975     // 1.1. private
976     this->event_ptr = event_ptr;
977     this->render_window_ptr = render_window_ptr;
978
979     this->assets_manager_ptr = assets_manager_ptr;
980     this->message_hub_ptr = message_hub_ptr;
981
982     // 1.2. public
983     this->tile_selected = false;
984
985     this->frame = 0;
986
987     this->n_layers = n_layers;
988     if (this->n_layers < 0) {
989         this->n_layers = 0;
990     }
991
992     this->position_x = 400;
993     this->position_y = 400;
994
995     // 2. assemble n layer hex map
996     this->__assembleHexMap();
997
998     // 3. set up and position drawable attributes
999     this->__setUpGlassScreen();
1000
1001     // 4. add message channel(s)
1002     this->message_hub_ptr->addChannel(TILE_SELECTED_CHANNEL);
1003     this->message_hub_ptr->addChannel(NO_TILE_SELECTED_CHANNEL);
1004     this->message_hub_ptr->addChannel(TILE_STATE_CHANNEL);
1005
1006     std::cout << "HexMap constructed at " << this << std::endl;
1007
1008     return;
1009 } /* HexMap(), intended */

```

3.4.2.2 ~HexMap()

```

HexMap::~HexMap (
    void )

```

Destructor for the [HexMap](#) class.

```

1262 {
1263     this->clear();
1264
1265     std::cout << "HexMap at " << this << " destroyed" << std::endl;
1266
1267     return;
1268 } /* ~HexMap() */

```

3.4.3 Member Function Documentation

3.4.3.1 __assembleHexMap()

```

void HexMap::__assembleHexMap (
    void ) [private]

```

Helper method to assemble the hex map.

```

758 {
759     // 1. seed RNG (using milliseconds since 1 Jan 1970)
760     unsigned long long int milliseconds_since_epoch =
761         std::chrono::duration_cast<std::chrono::milliseconds>(

```



```

762         std::chrono::system_clock::now().time_since_epoch()
763         ).count();
764     srand(millisecons_since_epoch);
765
766     // 2. lay tiles
767     this->__layTiles();
768
769     // 3. procedurally generate types
770     this->__procedurallyGenerateTileTypes();
771
772     // 4. procedurally generate resources
773     this->__procedurallyGenerateTileResources();
774
775     return;
776 } /* __assembleHexMap() */

```

3.4.3.2 __enforceOceanContinuity()

```

void HexMap::__enforceOceanContinuity (
    void ) [private]

```

Helper method to scan tiles and enforce ocean continuity. That is to say, if a lake tile is found to be in contact with an ocean tile, then it becomes ocean.

```

669 {
670     std::cout << "enforcing ocean continuity ..." << std::endl;
671
672     bool tile_changed = false;
673
674     // 1. scan tiles and enforce (where appropriate)
675     std::map<double, std::map<double, HexTile*>>::iterator hex_map_iter_x;
676     std::map<double, HexTile*>::iterator hex_map_iter_y;
677     HexTile* hex_ptr;
678     for (
679         hex_map_iter_x = this->hex_map.begin();
680         hex_map_iter_x != this->hex_map.end();
681         hex_map_iter_x++
682     ) {
683         for (
684             hex_map_iter_y = hex_map_iter_x->second.begin();
685             hex_map_iter_y != hex_map_iter_x->second.end();
686             hex_map_iter_y++
687         ) {
688             hex_ptr = hex_map_iter_y->second;
689
690             if (this->__isLakeTouchingOcean(hex_ptr)) {
691                 hex_ptr->setTileType(TileType::OCEAN);
692                 tile_changed = true;
693             }
694         }
695     }
696
697     if (tile_changed) {
698         this->__enforceOceanContinuity();
699     }
700     else {
701         return;
702     }
703 } /* __enforceOceanContinuity() */

```

3.4.3.3 __getMajorityTileType()

```

TileType HexMap::__getMajorityTileType (
    HexTile * hex_ptr ) [private]

```

Function to return majority tile type of a tile and its neighbours. If no clear majority, simply returns the type of the given tile.

Parameters

<code>hex_ptr</code>	Pointer to the given tile.
----------------------	----------------------------

Returns

The majority tile type of the tile and its neighbours. If no clear majority type, then the type of the given tile is simply returned.

```

525 {
526     // 1. init type count map
527     std::map<TileType, int> type_count_map;
528     type_count_map[hex_ptr->tile_type] = 1;
529
530     // 2. survey neighbours, count type instances
531     std::vector<HexTile*> neighbours_vec = this->__getNeighboursVector(hex_ptr);
532
533     for (size_t i = 0; i < neighbours_vec.size(); i++) {
534         if (type_count_map.count(neighbours_vec[i]->tile_type) <= 0) {
535             type_count_map[neighbours_vec[i]->tile_type] = 1;
536         }
537         else {
538             type_count_map[neighbours_vec[i]->tile_type] += 1;
539         }
540     }
541
542     // 3. find majority tile type
543     int max_count = -1 * std::numeric_limits<int>::infinity();
544     TileType majority_tile_type = hex_ptr->tile_type;
545
546     std::map<TileType, int>::iterator map_iter;
547     for (
548         map_iter = type_count_map.begin();
549         map_iter != type_count_map.end();
550         map_iter++
551     ){
552         if (map_iter->second > max_count) {
553             max_count = map_iter->second;
554             majority_tile_type = map_iter->first;
555         }
556     }
557
558     // 4. detect ties
559     for (
560         map_iter = type_count_map.begin();
561         map_iter != type_count_map.end();
562         map_iter++
563     ){
564         if (
565             map_iter->second == max_count and
566             map_iter->first != majority_tile_type
567         ) {
568             majority_tile_type = hex_ptr->tile_type;
569             break;
570         }
571     }
572
573     return majority_tile_type;
574 } /* __getMajorityTileType() */

```

3.4.3.4 __getNeighboursVector()

```

std::vector< HexTile * > HexMap::__getNeighboursVector (
    HexTile * hex_ptr ) [private]

```

Helper method to assemble a vector pointers to all neighbours of the given tile.

Parameters

<code>hex_ptr</code>	A pointer to the given tile.
----------------------	------------------------------

Returns

A vector of pointers to all neighbours of the given tile.

```

467 {
468     std::vector<HexTile*> neighbours_vec;
469
470     // 1. build potential neighbour positions
471     std::vector<double> potential_neighbour_x_vec(6, 0);
472     std::vector<double> potential_neighbour_y_vec(6, 0);
473
474     for (int i = 0; i < 6; i++) {
475         potential_neighbour_x_vec[i] = hex_ptr->position_x +
476             2 * hex_ptr->minor_radius * cos((60 * i) * (M_PI / 180));
477
478         potential_neighbour_y_vec[i] = hex_ptr->position_y +
479             2 * hex_ptr->minor_radius * sin((60 * i) * (M_PI / 180));
480     }
481
482     // 2. populate neighbours vector
483     std::vector<double> map_index_positions;
484     double potential_x = 0;
485     double potential_y = 0;
486
487     for (int i = 0; i < 6; i++) {
488         potential_x = potential_neighbour_x_vec[i];
489         potential_y = potential_neighbour_y_vec[i];
490
491         map_index_positions = this->__getValidMapIndexPositions(
492             potential_x,
493             potential_y
494         );
495
496         if (not (map_index_positions[0] == -1)) {
497             neighbours_vec.push_back(
498                 this->hex_map[map_index_positions[0]][map_index_positions[1]]
499             );
500         }
501     }
502
503     return neighbours_vec;
504 } /* __getNeighbourVector() */

```

3.4.3.5 __getNoise()

```

std::vector< double > HexMap::__getNoise (
    int n_elements,
    int n_components = 128 ) [private]

```

Helper method to generate a vector of noise, with values mapped to the closed interval [0, 1]. Applies a random cosine series approach.

Parameters

<i>n_elements</i>	The number of elements in the generated noise vector.
<i>n_components</i>	The number of components to use in the random cosine series. Defaults to 64.

Returns

A vector of noise, with values mapped to the closed interval [0, 1].

```

247 {
248     // 1. generate random amplitude, wave number, direction, and phase vectors
249     std::vector<double> random_amplitude_vec(n_components, 0);
250     std::vector<double> random_wave_number_vec(n_components, 0);
251     std::vector<double> random_frequency_vec(n_components, 0);
252     std::vector<double> random_direction_vec(n_components, 0);
253     std::vector<double> random_phase_vec(n_components, 0);
254
255     for (int i = 0; i < n_components; i++) {

```

```

256     random_amplitude_vec[i] = 10 * ((double)rand() / RAND_MAX);
257
258     random_wave_number_vec[i] = 2 * M_PI * ((double)rand() / RAND_MAX);
259
260     random_frequency_vec[i] = ((double)rand() / RAND_MAX);
261
262     random_direction_vec[i] = 2 * M_PI * ((double)rand() / RAND_MAX);
263
264     random_phase_vec[i] = 2 * M_PI * ((double)rand() / RAND_MAX);
265 }
266
267 // 2. generate noise vec
268 double amp = 0;
269 double wave_no = 0;
270 double freq = 0;
271 double dir = 0;
272 double phase = 0;
273
274 double x = 0;
275 double y = 0;
276 double t = time(NULL);
277
278 double max_noise = -1 * std::numeric_limits<double>::infinity();
279 double min_noise = std::numeric_limits<double>::infinity();
280
281 double noise = 0;
282 std::vector<double> noise_vec(n_elements, 0);
283
284 for (int i = 0; i < n_elements; i++) {
285     x = this->tile_position_x_vec[i] - this->position_x;
286     y = this->tile_position_y_vec[i] - this->position_y;
287
288     for (int j = 0; j < n_components; j++) {
289         amp = random_amplitude_vec[j];
290         wave_no = random_wave_number_vec[j];
291         freq = random_frequency_vec[j];
292         dir = random_direction_vec[j];
293         phase = random_phase_vec[j];
294
295         noise += (amp / (j + 1)) * cos(
296             wave_no * (j + 1) * (x * sin(dir) + y * cos(dir)) +
297             2 * M_PI * (j + 1) * freq * t +
298             phase
299         );
300     }
301
302     noise_vec[i] = noise;
303
304     if (noise > max_noise) {
305         max_noise = noise;
306     }
307
308     else if (noise < min_noise) {
309         min_noise = noise;
310     }
311
312     noise = 0;
313 }
314
315 // 3. normalize noise vec
316 for (int i = 0; i < n_elements; i++) {
317     noise_vec[i] = (noise_vec[i] - min_noise) / (max_noise - min_noise);
318
319     if (noise_vec[i] < 0) {
320         noise_vec[i] = 0;
321     }
322     else if (noise_vec[i] > 1) {
323         noise_vec[i] = 1;
324     }
325 }
326
327 return noise_vec;
328 } /* __getNoise() */

```

3.4.3.6 __getSelectedTile()

```

HexTile * HexMap::__getSelectedTile (
    void ) [private]

```

Helper method to get pointer to selected tile.

Returns

Pointer to selected tile (or NULL if no tile selected).

```

793 {
794     HexTile* selected_tile_ptr = NULL;
795
796     bool break_flag = false;
797     std::map<double, std::map<double, HexTile*>::iterator hex_map_iter_x;
798     std::map<double, HexTile*>::iterator hex_map_iter_y;
799
800     for (
801         hex_map_iter_x = this->hex_map.begin();
802         hex_map_iter_x != this->hex_map.end();
803         hex_map_iter_x++
804     ) {
805         for (
806             hex_map_iter_y = hex_map_iter_x->second.begin();
807             hex_map_iter_y != hex_map_iter_x->second.end();
808             hex_map_iter_y++
809         ) {
810             if (hex_map_iter_y->second->is_selected) {
811                 selected_tile_ptr = hex_map_iter_y->second;
812                 break_flag = true;
813             }
814
815             if (break_flag) {
816                 break;
817             }
818         }
819
820         if (break_flag) {
821             break;
822         }
823     }
824
825     return selected_tile_ptr;
826 } /* __getSelectedTile() */

```

3.4.3.7 __getValidMapIndexPositions()

```

std::vector< double > HexMap::__getValidMapIndexPositions (
    double potential_x,
    double potential_y ) [private]

```

Helper method to translate given position into valid index position for a.

Parameters

<i>potential_x</i>	The potential x position of the tile.
<i>potential_y</i>	The potential y position of the tile.

Returns

A vector of positions, either valid for indexing into the hex map, or sentinel values (-1) if invalid.

```

413 {
414     std::vector<double> map_index_positions = {-1, -1};
415
416     std::map<double, std::map<double, HexTile*>::iterator hex_map_iter_x;
417     std::map<double, HexTile*>::iterator hex_map_iter_y;
418     HexTile* hex_ptr;
419
420     double distance = 0;
421
422     for (
423         hex_map_iter_x = this->hex_map.begin();

```

```

424         hex_map_iter_x != this->hex_map.end();
425         hex_map_iter_x++
426     ) {
427         for (
428             hex_map_iter_y = hex_map_iter_x->second.begin();
429             hex_map_iter_y != hex_map_iter_x->second.end();
430             hex_map_iter_y++
431         ) {
432             hex_ptr = hex_map_iter_y->second;
433
434             distance = sqrt(
435                 pow(hex_ptr->position_x - potential_x, 2) +
436                 pow(hex_ptr->position_y - potential_y, 2)
437             );
438
439             if (distance <= hex_ptr->minor_radius / 4) {
440                 map_index_positions = {hex_ptr->position_x, hex_ptr->position_y};
441                 return map_index_positions;
442             }
443         }
444     }
445
446     return map_index_positions;
447 } /* __isInHexMap() */

```

3.4.3.8 __handleKeyPressEvents()

```

void HexMap::__handleKeyPressEvents (
    void ) [private]

```

Helper method to handle key press events.

```

841 {
842     switch (this->event_ptr->key.code) {
843         case (sf::Keyboard::Escape): {
844             this->tile_selected = false;
845         }
846
847         default: {
848             // do nothing!
849
850             break;
851         }
852     }
853 }
854
855 return;
856 } /* __handleKeyPressEvents() */

```

3.4.3.9 __handleMouseButtonEvents()

```

void HexMap::__handleMouseButtonEvents (
    void ) [private]

```

Helper method to handle mouse button events.

```

871 {
872     switch (this->event_ptr->mouseButton.button) {
873         case (sf::Mouse::Left): {
874             HexTile* hex_ptr = this->__getSelectedTile();
875
876             if (hex_ptr != NULL) {
877                 this->tile_selected = true;
878             }
879
880             else if (this->tile_selected) {
881                 this->tile_selected = false;
882                 this->__sendNoTileSelectedMessage();
883             }
884
885             break;

```

```

886     }
887
888
889     case (sf::Mouse::Right): {
890         if (this->tile_selected) {
891             this->tile_selected = false;
892             this->__sendNoTileSelectedMessage();
893         }
894
895         break;
896     }
897
898
899     default: {
900         // do nothing!
901
902         break;
903     }
904 }
905
906 return;
907 } /* __handleMouseButtonEvents() */

```

3.4.3.10 __isLakeTouchingOcean()

```

bool HexMap::__isLakeTouchingOcean (
    HexTile * hex_ptr ) [private]
636 {
637     // 1. if not lake tile, return
638     if (not (hex_ptr->tile_type == TileType :: LAKE)) {
639         return false;
640     }
641
642     // 2. scan neighbours for ocean tiles
643     std::vector<HexTile*> neighbours_vec = this->__getNeighboursVector(hex_ptr);
644
645     for (size_t i = 0; i < neighbours_vec.size(); i++) {
646         if (neighbours_vec[i]->tile_type == TileType :: OCEAN) {
647             return true;
648         }
649     }
650
651     return false;
652 } /* __isLakeTouchingOcean() */

```

3.4.3.11 __layTiles()

```

void HexMap::__layTiles (
    void ) [private]

```

Helper method to lay the hex tiles down to generate the game world.

```

54 {
55     this->n_tiles = 0;
56
57     // 1. add origin tile
58     HexTile* hex_ptr = new HexTile(
59         this->position_x,
60         this->position_y,
61         this->event_ptr,
62         this->render_window_ptr,
63         this->assets_manager_ptr,
64         this->message_hub_ptr
65     );
66
67     this->hex_map[this->position_x][this->position_y] = hex_ptr;
68     this->tile_position_x_vec.push_back(this->position_x);
69     this->tile_position_y_vec.push_back(this->position_y);
70     this->n_tiles++;
71
72

```

```

73 // 2. fill out first row (reflect across origin tile)
74 for (int i = 0; i < this->n_layers; i++) {
75     hex_ptr = new HexTile(
76         this->position_x + 2 * (i + 1) * hex_ptr->minor_radius,
77         this->position_y,
78         this->event_ptr,
79         this->render_window_ptr,
80         this->assets_manager_ptr,
81         this->message_hub_ptr
82     );
83
84     this->hex_map[hex_ptr->position_x][hex_ptr->position_y] = hex_ptr;
85     this->tile_position_x_vec.push_back(hex_ptr->position_x);
86     this->tile_position_y_vec.push_back(hex_ptr->position_y);
87     this->n_tiles++;
88
89     if (i == this->n_layers - 1) {
90         this->border_tiles_vec.push_back(hex_ptr);
91     }
92
93     hex_ptr = new HexTile(
94         this->position_x - 2 * (i + 1) * hex_ptr->minor_radius,
95         this->position_y,
96         this->event_ptr,
97         this->render_window_ptr,
98         this->assets_manager_ptr,
99         this->message_hub_ptr
100    );
101
102    this->hex_map[hex_ptr->position_x][hex_ptr->position_y] = hex_ptr;
103    this->tile_position_x_vec.push_back(hex_ptr->position_x);
104    this->tile_position_y_vec.push_back(hex_ptr->position_y);
105    this->n_tiles++;
106
107    if (i == this->n_layers - 1) {
108        this->border_tiles_vec.push_back(hex_ptr);
109    }
110 }
111
112
113 // 3. fill out subsequent rows (reflect across first row)
114 HexTile* first_row_left_tile = hex_ptr;
115
116 int offset_count = 1;
117
118 double x_offset = 0;
119 double y_offset = 0;
120
121 for (
122     int row_width = 2 * this->n_layers;
123     row_width > this->n_layers;
124     row_width--
125 ) {
126     // 3.1. upper row
127     x_offset = first_row_left_tile->position_x +
128         2 * offset_count * first_row_left_tile->minor_radius *
129         cos(60 * (M_PI / 180));
130
131     y_offset = first_row_left_tile->position_y -
132         2 * offset_count * first_row_left_tile->minor_radius *
133         sin(60 * (M_PI / 180));
134
135     hex_ptr = new HexTile(
136         x_offset,
137         y_offset,
138         this->event_ptr,
139         this->render_window_ptr,
140         this->assets_manager_ptr,
141         this->message_hub_ptr
142     );
143
144     this->hex_map[hex_ptr->position_x][hex_ptr->position_y] = hex_ptr;
145     this->tile_position_x_vec.push_back(hex_ptr->position_x);
146     this->tile_position_y_vec.push_back(hex_ptr->position_y);
147     this->n_tiles++;
148
149     this->border_tiles_vec.push_back(hex_ptr);
150
151     for (int i = 1; i < row_width; i++) {
152         x_offset += 2 * first_row_left_tile->minor_radius;
153
154         hex_ptr = new HexTile(
155             x_offset,
156             y_offset,
157             this->event_ptr,
158             this->render_window_ptr,
159             this->assets_manager_ptr,

```



```

160         this->message_hub_ptr
161     );
162
163     this->hex_map[hex_ptr->position_x][hex_ptr->position_y] = hex_ptr;
164     this->tile_position_x_vec.push_back(hex_ptr->position_x);
165     this->tile_position_y_vec.push_back(hex_ptr->position_y);
166     this->n_tiles++;
167
168     if (row_width == this->n_layers + 1 or i == row_width - 1) {
169         this->border_tiles_vec.push_back(hex_ptr);
170     }
171 }
172
173 // 3.2. lower row
174 x_offset = first_row_left_tile->position_x +
175     2 * offset_count * first_row_left_tile->minor_radius *
176     cos(60 * (M_PI / 180));
177
178 y_offset = first_row_left_tile->position_y +
179     2 * offset_count * first_row_left_tile->minor_radius *
180     sin(60 * (M_PI / 180));
181
182 hex_ptr = new HexTile(
183     x_offset,
184     y_offset,
185     this->event_ptr,
186     this->render_window_ptr,
187     this->assets_manager_ptr,
188     this->message_hub_ptr
189 );
190
191 this->hex_map[hex_ptr->position_x][hex_ptr->position_y] = hex_ptr;
192 this->tile_position_x_vec.push_back(hex_ptr->position_x);
193 this->tile_position_y_vec.push_back(hex_ptr->position_y);
194 this->n_tiles++;
195
196 this->border_tiles_vec.push_back(hex_ptr);
197
198 for (int i = 1; i < row_width; i++) {
199     x_offset += 2 * first_row_left_tile->minor_radius;
200
201     hex_ptr = new HexTile(
202         x_offset,
203         y_offset,
204         this->event_ptr,
205         this->render_window_ptr,
206         this->assets_manager_ptr,
207         this->message_hub_ptr
208     );
209
210     this->hex_map[hex_ptr->position_x][hex_ptr->position_y] = hex_ptr;
211     this->tile_position_x_vec.push_back(hex_ptr->position_x);
212     this->tile_position_y_vec.push_back(hex_ptr->position_y);
213     this->n_tiles++;
214
215     if (row_width == this->n_layers + 1 or i == row_width - 1) {
216         this->border_tiles_vec.push_back(hex_ptr);
217     }
218 }
219
220 offset_count++;
221 }
222
223 return;
224 } /* __layTiles() */

```

3.4.3.12 __procedurallyGenerateTileResources()

```

void HexMap::__procedurallyGenerateTileResources (
    void ) [private]

```

Helper method to procedurally generate tile resources and set tiles accordingly.

```

718 {
719     // 1. get random cosine series noise vec
720     std::vector<double> noise_vec = this->__getNoise(this->n_tiles);
721
722     // 2. set tile resources based on random cosine series noise
723     int noise_idx = 0;

```

```

724
725     std::map<double, std::map<double, HexTile*>::iterator hex_map_iter_x;
726     std::map<double, HexTile*>::iterator hex_map_iter_y;
727     for (
728         hex_map_iter_x = this->hex_map.begin();
729         hex_map_iter_x != this->hex_map.end();
730         hex_map_iter_x++
731     ) {
732         for (
733             hex_map_iter_y = hex_map_iter_x->second.begin();
734             hex_map_iter_y != hex_map_iter_x->second.end();
735             hex_map_iter_y++
736         ) {
737             hex_map_iter_y->second->setTileResource(noise_vec[noise_idx]);
738             noise_idx++;
739         }
740     }
741
742     return;
743 } /* __procedurallyGenerateTileResources() */

```

3.4.3.13 __procedurallyGenerateTileTypes()

```

void HexMap::__procedurallyGenerateTileTypes (
    void ) [private]

```

Helper method to procedurally generate tile types and set tiles accordingly.

```

343 {
344     // 1. get random cosine series noise vec
345     std::vector<double> noise_vec = this->__getNoise(this->n_tiles);
346
347     // 2. set initial tile types based on either random cosine series noise or white
348     //     noise (decided by coin toss)
349     int noise_idx = 0;
350
351     std::map<double, std::map<double, HexTile*>::iterator hex_map_iter_x;
352     std::map<double, HexTile*>::iterator hex_map_iter_y;
353     for (
354         hex_map_iter_x = this->hex_map.begin();
355         hex_map_iter_x != this->hex_map.end();
356         hex_map_iter_x++
357     ) {
358         for (
359             hex_map_iter_y = hex_map_iter_x->second.begin();
360             hex_map_iter_y != hex_map_iter_x->second.end();
361             hex_map_iter_y++
362         ) {
363             if ((double)rand() / RAND_MAX > 0.5) {
364                 hex_map_iter_y->second->setTileType(noise_vec[noise_idx]);
365             }
366             else {
367                 hex_map_iter_y->second->setTileType((double)rand() / RAND_MAX);
368             }
369             noise_idx++;
370         }
371     }
372
373     // 3. smooth tile types (majority rules)
374     this->__smoothTileTypes();
375
376     // 4. set border tile type to ocean
377     for (size_t i = 0; i < this->border_tiles_vec.size(); i++) {
378         this->border_tiles_vec[i]->setTileType(TileType :: OCEAN);
379     }
380
381     // 5. enforce ocean continuity (i.e. all lake tiles touching ocean become ocean)
382     this->__enforceOceanContinuity();
383
384     return;
385 } /* __procedurallyGenerateTileTypes() */

```

3.4.3.14 __sendNoTileSelectedMessage()

```
void HexMap::__sendNoTileSelectedMessage (
    void ) [private]
```

Helper method to format and send message on no tile selected.

```
922 {
923     Message no_tile_selected_message;
924
925     no_tile_selected_message.channel = NO_TILE_SELECTED_CHANNEL;
926     no_tile_selected_message.subject = "no tile selected";
927
928     this->message_hub_ptr->sendMessage(no_tile_selected_message);
929
930     return;
931 } /* __sendNoTileSelectedMessage() */
```

3.4.3.15 __setUpGlassScreen()

```
void HexMap::__setUpGlassScreen (
    void ) [private]
```

Helper method to set up glass screen effect (drawable).

```
34 {
35     this->glass_screen.setSize(sf::Vector2f(GAME_WIDTH, GAME_HEIGHT));
36     this->glass_screen.setFillColor(sf::Color(40, 40, 40, 40));
37
38     return;
39 } /* __setUpGlassScreen() */
```

3.4.3.16 __smoothTileTypes()

```
void HexMap::__smoothTileTypes (
    void ) [private]
```

Helper method to smooth tile types using a majority rules approach.

```
589 {
590     std::cout << "smoothing ..." << std::endl;
591
592     std::map<double, std::map<double, HexTile*>::iterator hex_map_iter_x;
593     std::map<double, HexTile*>::iterator hex_map_iter_y;
594     HexTile* hex_ptr;
595     TileType majority_tile_type;
596
597     for (
598         hex_map_iter_x = this->hex_map.begin();
599         hex_map_iter_x != this->hex_map.end();
600         hex_map_iter_x++
601     ) {
602         for (
603             hex_map_iter_y = hex_map_iter_x->second.begin();
604             hex_map_iter_y != hex_map_iter_x->second.end();
605             hex_map_iter_y++
606         ) {
607             hex_ptr = hex_map_iter_y->second;
608             majority_tile_type = this->__getMajorityTileType(hex_ptr);
609
610             if (majority_tile_type != hex_ptr->tile_type) {
611                 hex_ptr->setTileType(majority_tile_type);
612             }
613         }
614     }
615
616     return;
617 } /* __smoothTileTypes() */
```

3.4.3.17 assess()

```
void HexMap::assess (
    void )
```

Method to assess the resource of the selected tile.

```
1024 {
1025     HexTile* selected_tile_ptr = this->__getSelectedTile();
1026     if (selected_tile_ptr != NULL) {
1027         selected_tile_ptr->assess();
1028     }
1029
1030     return;
1031 } /* assess() */
```

3.4.3.18 clear()

```
void HexMap::clear (
    void )
```

Method to clear the hex map.

```
1224 {
1225     std::map<double, std::map<double, HexTile*>::iterator hex_map_iter_x;
1226     std::map<double, HexTile*>::iterator hex_map_iter_y;
1227     for (
1228         hex_map_iter_x = this->hex_map.begin();
1229         hex_map_iter_x != this->hex_map.end();
1230         hex_map_iter_x++
1231     ) {
1232         for (
1233             hex_map_iter_y = hex_map_iter_x->second.begin();
1234             hex_map_iter_y != hex_map_iter_x->second.end();
1235             hex_map_iter_y++
1236         ) {
1237             delete hex_map_iter_y->second;
1238         }
1239     }
1240     this->hex_map.clear();
1241
1242     this->tile_position_x_vec.clear();
1243     this->tile_position_y_vec.clear();
1244     this->border_tiles_vec.clear();
1245
1246     return;
1247 } /* clear() */
```

3.4.3.19 draw()

```
void HexMap::draw (
    void )
```

Method to draw the hex map to the render window. To be called once per frame.

```
1180 {
1181     // 1. draw all tiles in order
1182     std::map<double, std::map<double, HexTile*>::iterator hex_map_iter_x;
1183     std::map<double, HexTile*>::iterator hex_map_iter_y;
1184     for (
1185         hex_map_iter_x = this->hex_map.begin();
1186         hex_map_iter_x != this->hex_map.end();
1187         hex_map_iter_x++
1188     ) {
1189         for (
1190             hex_map_iter_y = hex_map_iter_x->second.begin();
1191             hex_map_iter_y != hex_map_iter_x->second.end();
1192             hex_map_iter_y++
1193         ) {
```

```

1194         hex_map_iter_y->second->draw();
1195     }
1196 }
1197
1198 // 2. redraw selected tile
1199 HexTile* selected_tile_ptr = this->__getSelectedTile();
1200 if (selected_tile_ptr != NULL) {
1201     selected_tile_ptr->draw();
1202 }
1203
1204 // 3. draw glass screen
1205 this->render_window_ptr->draw(this->glass_screen);
1206
1207 this->frame++;
1208 return;
1209 } /* draw() */

```

3.4.3.20 processEvent()

```

void HexMap::processEvent (
    void )

```

Method to process [HexMap](#). To be called once per event.

```

1099 {
1100     // 1. process HexTile events
1101     std::map<double, std::map<double, HexTile*>::iterator hex_map_iter_x;
1102     std::map<double, HexTile*>::iterator hex_map_iter_y;
1103     for (
1104         hex_map_iter_x = this->hex_map.begin();
1105         hex_map_iter_x != this->hex_map.end();
1106         hex_map_iter_x++
1107     ) {
1108         for (
1109             hex_map_iter_y = hex_map_iter_x->second.begin();
1110             hex_map_iter_y != hex_map_iter_x->second.end();
1111             hex_map_iter_y++
1112         ) {
1113             hex_map_iter_y->second->processEvent();
1114         }
1115     }
1116
1117     // 2. process HexMap events
1118     if (this->event_ptr->type == sf::Event::KeyPressed) {
1119         this->__handleKeyPressEvents();
1120     }
1121
1122     if (this->event_ptr->type == sf::Event::MouseButtonPressed) {
1123         this->__handleMouseButtonEvents();
1124     }
1125
1126     return;
1127 } /* processEvent() */

```

3.4.3.21 processMessage()

```

void HexMap::processMessage (
    void )

```

Method to process [HexMap](#). To be called once per message.

```

1142 {
1143     // 1. process HexTile messages
1144     std::map<double, std::map<double, HexTile*>::iterator hex_map_iter_x;
1145     std::map<double, HexTile*>::iterator hex_map_iter_y;
1146     for (
1147         hex_map_iter_x = this->hex_map.begin();
1148         hex_map_iter_x != this->hex_map.end();
1149         hex_map_iter_x++
1150     ) {
1151         for (

```

```

1152         hex_map_iter_y = hex_map_iter_x->second.begin();
1153         hex_map_iter_y != hex_map_iter_x->second.end();
1154         hex_map_iter_y++
1155     ) {
1156         hex_map_iter_y->second->processMessage();
1157     }
1158 }
1159
1160 // 2. process HexMap messages
1161 //...
1162
1163 return;
1164 } /* processMessage() */

```

3.4.3.22 reroll()

```

void HexMap::reroll (
    void )

```

Method to re-roll the hex map.

```

1046 {
1047     this->clear();
1048     this->__assembleHexMap();
1049
1050     return;
1051 } /* reroll() */

```

3.4.3.23 toggleResourceOverlay()

```

void HexMap::toggleResourceOverlay (
    void )

```

Method to toggle the hex map resource overlay.

```

1066 {
1067     std::map<double, std::map<double, HexTile*>>::iterator hex_map_iter_x;
1068     std::map<double, HexTile*>::iterator hex_map_iter_y;
1069     for (
1070         hex_map_iter_x = this->hex_map.begin();
1071         hex_map_iter_x != this->hex_map.end();
1072         hex_map_iter_x++
1073     ) {
1074         for (
1075             hex_map_iter_y = hex_map_iter_x->second.begin();
1076             hex_map_iter_y != hex_map_iter_x->second.end();
1077             hex_map_iter_y++
1078         ) {
1079             hex_map_iter_y->second->toggleResourceOverlay();
1080         }
1081     }
1082
1083     return;
1084 } /* toggleResourceOverlay() */

```

3.4.4 Member Data Documentation

3.4.4.1 assets_manager_ptr

```
AssetsManager* HexMap::assets_manager_ptr [private]
```

A pointer to the assets manager.

3.4.4.2 border_tiles_vec

```
std::vector<HexTile*> HexMap::border_tiles_vec
```

A vector of pointers to the border tiles.

3.4.4.3 event_ptr

```
sf::Event* HexMap::event_ptr [private]
```

A pointer to the event class.

3.4.4.4 frame

```
int HexMap::frame
```

The current frame of this object.

3.4.4.5 glass_screen

```
sf::RectangleShape HexMap::glass_screen
```

To give the effect of an old glass screen over the hex map.

3.4.4.6 hex_map

```
std::map<double, std::map<double, HexTile*> > HexMap::hex_map
```

A position-indexed, nested map of hex tiles.

3.4.4.7 message_hub_ptr

```
MessageHub* HexMap::message_hub_ptr [private]
```

A pointer to the message hub.

3.4.4.8 n_layers

```
int HexMap::n_layers
```

The number of layers in the hex map.

3.4.4.9 n_tiles

```
int HexMap::n_tiles
```

The number of tiles in the hex map.

3.4.4.10 position_x

```
double HexMap::position_x
```

The x position of the hex map's origin (i.e. central) tile.

3.4.4.11 position_y

```
double HexMap::position_y
```

The y position of the hex map's origin (i.e. central) tile.

3.4.4.12 render_window_ptr

```
sf::RenderWindow* HexMap::render_window_ptr [private]
```

A pointer to the render window.

3.4.4.13 tile_position_x_vec

```
std::vector<double> HexMap::tile_position_x_vec
```

A vector of tile x positions.

3.4.4.14 tile_position_y_vec

```
std::vector<double> HexMap::tile_position_y_vec
```

A vector of tile y position.

3.4.4.15 tile_selected

```
bool HexMap::tile_selected
```

A boolean which indicates if a tile is currently selected.

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

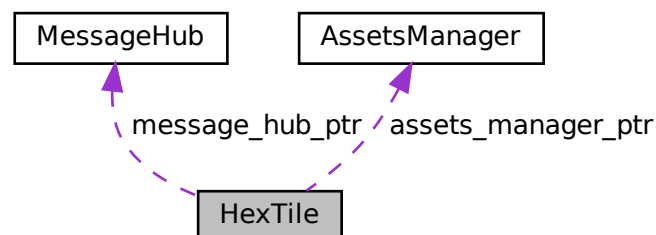
- header/[HexMap.h](#)
- source/[HexMap.cpp](#)

3.5 HexTile Class Reference

A class which defines a hex tile of the hex map.

```
#include <HexTile.h>
```

Collaboration diagram for HexTile:



Public Member Functions

- [HexTile](#) (double, double, sf::Event *, sf::RenderWindow *, [AssetsManager](#) *, [MessageHub](#) *)
Constructor for the [HexTile](#) class.
- void [setTileType](#) ([TileType](#))
Method to set the tile type (by enum value).
- void [setTileType](#) (double)
Method to set the tile type (by numeric input).
- void [setTileResource](#) ([TileResource](#))
Method to set the tile resource (by enum value).
- void [setTileResource](#) (double)
Method to set the tile resource (by numeric input).
- void [toggleResourceOverlay](#) (void)
Method to toggle the tile resource overlay.
- void [assess](#) (void)
Method to assess the tile's resource.
- void [processEvent](#) (void)
Method to process [HexTile](#). To be called once per event.
- void [processMessage](#) (void)
Method to process [HexTile](#). To be called once per message.
- void [draw](#) (void)
Method to draw the hex tile to the render window. To be called once per frame.
- [~HexTile](#) (void)
Destructor for the [HexTile](#) class.

Public Attributes

- [TileType](#) [tile_type](#)
- [TileResource](#) [tile_resource](#)
- bool [show_node](#)
A boolean which indicates whether or not to show the tile node.
- bool [show_resource](#)
A boolean which indicates whether or not to show resource value.
- bool [resource_assessed](#)
A boolean which indicates whether or not the resource has been assessed.
- bool [is_selected](#)
A boolean which indicates whether or not the tile is selected.
- int [frame](#)
The current frame of this object.
- double [position_x](#)
The x position of the tile.
- double [position_y](#)
The y position of the tile.
- double [major_radius](#)
The radius of the smallest bounding circle.
- double [minor_radius](#)
The radius of the largest inscribed circle.
- sf::CircleShape [node_sprite](#)
A circle shape to mark the tile node.
- sf::ConvexShape [tile_sprite](#)

- *A convex shape which represents the tile.*
- sf::ConvexShape [select_outline_sprite](#)
A convex shape which outlines the tile when selected.
- sf::CircleShape [resource_chip_sprite](#)
A circle shape which represents a resource chip.
- sf::Text [resource_text](#)
A text representation of the resource.

Private Member Functions

- void [__setUpNodeSprite](#) (void)
Helper method to set up node sprite.
- void [__setUpTileSprite](#) (void)
Helper method to set up tile sprite.
- void [__setUpSelectOutlineSprite](#) (void)
Helper method to set up select outline sprite.
- void [__setUpResourceChipSprite](#) (void)
Helper method to set up resource chip sprite.
- void [__setResourceText](#) (void)
Helper method to set up resource text.
- bool [__isClicked](#) (void)
Helper method to determine if tile was clicked on.
- void [__handleKeyPressEvents](#) (void)
Helper method to handle key press events.
- void [__handleMouseButtonEvents](#) (void)
Helper method to handle mouse button events.
- void [__sendTileSelectedMessage](#) (void)
Helper method to format and send message on tile selection.
- void [__sendTileStateMessage](#) (void)
Helper method to format and send tile state message.

Private Attributes

- sf::Event * [event_ptr](#)
A pointer to the event class.
- sf::RenderWindow * [render_window_ptr](#)
A pointer to the render window.
- AssetsManager * [assets_manager_ptr](#)
A pointer to the assets manager.
- MessageHub * [message_hub_ptr](#)
A pointer to the message hub.

3.5.1 Detailed Description

A class which defines a hex tile of the hex map.

3.5.2 Constructor & Destructor Documentation

3.5.2.1 HexTile()

```
HexTile::HexTile (
    double position_x,
    double position_y,
    sf::Event * event_ptr,
    sf::RenderWindow * render_window_ptr,
    AssetsManager * assets_manager_ptr,
    MessageHub * message_hub_ptr )
```

Constructor for the [HexTile](#) class.

Ref: [Wikipedia \[2023\]](#)

Parameters

<i>position_x</i>	The x position of the tile.
<i>position_y</i>	The y position of the tile.
<i>event_ptr</i>	Pointer to the event class.
<i>render_window_ptr</i>	Pointer to the render window.
<i>assets_manager_ptr</i>	Pointer to the assets manager.
<i>message_hub_ptr</i>	Pointer to the message hub.

```
528 {
529     // 1. set attributes
530
531     // 1.1. private
532     this->event_ptr = event_ptr;
533     this->render_window_ptr = render_window_ptr;
534
535     this->assets_manager_ptr = assets_manager_ptr;
536     this->message_hub_ptr = message_hub_ptr;
537
538     // 1.2. public
539     this->show_node = false;
540     this->show_resource = false;
541     this->resource_assessed = false;
542     this->is_selected = false;
543
544     this->frame = 0;
545
546     this->position_x = position_x;
547     this->position_y = position_y;
548
549     this->major_radius = 32;
550     this->minor_radius = (sqrt(3) / 2) * this->major_radius;
551
552     // 2. set up and position drawable attributes
553     this->__setUpNodeSprite();
554     this->__setUpTileSprite();
555     this->__setUpSelectOutlineSprite();
556     this->__setUpResourceChipSprite();
557     this->__setUpResourceText();
558
559     // 3. set tile type and resource (default to forest and average)
560     this->setTileType(TileType :: FOREST);
561     this->setTileResource(TileResource :: AVERAGE);
562
563     std::cout << "HexTile constructed at " << this << std::endl;
564
565     return;
566 } /* HexTile() */
```

3.5.2.2 ~HexTile()

```
HexTile::~HexTile (
    void )
```

Destructor for the [HexTile](#) class.

```
896 {
897     std::cout << "HexTile at " << this << " destroyed" << std::endl;
898
899     return;
900 } /* ~HexTile() */
```

3.5.3 Member Function Documentation

3.5.3.1 __handleKeyPressEvents()

```
void HexTile::__handleKeyPressEvents (
    void ) [private]
```

Helper method to handle key press events.

```
268 {
269     switch (this->event_ptr->key.code) {
270         case (sf::Keyboard::Escape): {
271             this->is_selected = false;
272         }
273
274         default: {
275             // do nothing!
276
277             break;
278         }
279     }
280
281     return;
282 } /* __handleKeyPressEvents() */
```

3.5.3.2 __handleMouseButtonEvents()

```
void HexTile::__handleMouseButtonEvents (
    void ) [private]
```

Helper method to handle mouse button events.

```
298 {
299     switch (this->event_ptr->mouseButton.button) {
300         case (sf::Mouse::Left): {
301             if (this->__isClicked()) {
302                 std::cout << "Tile (" << this->position_x << ", " <<
303                     this->position_y << ") was selected" << std::endl;
304
305                 this->is_selected = true;
306
307                 this->__sendTileSelectedMessage();
308                 this->__sendTileStateMessage();
309             }
310
311             else {
```

```

312         this->is_selected = false;
313     }
314
315     break;
316 }
317
318
319 case (sf::Mouse::Right): {
320     this->is_selected = false;
321
322     break;
323 }
324
325
326 default: {
327     // do nothing!
328
329     break;
330 }
331 }
332
333 return;
334 } /* __handleMouseButtonEvents() */

```

3.5.3.3 __isClicked()

```

bool HexTile::__isClicked (
    void ) [private]

```

Helper method to determine if tile was clicked on.

Returns

Boolean indicating whether or not tile was clicked on.

```

236 {
237     sf::Vector2i mouse_position = sf::Mouse::getPosition(*render_window_ptr);
238
239     double mouse_x = mouse_position.x;
240     double mouse_y = mouse_position.y;
241
242     double distance = sqrt(
243         pow(this->position_x - mouse_x, 2) +
244         pow(this->position_y - mouse_y, 2)
245     );
246
247     if (distance < this->minor_radius) {
248         return true;
249     }
250     else {
251         return false;
252     }
253 } /* __isClicked() */

```

3.5.3.4 __sendTileSelectedMessage()

```

void HexTile::__sendTileSelectedMessage (
    void ) [private]

```

Helper method to format and send message on tile selection.

```

349 {
350     Message tile_selected_message;
351
352     tile_selected_message.channel = TILE_SELECTED_CHANNEL;
353     tile_selected_message.subject = "tile selected";
354
355     this->message_hub_ptr->sendMessage(tile_selected_message);
356
357     return;
358 } /* __sendTileSelectedMessage() */

```

3.5.3.5 __sendTileStateMessage()

```
void HexTile::__sendTileStateMessage (
    void ) [private]
```

Helper method to format and send tile state message.

```
373 {
374     Message tile_state_message;
375
376     tile_state_message.channel = TILE_STATE_CHANNEL;
377     tile_state_message.subject = "tile state";
378
379
380     //          32 char x 17 line console "-----\n";
381     std::string string_payload = "    **** TILE INFO/OPTIONS **** \n";
382     string_payload += "
383
384
385     string_payload += "TILE COORDS: (";
386     string_payload += std::to_string(
387         int(this->position_x - 400)
388     );
389     string_payload += ", ";
390     string_payload += std::to_string(
391         int(this->position_y - 400)
392     );
393     string_payload += ") \n";
394     string_payload += "
395
396
397     string_payload += "TILE TYPE: ";
398
399     switch (this->tile_type) {
400         case (TileType :: FOREST): {
401             string_payload += "FOREST \n";
402             break;
403         }
404
405
406
407         case (TileType :: LAKE): {
408             string_payload += "LAKE \n";
409             break;
410         }
411
412
413
414         case (TileType :: MOUNTAINS): {
415             string_payload += "MOUNTAINS \n";
416             break;
417         }
418
419
420
421         case (TileType :: OCEAN): {
422             string_payload += "OCEAN \n";
423             break;
424         }
425
426
427
428         case (TileType :: PLAINS): {
429             string_payload += "PLAINS \n";
430             break;
431         }
432
433
434
435         default: {
436             string_payload += "??? \n";
437             break;
438         }
439     }
440 }
441
442
443     string_payload += "TILE RESOURCE: ";
444
445     if (this->resource_assessed) {
446         switch (this->tile_resource) {
447             //...
448
449
450             default: {
```

```

451         string_payload          +=      "???"      "\n";
452
453         break;
454     }
455 }
456 }
457
458 else {
459     string_payload          +=      "???"      "\n";
460 }
461
462
463 string_payload          += "
464 string_payload          += "
465 string_payload          += "
466 string_payload          += "
467 string_payload          += "
468 string_payload          += "
469 string_payload          += "
470 string_payload          += "
471 string_payload          += "
472 string_payload          += "
473 string_payload          += "
474 ";
475
476 tile_state_message.string_payload = string_payload;
477
478 this->message_hub_ptr->sendMessage(tile_state_message);
479
480 return;
481 } /* __sendTileStateMessage() */

```

3.5.3.6 __setResourceText()

```

void HexTile::__setResourceText (
    void ) [private]

```

Helper method to set up resource text.

```

159 {
160     this->resource_text.setFont(*(assets_manager_ptr->getFont("Glass_TTY_VT220")));
161
162     switch (this->tile_resource) {
163         case (TileResource :: POOR): {
164             this->resource_text.setString("-2");
165
166             break;
167         }
168
169         case (TileResource :: BELOW_AVERAGE): {
170             this->resource_text.setString("-1");
171
172             break;
173         }
174
175         case (TileResource :: AVERAGE): {
176             this->resource_text.setString("0");
177
178             break;
179         }
180
181         case (TileResource :: ABOVE_AVERAGE): {
182             this->resource_text.setString("+1");
183
184             break;
185         }
186
187         case (TileResource :: GOOD): {
188             this->resource_text.setString("+2");
189
190             break;
191         }
192
193         default: {
194             this->resource_text.setString("?");
195
196             break;
197         }
198     }

```



```

199
200     if (not this->resource_assessed) {
201         this->resource_text.setString("?");
202     }
203
204     this->resource_text.setCharacterSize(16);
205
206     this->resource_text.setOrigin(
207         this->resource_text.getLocalBounds().width / 2,
208         this->resource_text.getLocalBounds().height / 2
209     );
210
211     this->resource_text.setFillColor(sf::Color(0, 0, 0, 255));
212
213     this->resource_text.setPosition(
214         this->position_x,
215         this->position_y - 4
216     );
217
218     return;
219 } /* __setResourceText() */

```

3.5.3.7 __setUpNodeSprite()

```

void HexTile::__setUpNodeSprite (
    void ) [private]

```

Helper method to set up node sprite.

```

34 {
35     this->node_sprite.setRadius(4);
36
37     this->node_sprite.setOrigin(
38         this->node_sprite.getLocalBounds().width / 2,
39         this->node_sprite.getLocalBounds().height / 2
40     );
41
42     this->node_sprite.setPosition(this->position_x, this->position_y);
43
44     this->node_sprite.setFillColor(sf::Color(255, 0, 0, 255));
45
46     return;
47 } /* __setUpNodeSprite() */

```

3.5.3.8 __setUpResourceChipSprite()

```

void HexTile::__setUpResourceChipSprite (
    void ) [private]

```

Helper method to set up resource chip sprite.

```

132 {
133     this->resource_chip_sprite.setRadius(2 * this->minor_radius / 3);
134
135     this->resource_chip_sprite.setOrigin(
136         this->resource_chip_sprite.getLocalBounds().width / 2,
137         this->resource_chip_sprite.getLocalBounds().height / 2
138     );
139
140     this->resource_chip_sprite.setPosition(this->position_x, this->position_y);
141
142     this->resource_chip_sprite.setFillColor(sf::Color(175, 175, 175, 175));
143
144     return;
145 } /* __setUpResourceChip() */

```

3.5.3.9 __setUpSelectOutlineSprite()

```
void HexTile::__setUpSelectOutlineSprite (
    void ) [private]
```

Helper method to set up select outline sprite.

```
96 {
97     int n_points = 6;
98
99     this->select_outline_sprite.setPointCount(n_points);
100
101     for (int i = 0; i < n_points; i++) {
102         this->select_outline_sprite.setPoint(
103             i,
104             sf::Vector2f(
105                 this->position_x + this->major_radius * cos((30 + 60 * i) * (M_PI / 180)),
106                 this->position_y + this->major_radius * sin((30 + 60 * i) * (M_PI / 180))
107             )
108         );
109     }
110
111     this->select_outline_sprite.setOutlineThickness(4);
112     this->select_outline_sprite.setOutlineColor(MONOCROME_TEXT_RED);
113
114     this->select_outline_sprite.setFill(sf::Color(0, 0, 0, 0));
115
116     return;
117 } /* __setUpSelectOutline() */
```

3.5.3.10 __setUpTileSprite()

```
void HexTile::__setUpTileSprite (
    void ) [private]
```

Helper method to set up tile sprite.

```
62 {
63     int n_points = 6;
64
65     this->tile_sprite.setPointCount(n_points);
66
67     for (int i = 0; i < n_points; i++) {
68         this->tile_sprite.setPoint(
69             i,
70             sf::Vector2f(
71                 this->position_x + this->major_radius * cos((30 + 60 * i) * (M_PI / 180)),
72                 this->position_y + this->major_radius * sin((30 + 60 * i) * (M_PI / 180))
73             )
74         );
75     }
76
77     this->tile_sprite.setOutlineThickness(1);
78     this->tile_sprite.setOutlineColor(sf::Color(175, 175, 175, 255));
79
80     return;
81 } /* __setUpTileSprite() */
```

3.5.3.11 assess()

```
void HexTile::assess (
    void )
```

Method to assess the tile's resource.

```
787 {
788     this->resource_assessed = true;
789     this->__setResourceText();
790
791     return;
792 } /* assess() */
```

3.5.3.12 draw()

```
void HexTile::draw (
    void )
```

Method to draw the hex tile to the render window. To be called once per frame.

```
852 {
853     // 1. draw hex
854     this->render_window_ptr->draw(this->tile_sprite);
855
856     // 2. draw node
857     if (this->show_node) {
858         this->render_window_ptr->draw(this->node_sprite);
859     }
860
861     // 3. draw resource
862     if (this->show_resource) {
863         this->render_window_ptr->draw(this->resource_chip_sprite);
864         this->render_window_ptr->draw(this->resource_text);
865     }
866
867     // 4. draw selection outline
868     if (this->is_selected) {
869         sf::Color outline_colour = this->select_outline_sprite.getOutlineColor();
870
871         outline_colour.a =
872             255 * pow(cos((M_PI * this->frame) / (1.5 * FRAMES_PER_SECOND)), 2);
873
874         this->select_outline_sprite.setOutlineColor(outline_colour);
875
876         this->render_window_ptr->draw(this->select_outline_sprite);
877     }
878
879     this->frame++;
880     return;
881 } /* draw() */
```

3.5.3.13 processEvent()

```
void HexTile::processEvent (
    void )
```

Method to process [HexTile](#). To be called once per event.

```
807 {
808     if (this->event_ptr->type == sf::Event::KeyPressed) {
809         this->__handleKeyPressEvents();
810     }
811
812     if (this->event_ptr->type == sf::Event::MouseButtonPressed) {
813         this->__handleMouseButtonEvents();
814     }
815
816     return;
817 } /* processEvent() */
```

3.5.3.14 processMessage()

```
void HexTile::processMessage (
    void )
```

Method to process [HexTile](#). To be called once per message.

```
832 {
833     //...
834
835     return;
836 } /* processMessage() */
```

3.5.3.15 setTileResource() [1/2]

```
void HexTile::setTileResource (
    double input_value )
```

Method to set the tile resource (by numeric input).

Parameters

<i>input_value</i>	A numerical input in the closed interval [0, 1].
--------------------	--

```
712 {
713     // 1. check input
714     if (input_value < 0 or input_value > 1) {
715         std::string error_str = "ERROR HexTile::setTileResource() given input value is ";
716         error_str += "not in the closed interval [0, 1]";
717
718         #ifdef _WIN32
719             std::cout << error_str << std::endl;
720         #endif /* _WIN32 */
721
722         throw std::runtime_error(error_str);
723     }
724
725     // 2. convert input value to tile resource
726     TileResource tile_resource;
727
728     if (input_value <= TILE_RESOURCE_CUMULATIVE_PROBABILITIES[0]) {
729         tile_resource = TileResource :: POOR;
730     }
731     else if (input_value <= TILE_RESOURCE_CUMULATIVE_PROBABILITIES[1]) {
732         tile_resource = TileResource :: BELOW_AVERAGE;
733     }
734     else if (input_value <= TILE_RESOURCE_CUMULATIVE_PROBABILITIES[2]) {
735         tile_resource = TileResource :: AVERAGE;
736     }
737     else if (input_value <= TILE_RESOURCE_CUMULATIVE_PROBABILITIES[3]) {
738         tile_resource = TileResource :: ABOVE_AVERAGE;
739     }
740     else {
741         tile_resource = TileResource :: GOOD;
742     }
743
744     // 3. call alternate method
745     this->setTileResource(tile_resource);
746
747     return;
748 } /* setTileResource(double) */
```

3.5.3.16 setTileResource() [2/2]

```
void HexTile::setTileResource (
    TileResource tile_resource )
```

Method to set the tile resource (by enum value).

Parameters

<i>tile_resource</i>	The resource (TileResource) value to attribute to the tile.
----------------------	---

```
690 {
691     this->tile_resource = tile_resource;
692     this->__setResourceText();
693
694     return;
695 } /* setTileResource(TileResource) */
```

3.5.3.17 setTileType() [1/2]

```
void HexTile::setTileType (
    double input_value )
```

Method to set the tile type (by numeric input).

Parameters

<i>input_value</i>	A numerical input in the closed interval [0, 1].
--------------------	--

```
640 {
641     // 1. check input
642     if (input_value < 0 or input_value > 1) {
643         std::string error_str = "ERROR HexTile::setTileType() given input value is ";
644         error_str += "not in the closed interval [0, 1]";
645
646         #ifdef _WIN32
647             std::cout << error_str << std::endl;
648         #endif /* _WIN32 */
649
650         throw std::runtime_error(error_str);
651     }
652
653     // 2. convert input value to tile type
654     TileType tile_type;
655
656     if (input_value <= TILE_TYPE_CUMULATIVE_PROBABILITIES[0]) {
657         tile_type = TileType :: LAKE;
658     }
659     else if (input_value <= TILE_TYPE_CUMULATIVE_PROBABILITIES[1]) {
660         tile_type = TileType :: PLAINS;
661     }
662     else if (input_value <= TILE_TYPE_CUMULATIVE_PROBABILITIES[2]) {
663         tile_type = TileType :: FOREST;
664     }
665     else {
666         tile_type = TileType :: MOUNTAINS;
667     }
668
669     // 3. call alternate method
670     this->setTileType(tile_type);
671
672     return;
673 } /* setTileType(double) */
```

3.5.3.18 setTileType() [2/2]

```
void HexTile::setTileType (
    TileType tile_type )
```

Method to set the tile type (by enum value).

Parameters

<i>tile_type</i>	The type (TileType) to set the tile to.
------------------	---

```
581 {
582     this->tile_type = tile_type;
583
584     switch (this->tile_type) {
585         case (TileType :: FOREST): {
586             this->tile_sprite.setFillColor(FOREST_GREEN);
587
588             break;
589         }
590
591         case (TileType :: LAKE): {
```

```

592         this->tile_sprite.setFillColor(LAKE_BLUE);
593
594         break;
595     }
596
597     case (TileType :: MOUNTAINS): {
598         this->tile_sprite.setFillColor(MOUNTAINS_GREY);
599
600         break;
601     }
602
603     case (TileType :: OCEAN): {
604         this->tile_sprite.setFillColor(OCEAN_BLUE);
605
606         break;
607     }
608
609     case (TileType :: PLAINS): {
610         this->tile_sprite.setFillColor(PLAINS_YELLOW);
611
612         break;
613     }
614
615     default: {
616         // do nothing!
617
618         break;
619     }
620 }
621
622 return;
623 } /* setTileType(TileType) */

```

3.5.3.19 toggleResourceOverlay()

```

void HexTile::toggleResourceOverlay (
    void )

```

Method to toggle the tile resource overlay.

```

763 {
764     if (this->show_resource) {
765         this->show_resource = false;
766     }
767     else {
768         this->show_resource = true;
769     }
770
771     return;
772 } /* toggleResourceOverlay() */

```

3.5.4 Member Data Documentation

3.5.4.1 assets_manager_ptr

```
AssetsManager* HexTile::assets_manager_ptr [private]
```

A pointer to the assets manager.

3.5.4.2 event_ptr

```
sf::Event* HexTile::event_ptr [private]
```

A pointer to the event class.

3.5.4.3 frame

```
int HexTile::frame
```

The current frame of this object.

3.5.4.4 is_selected

```
bool HexTile::is_selected
```

A boolean which indicates whether or not the tile is selected.

3.5.4.5 major_radius

```
double HexTile::major_radius
```

The radius of the smallest bounding circle.

3.5.4.6 message_hub_ptr

```
MessageHub* HexTile::message_hub_ptr [private]
```

A pointer to the message hub.

3.5.4.7 minor_radius

```
double HexTile::minor_radius
```

The radius of the largest inscribed circle.

3.5.4.8 node_sprite

```
sf::CircleShape HexTile::node_sprite
```

A circle shape to mark the tile node.

3.5.4.9 position_x

```
double HexTile::position_x
```

The x position of the tile.

3.5.4.10 position_y

```
double HexTile::position_y
```

The y position of the tile.

3.5.4.11 render_window_ptr

```
sf::RenderWindow* HexTile::render_window_ptr [private]
```

A pointer to the render window.

3.5.4.12 resource_assessed

```
bool HexTile::resource_assessed
```

A boolean which indicates whether or not the resource has been assessed.

3.5.4.13 resource_chip_sprite

```
sf::CircleShape HexTile::resource_chip_sprite
```

A circle shape which represents a resource chip.

3.5.4.14 resource_text

```
sf::Text HexTile::resource_text
```

A text representation of the resource.

3.5.4.15 select_outline_sprite

```
sf::ConvexShape HexTile::select_outline_sprite
```

A convex shape which outlines the tile when selected.

3.5.4.16 show_node

```
bool HexTile::show_node
```

A boolean which indicates whether or not to show the tile node.

3.5.4.17 show_resource

```
bool HexTile::show_resource
```

A boolean which indicates whether or not to show resource value.

3.5.4.18 tile_resource

```
TileResource HexTile::tile_resource
```

3.5.4.19 tile_sprite

```
sf::ConvexShape HexTile::tile_sprite
```

A convex shape which represents the tile.

3.5.4.20 tile_type

`TileType HexTile::tile_type`

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

- header/[HexTile.h](#)
- source/[HexTile.cpp](#)

3.6 Message Struct Reference

A structure which defines a standard message format.

```
#include <MessageHub.h>
```

Public Attributes

- `std::string channel = ""`
A string identifying the appropriate channel for this message.
- `std::string subject = ""`
A string describing the message subject.
- `std::vector< bool > bool_payload_vec = {}`
A vector <bool> payload.
- `std::vector< int > int_payload_vec = {}`
A vector <int> payload.
- `std::vector< double > double_payload_vec = {}`
A vector <double> payload.
- `std::string string_payload = ""`
A string payload.

3.6.1 Detailed Description

A structure which defines a standard message format.

3.6.2 Member Data Documentation

3.6.2.1 bool_payload_vec

```
std::vector<bool> Message::bool_payload_vec = {}
```

A vector <bool> payload.

3.6.2.2 channel

```
std::string Message::channel = ""
```

A string identifying the appropriate channel for this message.

3.6.2.3 double_payload_vec

```
std::vector<double> Message::double_payload_vec = {}
```

A vector <double> payload.

3.6.2.4 int_payload_vec

```
std::vector<int> Message::int_payload_vec = {}
```

A vector <int> payload.

3.6.2.5 string_payload

```
std::string Message::string_payload = ""
```

A string payload.

3.6.2.6 subject

```
std::string Message::subject = ""
```

A string describing the message subject.

The documentation for this struct was generated from the following file:

- header/ESC_core/[MessageHub.h](#)

3.7 MessageHub Class Reference

A class which acts as a central hub for inter-object message traffic.

```
#include <MessageHub.h>
```

Public Member Functions

- [MessageHub](#) (void)
Constructor for the [MessageHub](#) class.
- bool [hasTraffic](#) (void)
Method to determine if there remains any message traffic.
- void [addChannel](#) (std::string)
Method to add channel to message map.
- void [removeChannel](#) (std::string)
Method to remove channel from message map.
- void [sendMessage](#) ([Message](#))
Method to send a message to the message map.
- bool [isEmpty](#) (std::string)
Method to check if channel is empty.
- [Message](#) [receiveMessage](#) (std::string)
Method to receive the latest message in the given channel.
- void [popMessage](#) (std::string)
Method to pop latest message off of the given channel.
- void [clearMessages](#) (void)
Method to clear messages from the [MessageHub](#).
- void [clear](#) (void)
Method to clear the [MessageHub](#).
- [~MessageHub](#) (void)
Destructor for the [MessageHub](#) class.

Private Attributes

- std::map< std::string, std::list< [Message](#) > > [message_map](#)
A map <string, list of [Message](#)> for sending and receiving messages. Here the key is the channel, and each channel maintains a list (history) of messages.

3.7.1 Detailed Description

A class which acts as a central hub for inter-object message traffic.

3.7.2 Constructor & Destructor Documentation

3.7.2.1 MessageHub()

```
MessageHub::MessageHub (
    void )
```

Constructor for the [MessageHub](#) class.

```
46 {
47     // ...
48
49     std::cout << "MessageHub constructed at " << this << std::endl;
50
51     return;
52 } /* MessageHub() */
```

3.7.2.2 ~MessageHub()

```
MessageHub::~MessageHub (
    void )
```

Destructor for the [MessageHub](#) class.

```
386 {
387     this->clear();
388
389     std::cout << "MessageHub at " << this << " destroyed" << std::endl;
390
391     return;
392 } /* ~MessageHub() */
```

3.7.3 Member Function Documentation

3.7.3.1 addChannel()

```
void MessageHub::addChannel (
    std::string channel )
```

Method to add channel to message map.

Parameters

<i>channel</i>	The key for the message channel being added.
----------------	--

```
97 {
98     // 1. check if channel is in map (if so, throw error)
99     if (this->message_map.count(channel) > 0) {
100         std::string error_str = "ERROR MessageHub::addChannel() channel ";
101         error_str += channel;
102         error_str += " is already in message map";
103
104         #ifdef _WIN32
105             std::cout << error_str << std::endl;
106         #endif /* _WIN32 */
107
108         throw std::runtime_error(error_str);
109     }
110
111     // 2. add channel to map
112     this->message_map[channel] = {};
113
114     return;
115 } /* addChannel() */
```

3.7.3.2 clear()

```
void MessageHub::clear (
    void )
```

Method to clear the [MessageHub](#).

```
366 {
367
368     this->clearMessages();
369     this->message_map.clear();
370
371     return;
372 } /* clear() */
```

3.7.3.3 clearMessages()

```
void MessageHub::clearMessages (
    void )
```

Method to clear messages from the [MessageHub](#).

```
340 {
341     std::map<std::string, std::list<Message>::iterator map_iter;
342     for (
343         map_iter = this->message_map.begin();
344         map_iter != this->message_map.end();
345         map_iter++
346     ) {
347         map_iter->second.clear();
348     }
349
350     return;
351 } /* clearMessages() */
```

3.7.3.4 hasTraffic()

```
bool MessageHub::hasTraffic (
    void )
```

Method to determine if there remains any message traffic.

```
67 {
68     std::map<std::string, std::list<Message>::iterator map_iter;
69     for (
70         map_iter = this->message_map.begin();
71         map_iter != this->message_map.end();
72         map_iter++
73     ) {
74         if (not map_iter->second.empty()) {
75             return true;
76         }
77     }
78
79     return false;
80 } /* hasTraffic() */
```

3.7.3.5 isEmpty()

```
bool MessageHub::isEmpty (
    std::string channel )
```

Method to check if channel is empty.

Parameters

<i>channel</i>	The key for the message channel being checked.
----------------	--

Returns

A boolean indicating whether the channel is empty or not.

```
207 {
208     // 1. check if channel is in map (if not, throw error)
209     if (this->message_map.count(channel) <= 0) {
```

```

210         std::string error_str = "ERROR MessageHub::isEmpty() channel ";
211         error_str += channel;
212         error_str += " is not in message map";
213
214         #ifdef _WIN32
215             std::cout << error_str << std::endl;
216         #endif /* _WIN32 */
217
218         throw std::runtime_error(error_str);
219     }
220
221     if (this->message_map[channel].empty()) {
222         return true;
223     }
224     else {
225         return false;
226     }
227 } /* isEmpty() */

```

3.7.3.6 popMessage()

```

void MessageHub::popMessage (
    std::string channel )

```

Method to pop latest message off of the given channel.

Parameters

<i>channel</i>	The key for the message channel being popped.
----------------	---

```

294 {
295     // 1. check if channel is in map (if not, throw error)
296     if (this->message_map.count(channel) <= 0) {
297         std::string error_str = "ERROR MessageHub::receiveMessage() channel ";
298         error_str += channel;
299         error_str += " is not in message map";
300
301         #ifdef _WIN32
302             std::cout << error_str << std::endl;
303         #endif /* _WIN32 */
304
305         throw std::runtime_error(error_str);
306     }
307
308     // 2. check if channel is empty (if so, throw error)
309     if (this->message_map[channel].empty()) {
310         std::string error_str = "ERROR MessageHub::receiveMessage() channel ";
311         error_str += channel;
312         error_str += " is empty";
313
314         #ifdef _WIN32
315             std::cout << error_str << std::endl;
316         #endif /* _WIN32 */
317
318         throw std::runtime_error(error_str);
319     }
320
321     // 3. pop message
322     this->message_map[channel].pop_back();
323
324     return;
325 } /* popMessage() */

```

3.7.3.7 receiveMessage()

```

Message MessageHub::receiveMessage (
    std::string channel )

```

Method to receive the latest message in the given channel.

Parameters

<i>channel</i>	The key for the message channel being received from.
----------------	--

Returns

The latest message in the given channel.

```

246 {
247     // 1. check if channel is in map (if not, throw error)
248     if (this->message_map.count(channel) <= 0) {
249         std::string error_str = "ERROR MessageHub::receiveMessage() channel ";
250         error_str += channel;
251         error_str += " is not in message map";
252
253         #ifdef _WIN32
254             std::cout << error_str << std::endl;
255         #endif /* _WIN32 */
256
257         throw std::runtime_error(error_str);
258     }
259
260     // 2. check if channel is empty (if so, throw error)
261     if (this->message_map[channel].empty()) {
262         std::string error_str = "ERROR MessageHub::receiveMessage() channel ";
263         error_str += channel;
264         error_str += " is empty";
265
266         #ifdef _WIN32
267             std::cout << error_str << std::endl;
268         #endif /* _WIN32 */
269
270         throw std::runtime_error(error_str);
271     }
272
273     // 3. receive message
274     Message message = this->message_map[channel].back();
275
276     return message;
277 } /* receiveMessage() */

```

3.7.3.8 removeChannel()

```

void MessageHub::removeChannel (
    std::string channel )

```

Method to remove channel from message map.

Parameters

<i>channel</i>	The key for the message channel being removed.
----------------	--

```

132 {
133     // 1. check if channel is in map (if not, throw error)
134     if (this->message_map.count(channel) <= 0) {
135         std::string error_str = "ERROR MessageHub::removeChannel() channel ";
136         error_str += channel;
137         error_str += " is not in message map";
138
139         #ifdef _WIN32
140             std::cout << error_str << std::endl;
141         #endif /* _WIN32 */
142
143         throw std::runtime_error(error_str);
144     }
145
146     // 2. remove channel from map
147     this->message_map[channel].clear();
148     this->message_map.erase(channel);

```

```

149
150     return;
151 }    /* removeChannel() */

```

3.7.3.9 sendMessage()

```

void MessageHub::sendMessage (
    Message message )

```

Method to send a message to the message map.

Parameters

<i>message</i>	The message to be sent.
----------------	-------------------------

```

168 {
169     // 1. check if channel is in map (if not, throw error)
170     std::string channel = message.channel;
171
172     if (this->message_map.count(channel) <= 0) {
173         std::string error_str = "ERROR MessageHub::sendMessage() channel ";
174         error_str += channel;
175         error_str += " is not in message map";
176
177         #ifdef _WIN32
178             std::cout << error_str << std::endl;
179         #endif /* _WIN32 */
180
181         throw std::runtime_error(error_str);
182     }
183
184     // 2. send message to message map
185     this->message_map[channel].push_back(message);
186
187     return;
188 }    /* sendMessage() */

```

3.7.4 Member Data Documentation

3.7.4.1 message_map

```
std::map<std::string, std::list<Message> > MessageHub::message_map [private]
```

A map <string, list of [Message](#)> for sending and receiving messages. Here the key is the channel, and each channel maintains a list (history) of messages.

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

- header/ESC_core/[MessageHub.h](#)
- source/ESC_core/[MessageHub.cpp](#)

Chapter 4

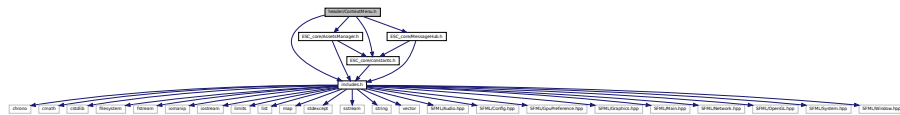
File Documentation

4.1 header/ContextMenu.h File Reference

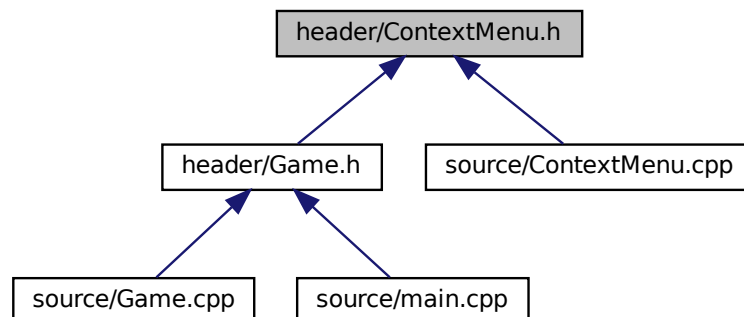
Header file for the [ContextMenu](#) class.

```
#include "ESC_core/constants.h"
#include "ESC_core/includes.h"
#include "ESC_core/AssetsManager.h"
#include "ESC_core/MessageHub.h"
```

Include dependency graph for ContextMenu.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [ContextMenu](#)

A class which defines a context menu for the game.

Enumerations

- enum [ConsoleState](#) {
[NONE](#) , [READY](#) , [MENU](#) , [TILE](#) ,
[N_CONSOLE_STATES](#) }

An enumeration of the different console screen states.

4.1.1 Detailed Description

Header file for the [ContextMenu](#) class.

4.1.2 Enumeration Type Documentation

4.1.2.1 ConsoleState

enum [ConsoleState](#)

An enumeration of the different console screen states.

Enumerator

NONE	None state (for initialization)
READY	Ready (default) state.
MENU	Game menu state.
TILE	Tile context state.
N_CONSOLE_STATES	A simple hack to get the number of console screen states.

```

34         {
35     NONE,
36     READY,
37     MENU,
38     TILE,
39     N_CONSOLE_STATES
40 };

```

4.2 header/ESC_core/AssetsManager.h File Reference

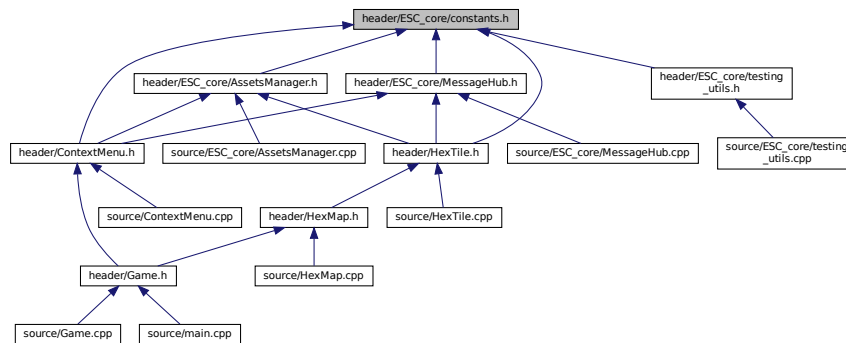
Header file for the [AssetsManager](#) class.

```

#include "constants.h"
#include "includes.h"

```


This graph shows which files directly or indirectly include this file:



Functions

- const sf::Color **FOREST_GREEN** (34, 139, 34)
The base colour of a forest tile.
- const sf::Color **LAKE_BLUE** (0, 102, 204)
The base colour of a lake (water) tile.
- const sf::Color **MOUNTAINS_GREY** (97, 110, 113)
The base colour of a mountains tile.
- const sf::Color **OCEAN_BLUE** (0, 51, 102)
The base colour of an ocean (water) tile.
- const sf::Color **PLAINS_YELLOW** (245, 222, 133)
The base colour of a plains tile.
- const sf::Color **MENU_FRAME_GREY** (185, 187, 182)
The base colour of the context menu frame.
- const sf::Color **MONOCHROME_SCREEN_BACKGROUND** (40, 40, 40)
The base colour of old monochrome screens.
- const sf::Color **VISUAL_SCREEN_FRAME_GREY** (151, 151, 143)
The base colour of the framing of the visual screen.
- const sf::Color **MONOCHROME_TEXT_GREEN** (0, 255, 102)
The base colour of old monochrome text (green).
- const sf::Color **MONOCHROME_TEXT_AMBER** (255, 176, 0)
The base colour of old monochrome text (amber).
- const sf::Color **MONOCHROME_TEXT_RED** (255, 44, 0)
The base colour of old monochrome text (red).

Variables

- const double **FLOAT_TOLERANCE** = 1e-6
Tolerance for floating point equality tests.
- const int **FRAMES_PER_SECOND** = 60
Target frames per second.
- const double **SECONDS_PER_FRAME** = 1.0 / 60
Target seconds per frame (just reciprocal of target frames per second).
- const int **GAME_WIDTH** = 1200

- Width of the game space.*
- const int `GAME_HEIGHT` = 800
- Height of the game space.*
- const std::vector< double > `TILE_TYPE_CUMULATIVE_PROBABILITIES`
Cumulative probabilities for each tile type (to support procedural generation).
- const std::vector< double > `TILE_RESOURCE_CUMULATIVE_PROBABILITIES`
Cumulative probabilities for each tile resource (to support procedural generation).
- const std::string `TILE_SELECTED_CHANNEL` = "TILE SELECTED CHANNEL"
A message channel for tile selection messages.
- const std::string `NO_TILE_SELECTED_CHANNEL` = "NO TILE SELECTED CHANNEL"
A message channel for no tile selected messages.
- const std::string `TILE_STATE_CHANNEL` = "TILE STATE CHANNEL"
A message channel for tile state messages.
- const std::string `GAME_CHANNEL` = "GAME CHANNEL"
A message channel for game messages.

4.3.1 Detailed Description

Header file for various constants.

4.3.2 Function Documentation

4.3.2.1 FOREST_GREEN()

```
const sf::Color FOREST_GREEN (
    34 ,
    139 ,
    34 )
```

The base colour of a forest tile.

4.3.2.2 LAKE_BLUE()

```
const sf::Color LAKE_BLUE (
    0 ,
    102 ,
    204 )
```

The base colour of a lake (water) tile.

4.3.2.3 MENU_FRAME_GREY()

```
const sf::Color MENU_FRAME_GREY (
    185 ,
    187 ,
    182 )
```

The base colour of the context menu frame.

4.3.2.4 MONOCHROME_SCREEN_BACKGROUND()

```
const sf::Color MONOCHROME_SCREEN_BACKGROUND (
    40 ,
    40 ,
    40 )
```

The base colour of old monochrome screens.

4.3.2.5 MONOCHROME_TEXT_AMBER()

```
const sf::Color MONOCHROME_TEXT_AMBER (
    255 ,
    176 ,
    0 )
```

The base colour of old monochrome text (amber).

4.3.2.6 MONOCHROME_TEXT_GREEN()

```
const sf::Color MONOCHROME_TEXT_GREEN (
    0 ,
    255 ,
    102 )
```

The base colour of old monochrome text (green).

4.3.2.7 MONOCHROME_TEXT_RED()

```
const sf::Color MONOCHROME_TEXT_RED (
    255 ,
    44 ,
    0 )
```

The base colour of old monochrome text (red).

4.3.2.8 MOUNTAINS_GREY()

```
const sf::Color MOUNTAINS_GREY (
    97 ,
    110 ,
    113 )
```

The base colour of a mountains tile.

4.3.2.9 OCEAN_BLUE()

```
const sf::Color OCEAN_BLUE (
    0 ,
    51 ,
    102 )
```

The base colour of an ocean (water) tile.

4.3.2.10 PLAINS_YELLOW()

```
const sf::Color PLAINS_YELLOW (
    245 ,
    222 ,
    133 )
```

The base colour of a plains tile.

4.3.2.11 VISUAL_SCREEN_FRAME_GREY()

```
const sf::Color VISUAL_SCREEN_FRAME_GREY (
    151 ,
    151 ,
    143 )
```

The base colour of the framing of the visual screen.

4.3.3 Variable Documentation

4.3.3.1 FLOAT_TOLERANCE

```
const double FLOAT_TOLERANCE = 1e-6
```

Tolerance for floating point equality tests.

4.3.3.2 FRAMES_PER_SECOND

```
const int FRAMES_PER_SECOND = 60
```

Target frames per second.

4.3.3.3 GAME_CHANNEL

```
const std::string GAME_CHANNEL = "GAME CHANNEL"
```

A message channel for game messages.

4.3.3.4 GAME_HEIGHT

```
const int GAME_HEIGHT = 800
```

Height of the game space.

4.3.3.5 GAME_WIDTH

```
const int GAME_WIDTH = 1200
```

Width of the game space.

4.3.3.6 NO_TILE_SELECTED_CHANNEL

```
const std::string NO_TILE_SELECTED_CHANNEL = "NO TILE SELECTED CHANNEL"
```

A message channel for no tile selected messages.

4.3.3.7 SECONDS_PER_FRAME

```
const double SECONDS_PER_FRAME = 1.0 / 60
```

Target seconds per frame (just reciprocal of target frames per second).

4.3.3.8 TILE_RESOURCE_CUMULATIVE_PROBABILITIES

```
const std::vector<double> TILE_RESOURCE_CUMULATIVE_PROBABILITIES
```

Initial value:

```
= {  
    0.10,  
    0.30,  
    0.70,  
    0.90,  
    1.00  
}
```

Cumulative probabilities for each tile resource (to support procedural generation).

4.3.3.9 TILE_SELECTED_CHANNEL

```
const std::string TILE_SELECTED_CHANNEL = "TILE SELECTED CHANNEL"
```

A message channel for tile selection messages.

4.3.3.10 TILE_STATE_CHANNEL

```
const std::string TILE_STATE_CHANNEL = "TILE STATE CHANNEL"
```

A message channel for tile state messages.

4.3.3.11 TILE_TYPE_CUMULATIVE_PROBABILITIES

```
const std::vector<double> TILE_TYPE_CUMULATIVE_PROBABILITIES
```

Initial value:

```
= {  
    0.25,  
    0.50,  
    0.75,  
    1.00  
}
```

Cumulative probabilities for each tile type (to support procedural generation).

4.4 header/ESC_core/doxygen_cite.h File Reference

Header file which simply cites the doxygen tool.

4.4.1 Detailed Description

Header file which simply cites the doxygen tool.

Ref: [van Heesch. \[2023\]](#)

4.5 header/ESC_core/includes.h File Reference

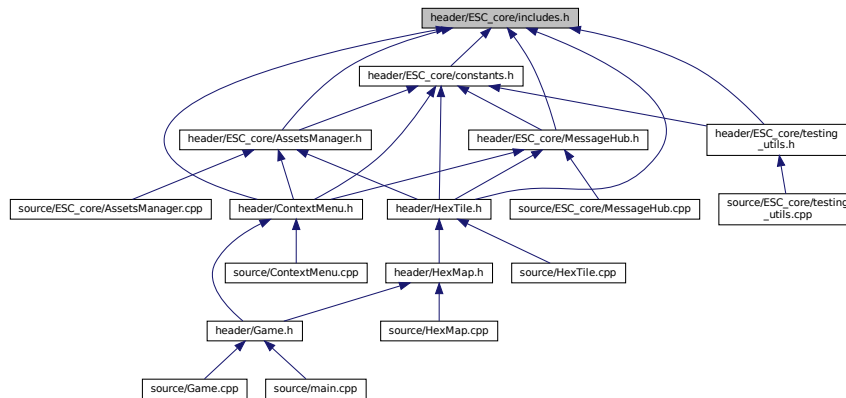
Header file for various includes.

```
#include <chrono>
#include <cmath>
#include <cstdlib>
#include <filesystem>
#include <fstream>
#include <iomanip>
#include <iostream>
#include <limits>
#include <list>
#include <map>
#include <stdexcept>
#include <sstream>
#include <string>
#include <vector>
#include <SFML/Audio.hpp>
#include <SFML/Config.hpp>
#include <SFML/GpuPreference.hpp>
#include <SFML/Graphics.hpp>
#include <SFML/Main.hpp>
#include <SFML/Network.hpp>
#include <SFML/OpenGL.hpp>
#include <SFML/System.hpp>
#include <SFML/Window.hpp>
```

Include dependency graph for includes.h:



This graph shows which files directly or indirectly include this file:



4.5.1 Detailed Description

Header file for various includes.

Ref: [Gomila \[2023\]](#)

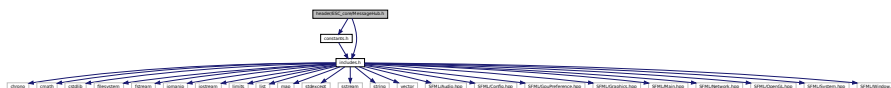
4.6 header/ESC_core/MessageHub.h File Reference

Header file for the [MessageHub](#) class.

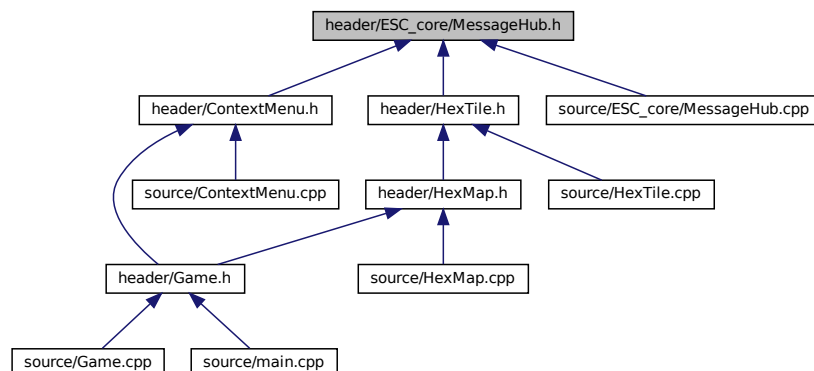
```
#include "constants.h"
```

```
#include "includes.h"
```

Include dependency graph for MessageHub.h:



This graph shows which files directly or indirectly include this file:



Functions

- void `printGreen` (std::string)
A function that sends green text to std::cout.
- void `printGold` (std::string)
A function that sends gold text to std::cout.
- void `printRed` (std::string)
A function that sends red text to std::cout.
- void `testFloatEquals` (double, double, std::string, int)
Tests for the equality of two floating point numbers x and y (to within `FLOAT_TOLERANCE`).
- void `testGreaterThan` (double, double, std::string, int)
Tests if $x > y$.
- void `testGreaterThanOrEqualTo` (double, double, std::string, int)
Tests if $x \geq y$.
- void `testLessThan` (double, double, std::string, int)
Tests if $x < y$.
- void `testLessThanOrEqualTo` (double, double, std::string, int)
Tests if $x \leq y$.
- void `testTruth` (bool, std::string, int)
Tests if the given statement is true.
- void `expectedErrorNotDetected` (std::string, int)
A utility function to print out a meaningful error message whenever an expected error fails to be thrown/caught/detected.

4.7.1 Detailed Description

Header file for various testing utilities.

This is a library of utility functions used throughout the various test suites.

4.7.2 Function Documentation

4.7.2.1 `expectedErrorNotDetected()`

```
void expectedErrorNotDetected (
    std::string file,
    int line )
```

A utility function to print out a meaningful error message whenever an expected error fails to be thrown/caught/detected.

Parameters

<i>file</i>	The file in which the test is applied (you should be able to just pass in " <code>__FILE__</code> ").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in " <code>__LINE__</code> ").

```
430 {
431     std::string error_str = "\n ERROR   failed to throw expected error prior to line ";
432     error_str += std::to_string(line);
```

```
433     error_str += " of ";
434     error_str += file;
435
436     #ifdef _WIN32
437         std::cout << error_str << std::endl;
438     #endif
439
440     throw std::runtime_error(error_str);
441     return;
442 } /* expectedErrorNotDetected() */
```

4.7.2.2 printGold()

```
void printGold (
    std::string input_str )
```

A function that sends gold text to std::cout.

Parameters

<i>input_str</i>	The text of the string to be sent to std::cout.
------------------	---

```
82 {
83     std::cout << "\x1B[33m" << input_str << "\033[0m";
84     return;
85 } /* printGold() */
```

4.7.2.3 printGreen()

```
void printGreen (
    std::string input_str )
```

A function that sends green text to std::cout.

Parameters

<i>input_str</i>	The text of the string to be sent to std::cout.
------------------	---

```
62 {
63     std::cout << "\x1B[32m" << input_str << "\033[0m";
64     return;
65 } /* printGreen() */
```

4.7.2.4 printRed()

```
void printRed (
    std::string input_str )
```

A function that sends red text to std::cout.

Parameters

<i>input_str</i>	The text of the string to be sent to <code>std::cout</code> .
------------------	---

```

102 {
103     std::cout << "\x1B[31m" << input_str << "\033[0m";
104     return;
105 } /* printRed() */

```

4.7.2.5 testFloatEquals()

```

void testFloatEquals (
    double x,
    double y,
    std::string file,
    int line )

```

Tests for the equality of two floating point numbers *x* and *y* (to within `FLOAT_TOLERANCE`).

Parameters

<i>x</i>	The first of two numbers to test.
<i>y</i>	The second of two numbers to test.
<i>file</i>	The file in which the test is applied (you should be able to just pass in " <code>__FILE__</code> ").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in " <code>__LINE__</code> ").

```

136 {
137     if (fabs(x - y) <= FLOAT_TOLERANCE) {
138         return;
139     }
140
141     std::string error_str = "ERROR: testFloatEquals():\t in ";
142     error_str += file;
143     error_str += "\tline ";
144     error_str += std::to_string(line);
145     error_str += ":\t\n";
146     error_str += std::to_string(x);
147     error_str += " and ";
148     error_str += std::to_string(y);
149     error_str += " are not equal to within +/- ";
150     error_str += std::to_string(FLOAT_TOLERANCE);
151     error_str += "\n";
152
153     #ifdef WIN32
154         std::cout << error_str << std::endl;
155     #endif
156
157     throw std::runtime_error(error_str);
158     return;
159 } /* testFloatEquals() */

```

4.7.2.6 testGreaterThan()

```

void testGreaterThan (
    double x,
    double y,
    std::string file,
    int line )

```

Tests if $x > y$.

Parameters

<i>x</i>	The first of two numbers to test.
<i>y</i>	The second of two numbers to test.
<i>file</i>	The file in which the test is applied (you should be able to just pass in "__FILE__").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in "__LINE__").

```

189 {
190     if (x > y) {
191         return;
192     }
193
194     std::string error_str = "ERROR: testGreaterThan():\t in ";
195     error_str += file;
196     error_str += "\tline ";
197     error_str += std::to_string(line);
198     error_str += ":\t\n";
199     error_str += std::to_string(x);
200     error_str += " is not greater than ";
201     error_str += std::to_string(y);
202     error_str += "\n";
203
204     #ifdef _WIN32
205         std::cout << error_str << std::endl;
206     #endif
207
208     throw std::runtime_error(error_str);
209     return;
210 } /* testGreaterThan() */

```

4.7.2.7 testGreaterThanOrEqualTo()

```

void testGreaterThanOrEqualTo (
    double x,
    double y,
    std::string file,
    int line )

```

Tests if $x \geq y$.

Parameters

<i>x</i>	The first of two numbers to test.
<i>y</i>	The second of two numbers to test.
<i>file</i>	The file in which the test is applied (you should be able to just pass in "__FILE__").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in "__LINE__").

```

240 {
241     if (x >= y) {
242         return;
243     }
244
245     std::string error_str = "ERROR: testGreaterThanOrEqualTo():\t in ";
246     error_str += file;
247     error_str += "\tline ";
248     error_str += std::to_string(line);
249     error_str += ":\t\n";
250     error_str += std::to_string(x);
251     error_str += " is not greater than or equal to ";
252     error_str += std::to_string(y);
253     error_str += "\n";
254
255     #ifdef _WIN32
256         std::cout << error_str << std::endl;
257     #endif
258
259     throw std::runtime_error(error_str);

```

```

260     return;
261 } /* testGreaterThanOrEqualTo() */

```

4.7.2.8 testLessThan()

```

void testLessThan (
    double x,
    double y,
    std::string file,
    int line )

```

Tests if $x < y$.

Parameters

<i>x</i>	The first of two numbers to test.
<i>y</i>	The second of two numbers to test.
<i>file</i>	The file in which the test is applied (you should be able to just pass in "__FILE__").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in "__LINE__").

```

291 {
292     if (x < y) {
293         return;
294     }
295
296     std::string error_str = "ERROR: testLessThan():\t in ";
297     error_str += file;
298     error_str += "\tline ";
299     error_str += std::to_string(line);
300     error_str += ":\t\n";
301     error_str += std::to_string(x);
302     error_str += " is not less than ";
303     error_str += std::to_string(y);
304     error_str += "\n";
305
306     #ifdef _WIN32
307         std::cout << error_str << std::endl;
308     #endif
309
310     throw std::runtime_error(error_str);
311     return;
312 } /* testLessThan() */

```

4.7.2.9 testLessThanOrEqualTo()

```

void testLessThanOrEqualTo (
    double x,
    double y,
    std::string file,
    int line )

```

Tests if $x \leq y$.

Parameters

<i>x</i>	The first of two numbers to test.
<i>y</i>	The second of two numbers to test.
<i>file</i>	The file in which the test is applied (you should be able to just pass in "__FILE__").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in "__LINE__").

```

342 {
343     if (x <= y) {
344         return;
345     }
346
347     std::string error_str = "ERROR: testLessThanOrEqualTo():\t in ";
348     error_str += file;
349     error_str += "\tline ";
350     error_str += std::to_string(line);
351     error_str += ":\t\n";
352     error_str += std::to_string(x);
353     error_str += " is not less than or equal to ";
354     error_str += std::to_string(y);
355     error_str += "\n";
356
357     #ifdef _WIN32
358         std::cout << error_str << std::endl;
359     #endif
360
361     throw std::runtime_error(error_str);
362     return;
363 } /* testLessThanOrEqualTo() */

```

4.7.2.10 testTruth()

```

void testTruth (
    bool statement,
    std::string file,
    int line )

```

Tests if the given statement is true.

Parameters

<i>statement</i>	The statement whose truth is to be tested ("1 == 0", for example).
<i>file</i>	The file in which the test is applied (you should be able to just pass in "__FILE__").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in "__LINE__").

```

390 {
391     if (statement) {
392         return;
393     }
394
395     std::string error_str = "ERROR: testTruth():\t in ";
396     error_str += file;
397     error_str += "\tline ";
398     error_str += std::to_string(line);
399     error_str += ":\t\n";
400     error_str += "Given statement is not true";
401
402     #ifdef _WIN32
403         std::cout << error_str << std::endl;
404     #endif
405
406     throw std::runtime_error(error_str);
407     return;
408 } /* testTruth() */

```

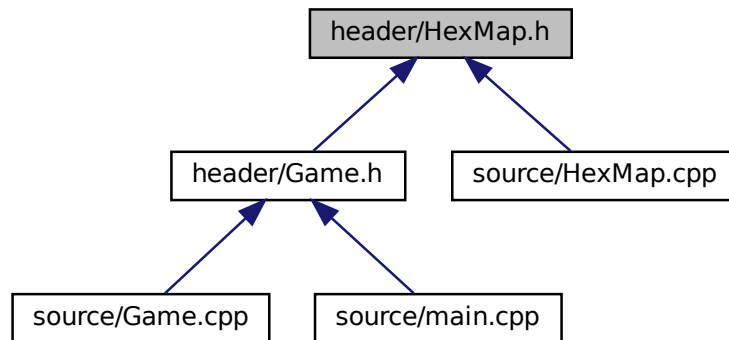
4.8 header/Game.h File Reference

```

#include "HexMap.h"
#include "ContextMenu.h"

```


This graph shows which files directly or indirectly include this file:



Classes

- class [HexMap](#)

A class which defines a hex map of hex tiles.

4.9.1 Detailed Description

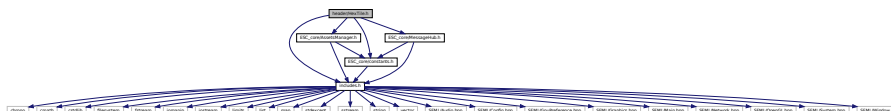
Header file for the [HexMap](#) class.

4.10 header/HexTile.h File Reference

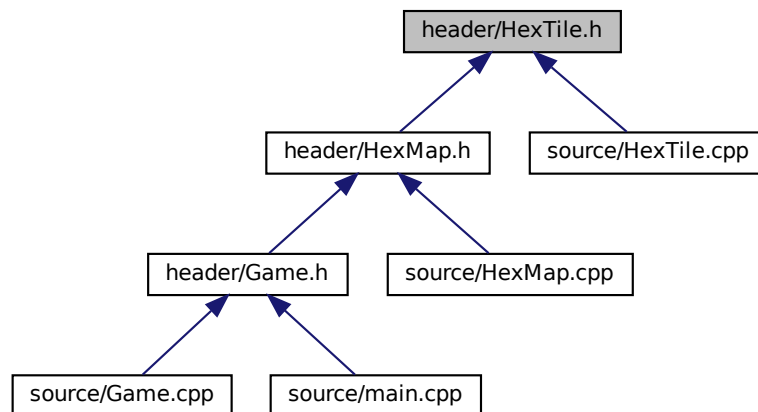
Header file for the [Game](#) class.

```
#include "ESC_core/constants.h"
#include "ESC_core/includes.h"
#include "ESC_core/AssetsManager.h"
#include "ESC_core/MessageHub.h"
```

Include dependency graph for HexTile.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [HexTile](#)
A class which defines a hex tile of the hex map.

Enumerations

- enum [TileType](#) {
[FOREST](#) , [LAKE](#) , [MOUNTAINS](#) , [OCEAN](#) ,
[PLAINS](#) , [N_TILE_TYPES](#) }
An enumeration of the different tile types.
- enum [TileResource](#) {
[POOR](#) , [BELOW_AVERAGE](#) , [AVERAGE](#) , [ABOVE_AVERAGE](#) ,
[GOOD](#) , [N_TILE_RESOURCES](#) }
An enumeration of the different tile resource values.

4.10.1 Detailed Description

Header file for the [Game](#) class.

Header file for the [HexTile](#) class.

4.10.2 Enumeration Type Documentation

4.10.2.1 TileResource

enum [TileResource](#)

An enumeration of the different tile resource values.

Parameters

<i>file</i>	The file in which the test is applied (you should be able to just pass in "__FILE__").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in "__LINE__").

```

430 {
431     std::string error_str = "\n ERROR   failed to throw expected error prior to line ";
432     error_str += std::to_string(line);
433     error_str += " of ";
434     error_str += file;
435
436     #ifdef _WIN32
437         std::cout << error_str << std::endl;
438     #endif
439
440     throw std::runtime_error(error_str);
441     return;
442 } /* expectedErrorNotDetected() */

```

4.14.2.2 printGold()

```

void printGold (
    std::string input_str )

```

A function that sends gold text to std::cout.

Parameters

<i>input_str</i>	The text of the string to be sent to std::cout.
------------------	---

```

82 {
83     std::cout << "\x1B[33m" << input_str << "\033[0m";
84     return;
85 } /* printGold() */

```

4.14.2.3 printGreen()

```

void printGreen (
    std::string input_str )

```

A function that sends green text to std::cout.

Parameters

<i>input_str</i>	The text of the string to be sent to std::cout.
------------------	---

```

62 {
63     std::cout << "\x1B[32m" << input_str << "\033[0m";
64     return;
65 } /* printGreen() */

```

4.14.2.4 printRed()

```

void printRed (

```

```
std::string input_str )
```

A function that sends red text to `std::cout`.

Parameters

<i>input_str</i>	The text of the string to be sent to <code>std::cout</code> .
------------------	---

```
102 {
103     std::cout << "\x1B[31m" << input_str << "\033[0m";
104     return;
105 } /* printRed() */
```

4.14.2.5 testFloatEquals()

```
void testFloatEquals (
    double x,
    double y,
    std::string file,
    int line )
```

Tests for the equality of two floating point numbers *x* and *y* (to within `FLOAT_TOLERANCE`).

Parameters

<i>x</i>	The first of two numbers to test.
<i>y</i>	The second of two numbers to test.
<i>file</i>	The file in which the test is applied (you should be able to just pass in " <code>__FILE__</code> ").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in " <code>__LINE__</code> ").

```
136 {
137     if (fabs(x - y) <= FLOAT_TOLERANCE) {
138         return;
139     }
140
141     std::string error_str = "ERROR: testFloatEquals():\t in ";
142     error_str += file;
143     error_str += "\tline ";
144     error_str += std::to_string(line);
145     error_str += ":\t\n";
146     error_str += std::to_string(x);
147     error_str += " and ";
148     error_str += std::to_string(y);
149     error_str += " are not equal to within +/- ";
150     error_str += std::to_string(FLOAT_TOLERANCE);
151     error_str += "\n";
152
153     #ifdef _WIN32
154         std::cout << error_str << std::endl;
155     #endif
156
157     throw std::runtime_error(error_str);
158     return;
159 } /* testFloatEquals() */
```

4.14.2.6 testGreaterThan()

```
void testGreaterThan (
    double x,
```

```
double y,
std::string file,
int line )
```

Tests if $x > y$.

Parameters

<i>x</i>	The first of two numbers to test.
<i>y</i>	The second of two numbers to test.
<i>file</i>	The file in which the test is applied (you should be able to just pass in "__FILE__").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in "__LINE__").

```
189 {
190     if (x > y) {
191         return;
192     }
193
194     std::string error_str = "ERROR: testGreaterThan():\t in ";
195     error_str += file;
196     error_str += "\tline ";
197     error_str += std::to_string(line);
198     error_str += ":\t\n";
199     error_str += std::to_string(x);
200     error_str += " is not greater than ";
201     error_str += std::to_string(y);
202     error_str += "\n";
203
204     #ifdef _WIN32
205         std::cout << error_str << std::endl;
206     #endif
207
208     throw std::runtime_error(error_str);
209     return;
210 } /* testGreaterThan() */
```

4.14.2.7 testGreaterThanOrEqualTo()

```
void testGreaterThanOrEqualTo (
    double x,
    double y,
    std::string file,
    int line )
```

Tests if $x \geq y$.

Parameters

<i>x</i>	The first of two numbers to test.
<i>y</i>	The second of two numbers to test.
<i>file</i>	The file in which the test is applied (you should be able to just pass in "__FILE__").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in "__LINE__").

```
240 {
241     if (x >= y) {
242         return;
243     }
244
245     std::string error_str = "ERROR: testGreaterThanOrEqualTo():\t in ";
246     error_str += file;
247     error_str += "\tline ";
248     error_str += std::to_string(line);
249     error_str += ":\t\n";
```

```

250     error_str += std::to_string(x);
251     error_str += " is not greater than or equal to ";
252     error_str += std::to_string(y);
253     error_str += "\n";
254
255     #ifdef _WIN32
256         std::cout << error_str << std::endl;
257     #endif
258
259     throw std::runtime_error(error_str);
260     return;
261 } /* testGreaterThanOrEqualTo() */

```

4.14.2.8 testLessThan()

```

void testLessThan (
    double x,
    double y,
    std::string file,
    int line )

```

Tests if $x < y$.

Parameters

<i>x</i>	The first of two numbers to test.
<i>y</i>	The second of two numbers to test.
<i>file</i>	The file in which the test is applied (you should be able to just pass in "__FILE__").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in "__LINE__").

```

291 {
292     if (x < y) {
293         return;
294     }
295
296     std::string error_str = "ERROR: testLessThan():\t in ";
297     error_str += file;
298     error_str += "\tline ";
299     error_str += std::to_string(line);
300     error_str += ":\t\n";
301     error_str += std::to_string(x);
302     error_str += " is not less than ";
303     error_str += std::to_string(y);
304     error_str += "\n";
305
306     #ifdef _WIN32
307         std::cout << error_str << std::endl;
308     #endif
309
310     throw std::runtime_error(error_str);
311     return;
312 } /* testLessThan() */

```

4.14.2.9 testLessThanOrEqualTo()

```

void testLessThanOrEqualTo (
    double x,
    double y,
    std::string file,
    int line )

```

Tests if $x \leq y$.

Parameters

<i>x</i>	The first of two numbers to test.
<i>y</i>	The second of two numbers to test.
<i>file</i>	The file in which the test is applied (you should be able to just pass in "__FILE__").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in "__LINE__").

```

342 {
343     if (x <= y) {
344         return;
345     }
346
347     std::string error_str = "ERROR: testLessThanOrEqualTo():\t in ";
348     error_str += file;
349     error_str += "\tline ";
350     error_str += std::to_string(line);
351     error_str += ":\t\n";
352     error_str += std::to_string(x);
353     error_str += " is not less than or equal to ";
354     error_str += std::to_string(y);
355     error_str += "\n";
356
357     #ifdef _WIN32
358         std::cout << error_str << std::endl;
359     #endif
360
361     throw std::runtime_error(error_str);
362     return;
363 } /* testLessThanOrEqualTo() */

```

4.14.2.10 testTruth()

```

void testTruth (
    bool statement,
    std::string file,
    int line )

```

Tests if the given statement is true.

Parameters

<i>statement</i>	The statement whose truth is to be tested ("1 == 0", for example).
<i>file</i>	The file in which the test is applied (you should be able to just pass in "__FILE__").
<i>line</i>	The line of the file in which the test is applied (you should be able to just pass in "__LINE__").

```

390 {
391     if (statement) {
392         return;
393     }
394
395     std::string error_str = "ERROR: testTruth():\t in ";
396     error_str += file;
397     error_str += "\tline ";
398     error_str += std::to_string(line);
399     error_str += ":\t\n";
400     error_str += "Given statement is not true";
401
402     #ifdef _WIN32
403         std::cout << error_str << std::endl;
404     #endif
405
406     throw std::runtime_error(error_str);
407     return;
408 } /* testTruth() */

```


4.18.2.2 loadAssets()

```
void loadAssets (
    AssetsManager * assets_manager_ptr )
```

Helper function to load game assets.

Parameters

<code>assets_manager_ptr</code>	Pointer to the assets manager.
---------------------------------	--------------------------------

```
32 {
33     // 1. load font assets
34     assets_manager_ptr->loadFont("assets/fonts/DroidSansMono.ttf", "DroidSansMono");
35     assets_manager_ptr->loadFont("assets/fonts/Glass_TTY_VT220.ttf", "Glass_TTY_VT220");
36
37     return;
38 } /* loadAssets() */
```

4.18.2.3 main()

```
int main (
    int argc,
    char ** argv )
{
    // 1. load assets
    AssetsManager assets_manager;
    loadAssets(&assets_manager);

    // 2. construct render window
    sf::RenderWindow* render_window_ptr = constructRenderWindow();

    // 3. start game loop
    bool quit_game = false;
    while (not quit_game) {
        Game game(render_window_ptr, &assets_manager);
        quit_game = game.run();
    }

    // 4. clean up
    render_window_ptr->close();
    delete render_window_ptr;

    return 0;
} /* main() */
```

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