3dchess

Generated by Doxygen 1.8.6

Sun Mar 9 2014 23:13:01

Contents

Chapter 1

Namespace Index

1.1 Namespace List

Here is a list of all documented namespaces with brief descriptions:

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 3

Class Index

3.1 Class List

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

Chapter 4

Namespace Documentation

4.1 DebugTools Namespace Reference

Contains functions for helping with debugging tasks.

Functions

- string toInitializerList (const std::array< Piece, 64 > &board)

  Returns the code needed to initialize a board to the given state.
- template<typename Rng >
  GameState generateRandomState (size_t maxTurns, Rng &rng)

  Generates a random GameState.
- template<typename Rng >
  ChessBoard generateRandomBoard (size_t maxTurns, Rng &rng)

  Generates a random Board.

4.1.1 Detailed Description

Contains functions for helping with debugging tasks.

4.1.2 Function Documentation

4.1.2.1 template<typename Rng > ChessBoard DebugTools::generateRandomBoard (size_t *maxTurns,* Rng & *rng*)

Generates a random Board.

See Also

generateRandomState

4.1.2.2 template<typename Rng > GameState DebugTools::generateRandomState (size_t *maxTurns,* Rng & *rng*)

Generates a random GameState.

Emulating a games a game with up to maxTurns random moves.

Parameters

maxTurns	Limit for number of moves.
rng	C++ Random number generator to use.

4.2 freetype Namespace Reference

FreeType Headers.

Classes

- struct font_data

  This holds all of the information related to any freetype font that we want to create.

Functions

- int next_p2 (int a)

  This function gets the first power of 2 >= the int that we pass it.
- void make_dlist (FT_Face face, char ch, GLuint list_base, GLuint *tex_base)

  Create a display list coresponding to the give character.
- void pushScreenCoordinateMatrix ()

  A fairly straight forward function that pushes a projection matrix that will make object world coordinates identical to window coordinates.
- void pop_projection_matrix ()

  Pops the projection matrix without changing the current MatrixMode.
- void print (const font_data &ft_font, float x, float y, const char *fmt,...)

  Much like Nehe's glPrint function, but modified to work with freetype fonts.

4.2.1 Detailed Description

FreeType Headers. OpenGL Headers Some STL headers Using the STL exception library increases the chances that someone else using our code will corretly catch any exceptions that we throw. MSVC will spit out all sorts of useless warnings if you create vectors of strings, this pragma gets rid of them. Wrap everything in a namespace, that we can use common function names like "print" without worrying about overlapping with anyone else's code.

4.2.2 Function Documentation

4.2.2.1 int freetype::next_p2 (int *a*) [inline]

This function gets the first power of 2 >= the int that we pass it.

4.2.2.2 void freetype::pop_projection_matrix ( ) [inline]

Pops the projection matrix without changing the current MatrixMode.

4.2.2.3 void freetype::print (const font_data & *ft_font*, float *x*, float *y*, const char * *fmt*, ...)

Much like Nehe's glPrint function, but modified to work with freetype fonts.

The flagship function of the library - this thing will print out text at window coordinates x,y, using the font ft_font.

The current modelview matrix will also be applied to the text.

4.2.2.4 void freetype::pushScreenCoordinateMatrix ( ) [inline]

A fairly straight forward function that pushes a projection matrix that will make object world coordinates identical to window coordinates.

Chapter 5

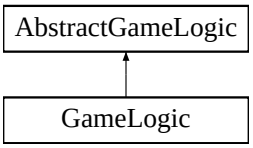
Class Documentation

5.1 AbstractGameLogic Class Reference

Interface for chess game logic implementations.

`#include <AbstractGameLogic.h>`

Inheritance diagram for AbstractGameLogic:



Public Member Functions

- virtual AbstractPlayerPtr **getWhitePlayer** () const =0
- virtual AbstractPlayerPtr **getBlackPlayer** () const =0
- virtual void addObserver (AbstractGameObserverPtr observer)=0

  Registers an observer for game events.
- virtual bool isGameOver () const =0
- virtual PlayerColor getWinner () const =0
- virtual GameConfigurationPtr getConfiguration () const =0
- virtual void start ()

  Starts the game logic thread.
- virtual void join ()

  Will block until the logic thread terminated.
- virtual void stop ()=0

  Initiates a shutdown of the game logic.

Protected Member Functions

- virtual void run ()=0

  Actual game logic function.

Protected Attributes

- std::thread m_thread

  Game logic thread.

5.1.1 Detailed Description

Interface for chess game logic implementations.

5.1.2 Member Function Documentation

5.1.2.1 virtual void AbstractGameLogic::addObserver (AbstractGameObserverPtr *observer*) [pure virtual]

Registers an observer for game events.

See Also

AbstractGameObserver for the available events.

Parameters

observer	Observer to register.

Implemented in GameLogic.

5.1.2.2 virtual GameConfigurationPtr AbstractGameLogic::getConfiguration ( ) const [pure virtual]

Returns

GameConfiguration currently used.

Implemented in GameLogic.

5.1.2.3 virtual PlayerColor AbstractGameLogic::getWinner ( ) const [pure virtual]

Returns

If isGameOver returns the winner of the game.

Implemented in GameLogic.

5.1.2.4 virtual bool AbstractGameLogic::isGameOver ( ) const [pure virtual]

Returns

true if game has ended.

Implemented in GameLogic.

5.1.2.5 virtual void AbstractGameLogic::join ( ) [inline], [virtual]

Will block until the logic thread terminated.

Be sure to call stop first to initiate logic thread shutdown.

5.1.2.6 virtual void AbstractGameLogic::run ( ) [protected], [pure virtual]

Actual game logic function.

Called by start function on the game logic thread to run the actual logic.

Implemented in GameLogic.

5.1.2.7 virtual void AbstractGameLogic::start ( ) [inline], [virtual]

Starts the game logic thread.

See Also

run

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

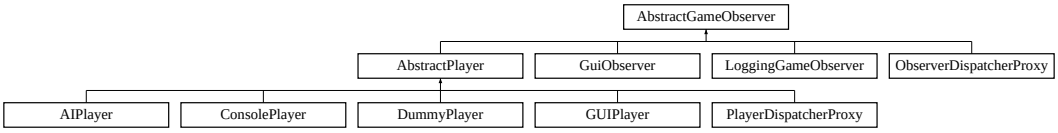
- S:/dev/3dchess/src/logic/interface/AbstractGameLogic.h

5.2 AbstractGameObserver Class Reference

Allows to observe relevant GameEvents inside the GameLogic.

`#include <AbstractGameObserver.h>`

Inheritance diagram for AbstractGameObserver:



Public Member Functions

- virtual void onGameStart (GameState state, GameConfiguration config)

  Called when the game starts.
- virtual void onTurnStart (PlayerColor who)

  Called if a player is asked to perform a turn.
- virtual void onTurnEnd (PlayerColor who, Turn turn, GameState newState)

  Called if a player ended its turn.
- virtual void onTurnTimeout (PlayerColor who, std::chrono::seconds timeout)

  Called if a players turn is aborted due to timeout.
- virtual void onGameOver (GameState state, PlayerColor winner)

  Called when a game started with onGameStart is over.

5.2.1 Detailed Description

Allows to observe relevant GameEvents inside the GameLogic.

Classes of this type can be registered with the GameLogic to be notified of relevant game events.

Note

A Observer is only required to stay in a valid state for one game. It is free to halt its operations after the end of the game.

Warning

None of the functions in the class must block.

5.2.2 Member Function Documentation

5.2.2.1 virtual void AbstractGameObserver::onGameOver (GameState *state,* PlayerColor *winner*) [inline], [virtual]

Called when a game started with onGameStart is over.

Parameters

state	State on game over.
winner	Winner of the game.

Reimplemented in PlayerDispatcherProxy, GuiObserver, ObserverDispatcherProxy, AIPlayer, ConsolePlayer, and LoggingGameObserver.

5.2.2.2 virtual void AbstractGameObserver::onGameStart (GameState *state,* GameConfiguration *config*) [inline], [virtual]

Called when the game starts.

Parameters

state	GameState on game start.
config	Valid GameConfiguration for this game.

Reimplemented in PlayerDispatcherProxy, AIPlayer, GuiObserver, ObserverDispatcherProxy, ConsolePlayer, and LoggingGameObserver.

5.2.2.3 virtual void AbstractGameObserver::onTurnEnd (PlayerColor *who,* Turn *turn,* GameState *newState*) [inline], [virtual]

Called if a player ended its turn.

Parameters

who	Color of the player doing the turn.
turn	Turn the player decided on.
newState	State after the player performed the turn.

Reimplemented in PlayerDispatcherProxy, GuiObserver, ObserverDispatcherProxy, ConsolePlayer, and LoggingGameObserver.

5.2.2.4 virtual void AbstractGameObserver::onTurnStart (PlayerColor *who*) [inline], [virtual]

Called if a player is asked to perform a turn.

Parameters

who	Color of the player doing the turn.

Reimplemented in PlayerDispatcherProxy, GuiObserver, ObserverDispatcherProxy, and LoggingGameObserver.

5.2.2.5 virtual void AbstractGameObserver::onTurnTimeout (PlayerColor *who*, std::chrono::seconds *timeout*) [inline], [virtual]

Called if a players turn is aborted due to timeout.

Parameters

who	Color of the player who got interrupted.
timeout	Length of the time limit that got violated.

Reimplemented in PlayerDispatcherProxy, GuiObserver, ObserverDispatcherProxy, and LoggingGameObserver.

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

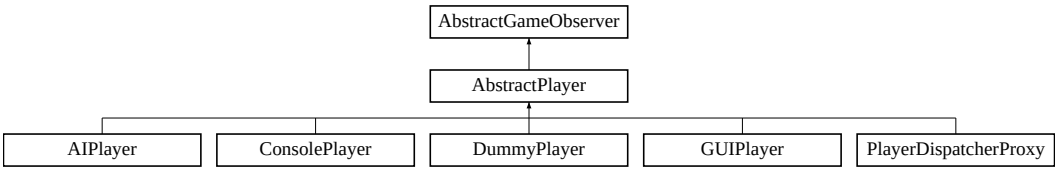
- S:/dev/3dchess/src/logic/interface/AbstractGameObserver.h

5.3 AbstractPlayer Class Reference

Class a player has to implement to interact with the GameLogic.

`#include <AbstractPlayer.h>`

Inheritance diagram for AbstractPlayer:



Public Member Functions

- virtual void onSetColor (PlayerColor color)=0

  Notifies that player what color he will be playing.
- virtual std::future< Turn > doMakeTurn (GameState state)=0

  Asks the player to make his turn.
- virtual void doAbortTurn ()=0

  Asks the player to abort a turn asked for with doMakeTurn.

5.3.1 Detailed Description

Class a player has to implement to interact with the GameLogic.

Every player is also a AbstractGameObserver which is notified of relevant game events. You do not need to register the player as an observer for this to happen.

Note

A Observer is only required to stay in a valid state for one game. It is free to halt its operations after the end of the game.

Warning

None of the functions in the class must block.

5.3.2 Member Function Documentation

5.3.2.1 virtual void AbstractPlayer::doAbortTurn ( ) [pure virtual]

Asks the player to abort a turn asked for with doMakeTurn.

When this is called the GameLogic will no longer react to the completion of the future for that turn. A use of this function is the abortion of a turn due to timeout.

Implemented in GUIPlayer, PlayerDispatcherProxy, AIPlayer, DummyPlayer, and ConsolePlayer.

5.3.2.2 virtual std::future<Turn> AbstractPlayer::doMakeTurn (GameState *state*) [pure virtual]

Asks the player to make his turn.

Warning

This function must not block. It is to return immediatly. The players turn is to be set on the returned future.

Note

The game logic can abort its request for a player to make his turn using the doAbortTurn function at any time.

Parameters

state	Current state of the game.

Returns

A future to the turn to make.

Implemented in GUIPlayer, DummyPlayer, AIPlayer, PlayerDispatcherProxy, and ConsolePlayer.

5.3.2.3 virtual void AbstractPlayer::onSetColor (PlayerColor *color*) [pure virtual]

Notifies that player what color he will be playing.

Called before onGameStart.

Parameters

color	Color the player has.

Implemented in GUIPlayer, AIPlayer, DummyPlayer, PlayerDispatcherProxy, and ConsolePlayer.

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

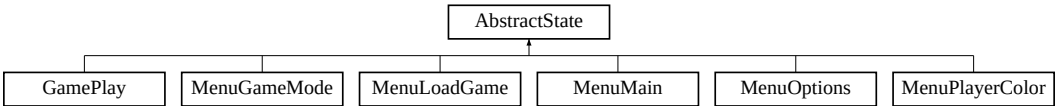
- S:/dev/3dchess/src/logic/interface/AbstractPlayer.h

5.4 AbstractState Class Reference

Interface for modelling a game state.

`#include <AbstractState.h>`

Inheritance diagram for AbstractState:



Public Member Functions

- virtual void enter ()=0

  Enters the state for the first time.
- virtual AbstractState * run ()=0

  Runs the current state and does all the work.
- virtual void exit ()=0

  Exits the current state and cleans up all allocated resources.
- virtual void draw ()=0

  Draws something state related stuff on the screen.

5.4.1 Detailed Description

Interface for modelling a game state.

Note

To run() a state, first enter() the state.

5.4.2 Member Function Documentation

5.4.2.1 virtual void AbstractState::enter ( ) [pure virtual]

Enters the state for the first time.

This will setup all the state related stuff.

Note

To run() the current state, first enter() it.

Implemented in GamePlay, MenuGameMode, MenuLoadGame, MenuOptions, MenuMain, and MenuPlayerColor.

5.4.2.2 virtual void AbstractState::exit ( ) [pure virtual]

Exits the current state and cleans up all allocated resources.

Note

This is the last method to call, before the object is deleted.

Implemented in GamePlay, MenuGameMode, MenuLoadGame, MenuOptions, MenuMain, and MenuPlayerColor.

5.4.2.3 virtual AbstractState* AbstractState::run ( ) [pure virtual]

Runs the current state and does all the work.

Returns

AbstractState* the state which should be run after this state. A nullptr if the game should be exited.

Implemented in GamePlay, MenuGameMode, MenuLoadGame, MenuOptions, MenuMain, and MenuPlayerColor.

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

- S:/dev/3dchess/src/gui/interface/AbstractState.h

5.5 AIConfiguration Class Reference

AI configuration class.

`#include <GameConfiguration.h>`

Public Member Functions

- std::string **toString** () const

Static Public Member Functions

- static AIConfiguration **defaults** ()

Public Attributes

- std::string name

  Name of this configuration.
- std::string openingBook

  Relative path to opening book. Empty for none.
- int maximumTimeForTurnInSeconds

  Time allowed to take for turn.
- bool ponderDuringOpposingPly

  Ponder when not playing.
- size_t maximumDepth

  Hard depth limit.

Private Member Functions

- template<class Archive >
  void **serialize** (Archive &ar, const unsigned int)

Friends

- class **boost::serialization::access**

5.5.1 Detailed Description

AI configuration class.

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

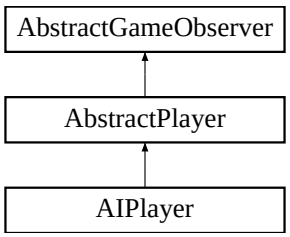
- S:/dev/3dchess/src/core/GameConfiguration.h
- S:/dev/3dchess/src/core/GameConfiguration.cpp

5.6 AIPlayer Class Reference

Artificial intelligence player implementation.

`#include <AIPlayer.h>`

Inheritance diagram for AIPlayer:



Public Types

- enum States { PREPARATION, PONDERING, PLAYING, STOPPED }

  States for AIPlayer.

Public Member Functions

- AIPlayer (const AIConfiguration &config, const std::string &name="AIPlayer", int seed=5253)

  Creates a new AIPlayer.
- void start ()

  Starts the AIPlayer thread.
- virtual void onSetColor (PlayerColor color) override

  Notifies that player what color he will be playing.
- virtual void onGameStart (GameState state, GameConfiguration config) override

  Called when the game starts.
- virtual std::future< Turn > doMakeTurn (GameState state) override

  Asks the player to make his turn.
- virtual void doAbortTurn () override

  Asks the player to abort a turn asked for with doMakeTurn.
- virtual void onGameOver (GameState, PlayerColor) override

  Called when a game started with onGameStart is over.
- States getState () const

Private Member Functions

- void run ()

  Executes AIPlayer state machine choosing to play, ponder or stop.
- void play ()

  State used when asked to make a turn.
- void ponder ()

  State between turns.
- void changeState (States newState)

  Changes AIPlayer state.
- bool tryFindPromisedTurnInOpeningBook ()

  Search opening book and fulfill promise if possible. If not return false.
- void searchForPromisedTurn ()

  Use negamax to iteratively search for the turn an fulfill with best found.
- void performIterativeDeepening ()

  Use negamax while discarding its results to fill transposition table.
- void completePromiseWith (const Turn &turn)

  Complete the promise and prepare the AI for pondering.
- boost::optional< Turn > performSearchIteration (size_t depth, GameState &state, States aiState)

  Performs an abortable negamax search up to the given depth.
- bool canStayInState (States currentState)

  Returns false if a time limit expired or the current state must be left.
- void setTimeLimit (std::chrono::milliseconds limit)

  Sets a time limit that can be checked with.

Private Attributes

- std::promise< Turn > m_promisedTurn

  Holds the promise during fulfillment (.
- std::atomic< States > m_playerState

  State of the AI.
- std::mutex m_stateMutex

  Mutex for m_playerState.
- GameState m_gameState

  Last notion of game state for the AI.
- GameState m_ponderGameState

  State for the AI to ponder on between turns.
- GameConfiguration m_gameConfig

  Game configuration the AI works with.
- PlayerColor m_color

  Color the AI is playing as.
- Negamax< GameState, true, true, true > m_negamax

  Algorithm used for search.
- std::thread m_thread

  Thread the AI is run on.
- PolyglotBook m_openingBook

  Opening book (potentially unititialized)
- bool m_outOfBook

  Indicates that we had a miss on the book and no longer use it.
- size_t m_maxIterationDepth

Depth limit for iterative deepening.

- std::chrono::seconds m_maxTimeForTurn

  Maximum time usable for turn.
- std::chrono::high_resolution_clock::time_point m_timeoutExpirationTime

  Timeout timer (.
- const AIConfiguration m_config

  AI configuration.
- bool m_hasWinningMove

  True if the AI has found a way to win.
- Logging::Logger **m_log**

5.6.1 Detailed Description

Artificial intelligence player implementation.

5.6.2 Member Enumeration Documentation

5.6.2.1 enum AIPlayer::States

States for AIPlayer.

Enumerator

PREPARATION Game preparation phase.

PONDERING Pondering during enemies turn.

PLAYING Playing own turn.

STOPPED Stopped operations.

5.6.3 Constructor & Destructor Documentation

5.6.3.1 AIPlayer::AIPlayer (const AIConfiguration & *config*, const std::string & *name* = `"AIPlayer"`, int *seed* = `5253`)

Creates a new AIPlayer.

Parameters

AIConfiguration	configuration to use for AI
name	Logger channel name to use
seed	Seed to use for random operations for the player.

Note

Don't forget to start() it.

5.6.4 Member Function Documentation

5.6.4.1 void AIPlayer::changeState (States *newState*) `[private]`

Changes AIPlayer state.

Note

A STOPPED AI cannot be restarted.

Parameters

newState	New state to adopt.

5.6.4.2 void AIPlayer::doAbortTurn ( ) [override], [virtual]

Asks the player to abort a turn asked for with doMakeTurn.

When this is called the GameLogic will no longer react to the completion of the future for that turn. A use of this function is the abortion of a turn due to timeout.

Implements AbstractPlayer.

5.6.4.3 future< Turn > AIPlayer::doMakeTurn (GameState *state*) [override], [virtual]

Asks the player to make his turn.

Warning

This function must not block. It is to return immediatly. The players turn is to be set on the returned future.

Note

The game logic can abort its request for a player to make his turn using the doAbortTurn function at any time.

Parameters

state	Current state of the game.

Returns

A future to the turn to make.

Implements AbstractPlayer.

5.6.4.4 AIPlayer::States AIPlayer::getState ( ) const

Returns

Return current state.

5.6.4.5 void AIPlayer::onGameOver (GameState *state*, PlayerColor *winner*) [override], [virtual]

Called when a game started with onGameStart is over.

Parameters

state	State on game over.
winner	Winner of the game.

Reimplemented from AbstractGameObserver.

5.6.4.6 void AIPlayer::onGameStart (GameState *state*, GameConfiguration *config*) [override], [virtual]

Called when the game starts.

Parameters

state	GameState on game start.
config	Valid GameConfiguration for this game.

Reimplemented from AbstractGameObserver.

5.6.4.7 void AIPlayer::onSetColor (PlayerColor *color*) [override],[virtual]

Notifies that player what color he will be playing.

Called before onGameStart.

Parameters

color	Color the player has.

Implements AbstractPlayer.

5.6.4.8 boost::optional< Turn > AIPlayer::performSearchIteration (size_t *depth*, GameState & *state*, States *aiState*) [private]

Performs an abortable negamax search up to the given depth.

Parameters

depth	Depth to search to.
state	State to search from.
aiState	Current ai state for abortion checks

Returns

Turn if depth was reached. None otherwise.

5.6.4.9 void AIPlayer::play ( ) [private]

State used when asked to make a turn.

Employs Negamax search to return a reasonable turn to the game logic.

5.6.4.10 void AIPlayer::ponder ( ) [private]

State between turns.

Can be used for additional processing (e.g. iterative deepening).

5.6.4.11 void AIPlayer::setTimeLimit (std::chrono::milliseconds *limit*) [private]

Sets a time limit that can be checked with.

See Also

canStayInState

5.6.5 Member Data Documentation

5.6.5.1 std::atomic<States> AIPlayer::m_playerState [private]

State of the AI.

Warning

Protected by m_stateMutex.

5.6.5.2 std::promise<Turn> AIPlayer::m_promisedTurn [private]

Holds the promise during fulfillment (.

See Also

play).

5.6.5.3 std::chrono::high_resolution_clock::time_point AIPlayer::m_timeoutExpirationTime [private]

Timeout timer (.

See Also

setTimeLimit
canStayInState)

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

- S:/dev/3dchess/src/ai/AIPlayer.h
- S:/dev/3dchess/src/ai/AIPlayer.cpp

5.7 ChessSet::AnimationCapsule Struct Reference

Struct for turn animation.

Public Attributes

- Piece **piece**
- Field **field**
- Turn **turn**

5.7.1 Detailed Description

Struct for turn animation.

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

- S:/dev/3dchess/src/gui/ChessSet.h

5.8 AnimationHelper Class Reference

The class helps to create animations by providing time dependent methods.

`#include <AnimationHelper.h>`

Public Types

- enum FunctionType { EASE_LINEAR, EASE_OUTSINE }

  The possible time function types.

Public Member Functions

- AnimationHelper (const int duration)

  Creates a new AnimationHelper object.
- void setStartNowOrKeepIt ()

  Sets the current time as start point for the animation.
- void reset ()

  Resets the start time stamp to the current time.
- float ease (FunctionType type, const float lowerBound, const float upperBound)

  The percentage of the range between the lowerBound and upperBound.
- bool hasStopped ()

  Gets the status of the animation.

Private Member Functions

- unsigned int getElapsedTime ()

  Gets the elapsed time since the animation was started.

Private Attributes

- unsigned int m_duration

  The duration of the animation in miliseconds.
- unsigned int m_startTime

  The start time of the animation.
- float m_completeness

  The completeness of the animation (1/100 percent, 0.0 - 1.0).
- float m_easingResult

  The calculated result of the animation.

5.8.1 Detailed Description

The class helps to create animations by providing time dependent methods.

5.8.2 Member Enumeration Documentation

5.8.2.1 enum AnimationHelper::FunctionType

The possible time function types.

Enumerator

EASE_LINEAR Linear.

EASE_OUTSINE Sinus like curve.

5.8.3 Constructor & Destructor Documentation

5.8.3.1 AnimationHelper::AnimationHelper (const int *duration*)

Creates a new AnimationHelper object.

Parameters

duration	The period how long the animation should took.

5.8.4 Member Function Documentation

5.8.4.1 float AnimationHelper::ease (FunctionType *type*, const float *lowerBound*, const float *upperBound*)

The percentage of the range between the lowerBound and upperBound.

Note

The lowerBound must be less than upperBound.

Parameters

type	One of the FunctionType as defined above.
lowerBound	The lower bound of the range.
upperBound	The upper bound of the range.

Returns

The numeric value in percent. This will show the completeness of the animation in percent between 0.0 and 1.0;

5.8.4.2 unsigned int AnimationHelper::getElapsedTime ( ) [private]

Gets the elapsed time since the animation was started.

Returns

The number of miliseconds since the animation was started.

5.8.4.3 bool AnimationHelper::hasStopped ( )

Gets the status of the animation.

Returns

True if the animation was started and has already finished. False if not.

5.8.4.4 void AnimationHelper::setStartNowOrKeepIt ( )

Sets the current time as start point for the animation.

If this method is called multiple times, only the first call will take effect.

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

- S:/dev/3dchess/src/gui/AnimationHelper.h
- S:/dev/3dchess/src/gui/AnimationHelper.cpp

5.9 ArrowNavigationHandler Class Reference

The class helps to handle the keyboard navigation with the arrow keys.

`#include <ArrowNavigationHandler.h>`

Classes

- struct Config

  The Configuration.

Public Types

- enum ArrowKey { **UP**, **RIGHT**, **DOWN**, **LEFT** }

  Enumeration for the arrow keys directions.

Public Member Functions

- ArrowNavigationHandler (bool inverseNavigation)

  Creates a new ArrowNavigationHandler object.
- void onKey (ArrowKey direction)

  This method must be called if an arrow key is pressed.
- Field getCursorPosition ()

  Returns the current cursor position.

Private Member Functions

- void checkTimeBetweenKeyStrokes (ArrowKey direction)

  Checks the time between the current and last keystroke and sets the throttle flag.
- void moveCursorVertical (int steps)

  Calculates the new vertical position depending on the given step-width.
- void moveCursorHorizontal (int steps)

  Calculates the new horizontal position depending on the given step-width.
- void moveCursorUp ()

  Moves the cursor up with respect to the configured inversion of the keys.
- void moveCursorRight ()

  Moves the cursor right with respect to the configured inversion of the keys.
- void moveCursorDown ()

  Moves the cursor down with respect to the configured inversion of the keys.
- void moveCursorLeft ()

  Moves the cursor left with respect to the configured inversion of the keys.

Private Attributes

- struct ArrowNavigationHandler::Config **m_config**
- unsigned int m_tileCursor

  The current cursor position.
- std::chrono::time_point < std::chrono::system_clock > m_timeStart [4]

  The last stroke-time for the direction keys.
- std::chrono::time_point < std::chrono::system_clock > **m_timeNow** [4]
- bool m_throttling [4]

  Flag, if a direction key must be throttled.

5.9.1 Detailed Description

The class helps to handle the keyboard navigation with the arrow keys.

5.9.2 Constructor & Destructor Documentation

5.9.2.1 ArrowNavigationHandler::ArrowNavigationHandler (bool *inverseNavigation*)

Creates a new ArrowNavigationHandler object.

Parameters

inverse-Navigation	If true left/right and up/down are changed to the opposite.

5.9.3 Member Function Documentation

5.9.3.1 void ArrowNavigationHandler::checkTimeBetweenKeyStrokes (ArrowKey *direction*) [private]

Checks the time between the current and last keystroke and sets the throttle flag.

Parameters

direction	The arrow key direction to check the time.

5.9.3.2 Field ArrowNavigationHandler::getCursorPosition ( )

Returns the current cursor position.

Returns

The cursor position as Field.

5.9.3.3 void ArrowNavigationHandler::moveCursorHorizontal (int *steps*) [private]

Calculates the new horizontal position depending on the given step-width.

Parameters

steps	The step-count (1 or -1) for the horizontal (left/right) move.

5.9.3.4 void ArrowNavigationHandler::moveCursorVertical (int *steps*) [private]

Calculates the new vertical position depending on the given step-width.

Parameters

steps	The step-count (8 or -8) for the vertical (up/down) move.

5.9.3.5 void ArrowNavigationHandler::onKey (ArrowKey *direction*)

This method must be called if an arrow key is pressed.

Parameters

direction	the ArrowKey direction (see above).

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

- S:/dev/3dchess/src/gui/ArrowNavigationHandler.h
- S:/dev/3dchess/src/gui/ArrowNavigationHandler.cpp

5.10 AssimpHelper Class Reference

Assimp wrapper class to handle scene modeling in an more comfortable way.

`#include <AssimpHelper.h>`

Public Member Functions

- void importScene (std::string filename)

  Imports the scene by filename.
- void drawScene ()

  Draws the scene.

Private Member Functions

- void drawMesh (Mesh *mesh)

  Draws the given mesh.

Private Attributes

- const aiScene * scene

  The scene object.
- Assimp::Importer * importer

  The Assimp Importer pointer.
- std::vector< Mesh * > meshes

  The scene Meshes.

5.10.1 Detailed Description

Assimp wrapper class to handle scene modeling in an more comfortable way.

5.10.2 Member Function Documentation

5.10.2.1 void AssimpHelper::drawMesh (Mesh * *mesh*) [private]

Draws the given mesh.

Parameters

mesh	The mesh to draw.

5.10.2.2 void AssimpHelper::importScene (std::string *filename*)

Imports the scene by filename.

Parameters

filename	The filename of the scene to import.

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

- S:/dev/3dchess/src/gui/AssimpHelper.h
- S:/dev/3dchess/src/gui/AssimpHelper.cpp

5.11 GamePlay::CapturedPieces Struct Reference

Struct that contains all captured pieces for the black and white player as also the OpenGL display lists for the black/white bars.

Public Attributes

- std::array< int, 6 > **countBlack**
- std::array< int, 6 > **countWhite**
- GLuint **blackBar**
- GLuint **whiteBar**

5.11.1 Detailed Description

Struct that contains all captured pieces for the black and white player as also the OpenGL display lists for the black/white bars.

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

- S:/dev/3dchess/src/gui/states/GamePlay.h

5.12 ChessBoard Class Reference

Chessboard representation and logic implementation.

`#include <ChessBoard.h>`

Public Member Functions

- **ChessBoard** (std::array< Piece, 64 > board, PlayerColor nextPlayer, std::array< bool, NUM_PLAYERS > shortCastleRight, std::array< bool, NUM_PLAYERS > longCastleRight, Field enPassantSquare, int halfMoveClock, int fullMoveClock)
- void applyTurn (const Turn &t)

  Applies the given turn on current chessboard.
- std::array< Piece, 64 > getBoard () const

  Returns the chessboard in array representation.

- bool hasBlackPieces () const

  Returns true if black pieces are on the board.
- bool hasWhitePieces () const

  Returns true if white pieces are on the board.
- PlayerColor getNextPlayer () const

  Return next player to make a turn.
- Score getScore (PlayerColor color, size_t depth=0) const

  Returns the current estimated score.
- Hash getHash () const

  Returns hash for current position.
- int getHalfMoveClock () const

  Returns half move clock.
- int getFullMoveClock () const

  Returns full move clock.
- std::string toFEN () const

  Converts the current board state into FEN notation.
- Field getEnPassantSquare () const

  Returns the field where en-passant rights exist. ERR if none.
- std::array< bool, NUM_PLAYERS > getShortCastleRights () const

  Returns short castle rights for players.
- std::array< bool, NUM_PLAYERS > getLongCastleRights () const

  Returns long castle rights for players.
- std::array< bool, NUM_PLAYERS > getKingInCheck () const

  Returns whether the king of the player is in check or not.
- bool isStalemate () const

  Gameover-Flag for stalemate position (gameover, no winner).
- std::array< bool, NUM_PLAYERS > getCheckmate () const

  Gameover-Flag for checkmate.
- bool isGameOver () const

  Returns true if the game is over.
- bool isDrawDueTo50MovesRule () const

  Returns true if the game is draw due to the 50 moves rule.
- PlayerColor getWinner () const

  Returns the winner of the game.
- Piece getLastCapturedPiece () const

  Returns the captured piece from the last turn or Piece(NoPlayer, NoType) if no piece was captured.
- bool **operator==** (const ChessBoard &other) const
- bool **operator!=** (const ChessBoard &other) const
- std::string **toString** () const

Static Public Member Functions

- static ChessBoard fromFEN (const std::string &fen)

  Create a chessboard from a Forsyth–Edwards Notation string.

Protected Member Functions

- void updateBitBoards ()

  Updates the helper bit boards.
- void setKingInCheck (PlayerColor player, bool kingInCheck)

  Set or unset the kingInCheck-Flag.
- void setStalemate ()

  Set the stalemate-Flag.
- void setCheckmate (PlayerColor player)

  Set the checkmate-Flag.

Protected Attributes

- std::array< std::array < BitBoard, NUM_PIECETYPES+1 > , NUM_PLAYERS > m_bb

  We use bit boards for internal turn generation.

Private Member Functions

- void initBitBoards (std::array< Piece, 64 > board)

  Init the bit boards from the given chess board in array presentation.
- void applyMoveTurn (const Turn &turn)

  Applies a "simple" move turn.
- void applyCastleTurn (const Turn &turn)

  Performs a long/short castle turn.
- void applyPromotionTurn (const Turn &turn, const PieceType pieceType)

  Promotes a pawn to a given piece type (Queen | Bishop | Rook | Knight).
- void capturePiece (const Turn &turn)

  Determines the type of a captured piece and takes it from the board.
- void addCapturedPiece (const Piece capturedPiece, Field field)

  Takes a Piece from the board and adds it to the captured piece list.
- void updateEnPassantSquare (const Turn &turn)

  Resets the enPassantSquare or sets it to the possible field.
- void updateCastlingRights (const Turn &turn)

  Checks whether the given turn affects castling rights and updates them accordingly.

Private Attributes

- std::array< bool, NUM_PLAYERS > m_kingInCheck

  King of player in check postion.
- std::array< bool, NUM_PLAYERS > m_checkmate

  King of player is checkmate.
- bool m_stalemate

  Game is stalemate.
- std::array< bool, NUM_PLAYERS > m_shortCastleRight

  Short castle rights for players.
- std::array< bool, NUM_PLAYERS > m_longCastleRight

  Long castle rights for players.
- Field m_enPassantSquare

En passant square.

- int m_halfMoveClock

  Half-move clock.

- int m_fullMoveClock

  Full move clock.

- PlayerColor m_nextPlayer

  Player doing the next turn.

- Piece m_lastCapturedPiece

  Capured piece from last turn.

- IncrementalMaterialAndPSTEvaluator **m_evaluator**
- IncrementalZobristHasher **m_hasher**

Friends

- class **TurnGenerator**
- class **IncrementalZobristHasher**

5.12.1 Detailed Description

Chessboard representation and logic implementation.

5.12.2 Member Function Documentation

5.12.2.1 ChessBoard ChessBoard::fromFEN (const std::string & *fen*) [static]

Create a chessboard from a Forsyth–Edwards Notation string.

http://en.wikipedia.org/wiki/Forsyth%E2%80%93Edwards_Notation

Warning

This function does no validation. Do not pass invalid FEN.

Parameters

fen	FEN String.

5.12.2.2 PlayerColor ChessBoard::getWinner ( ) const

Returns the winner of the game.

Returns Player color or NoPlayer on draw.

5.12.2.3 string ChessBoard::toFEN ( ) const

Converts the current board state into FEN notation.

Returns

State in FEN notation.

5.12.3 Member Data Documentation

5.12.3.1 std::array<std::array<BitBoard,NUM_PIECETYPES+1>, NUM_PLAYERS> ChessBoard::m_bb [protected]

We use bit boards for internal turn generation.

At least twelve bit boards are needed for complete board representation + some additional helper boards.

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

- S:/dev/3dchess/src/logic/ChessBoard.h
- S:/dev/3dchess/src/logic/ChessBoard.cpp

5.13 ChessSet Class Reference

The ChessSet holds all the figures together with the board needed for the chess game.

`#include <ChessSet.h>`

Classes

- struct AnimationCapsule

  Struct for turn animation.
- struct Coord3D

  Simple 3D Coord container.
- struct CorrectionValue

  Coordination-correction container to statically adjust unproper 3D models.
- struct StrikedModel

  Striked model for animation.

Public Types

- enum TileStyle { **NORMAL**, **CURSOR**, **MOVE**, **CASTLE** }

  The style type for a tile.

Public Member Functions

- ChessSet ()

  Creates a new chess set.
- void setState (std::array< Piece, 64 > state, PlayerColor lastPlayer, Turn lastTurn)

  Sets the new chess state.
- void drawActionTileAt (Field which, TileStyle style)

  Draws an action tile at a given field with a given style.
- int getResourcesCount ()

  Returns the number of big resources which must be loaded for initializing the ChessSet.
- void registerLoadCallback (const boost::function< void(std::string)> &callback)

  Registers a function as callback.
- void loadResources ()

  Loads all resources, builds the models and the chess board.
- void draw ()

  Draws the whole ChessSet.

Private Types

- enum InternalState { **ANIMATING**, **STATIC** }

  Internal states.
- enum Elevation { **UP**, **DOWN** }

  The elevation direction.
- using Signal = boost::signals2::signal< void(std::string)>

  boost::signals2 callback Signal to call when a resource will be loaded.

Private Member Functions

- void createChessBoardList ()

  Creates a new chess board as OpenGL display list.
- void createModelsList (bool withoutTurnDependentModels)

  Creates a OpenGL display list with all models at the positions as saved in the board state.
- void drawModelAt (Field field, PieceType type, PlayerColor color)

  Draws a precompiled OpenGL display list model at the given field.
- void drawModelAt (Coord3D coords, PieceType type, PlayerColor color)

  Draws a precompiled OpenGL display list model at the given coordinates.
- void animateModelTurn ()

  Animates the turn for the source and destination field.
- void drawModels ()

  Draws the models via the OpenGL display list and checks if turn animations are needed.
- void drawBoard ()

  Draws the board via the OpenGL display list.
- void drawTile (Coord3D coords, bool odd, TileStyle style)

  Draws a tile at the given coordinates.
- Coord3D calcCoordinatesForTileAt (Field which)

  Calculates the coordinates for a given field.
- void animateModelStrike (Coord3D coords, Piece piece)

  Animates the model strike/bash at the given coordinates.
- void animateModelTurn (Coord3D coords, AnimationCapsule animCapsule)

  Animates the model turn at the given coordinates.

Private Attributes

- int m_tileWidth

  The proportions of the tiles.
- int **m_tileHeight**
- unsigned int m_turnMoveShowDuration

  The duration for the animation of a turn.
- unsigned int m_turnMoveShownSince

  The timestamp of when the animation was started.
- enum ChessSet::InternalState **m_internalState**
- float m_animationElevationHeight

  The maximum height to lift a model when animating.
- float **m_animationElevationStrikeHeight**
- bool m_firstRun

  Flag to set if this is the first run.
- std::array< ModelPtr, 6 > m_models

  Simple (smart pointer) model array which holds the references to the six model types.

- std::vector< std::string > m_extResources

  Vector which hold the resources for all external resources (3D models).
- std::array< CorrectionValue, 6 > m_extCorrectionValues

  Simple array with correction values for each 3D model.
- GLuint m_boardList

  OpenGL display list index to the 3D board representation. 8x8 fields.
- GLuint m_modelList [12]

  OpenGL display lists indexes to the 3D models representation for black and white color.
- GLuint m_modelsList

  OpenGL display list index to all 3D models and translation combined.
- std::array< Piece, 64 > m_state

  Whole chess state.
- std::array< Piece, 64 > **m_lastState**
- std::vector< AnimationCapsule > m_animationCapsules

  One or more turn animation capsules.
- AnimationHelperPtr m_animationHelperModelX

  Animation helper objects.
- AnimationHelperPtr **m_animationHelperModelY**
- AnimationHelperPtr **m_animationHelperModelZ**
- AnimationHelperPtr **m_animationHelperModelStrike**
- enum ChessSet::Elevation **m_animationDirectionY**
- std::vector< StrikedModel > m_modelStrikes

  Striked model container.
- Turn m_lastTurn

  Last player turn.
- PlayerColor m_lastPlayer

  Last player color.
- Signal **m_loadCallback**

5.13.1 Detailed Description

The ChessSet holds all the figures together with the board needed for the chess game.

5.13.2 Member Function Documentation

5.13.2.1 void ChessSet::animateModelStrike (Coord3D *coords*, Piece *piece*) [private]

Animates the model strike/bash at the given coordinates.

Note

This function is time-dependent and must be called on each loop-step to see any effect.

Parameters

coords	The coordinates where to animate the strike.
piece	The type of the piece to animate.

5.13.2.2 void ChessSet::animateModelTurn (Coord3D *coords*, AnimationCapsule *animCapsule*) [private]

Animates the model turn at the given coordinates.

Parameters

coords	The coordinates where to animate the turn.
animCapsule	The animation capsule to animate.

5.13.2.3 ChessSet::Coord3D ChessSet::calcCoordinatesForTileAt (Field *which*) [private]

Calculates the coordinates for a given field.

The chess board is sectioned in the following way.

Parameters

which	The field for which the coordinates are calculated from.

Returns

The 3D coordinates.

The origin is in the center of the board.

x/z:

-96/-96 +96/-96 +__ __ __ __ __ __ __ __+ |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| **0/0** __ __ __ |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__|

- + -96/+96 +96/+96

5.13.2.4 void ChessSet::createModelsList (bool *withoutTurnDependentModels*) [private]

Creates a OpenGL display list with all models at the positions as saved in the board state.

Parameters

withoutTurnDependentModels	If true all models are positioned in the display list without those models on the start and destination field of the current turn. If false, all models are precompiled in the OGL list.

5.13.2.5 void ChessSet::draw ( )

Draws the whole ChessSet.

This includes all models and the chess board. Depending in the current state.

5.13.2.6 void ChessSet::drawActionTileAt (Field *which*, TileStyle *style*)

Draws an action tile at a given field with a given style.

Parameters

which	The field where the tile should be drawn.
style	The action tile's style.

5.13.2.7 void ChessSet::drawModelAt (Field *field*, PieceType *type*, PlayerColor *color*) [private]

Draws a precompiled OpenGL display list model at the given field.

Parameters

field	The field where the model will be drawn.
type	The model type to draw.
color	The color of the model.

5.13.2.8 void ChessSet::drawModelAt (Coord3D *coords*, PieceType *type*, PlayerColor *color*) [private]

Draws a precompiled OpenGL display list model at the given coordinates.

Note

This is used for animation purposes only.

Parameters

coords	The 3D coordinates where the model will be drawn.
type	The model type to draw.
color	The color of the model.

5.13.2.9 void ChessSet::drawTile (Coord3D *coords*, bool *odd*, TileStyle *style*) [private]

Draws a tile at the given coordinates.

Parameters

coords	The 3D world coordinates to draw the tile at.
odd	True if odd, false if even.
style	The tile style (e.g. CURSOR).

5.13.2.10 int ChessSet::getResourcesCount ( )

Returns the number of big resources which must be loaded for initializing the ChessSet.

Note

This can be used for a progress bar.

Returns

The number of big resources.

5.13.2.11 void ChessSet::loadResources ( )

Loads all resources, builds the models and the chess board.

Note

If you've registered a function as callback, you will be informed on each resource which is loaded.

5.13.2.12 void ChessSet::registerLoadCallback (const boost::function< void(std::string)> & *callback*)

Registers a function as callback.

Parameters

callback	The function which will be called when a resource was successfully loaded.

5.13.2.13 void ChessSet::setState (std::array< Piece, 64 > *state*, PlayerColor *lastPlayer*, Turn *lastTurn*)

Sets the new chess state.

Note

You need to call this only, when there's a visible change like moving a figure from field A to field B.

Parameters

state	The state of the current board. Only the given pieces on the fields will be drawn.

5.13.3 Member Data Documentation

5.13.3.1 GLuint ChessSet::m_modelList[12] [private]

OpenGL display lists indexes to the 3D models representation for black and white color.

First 6 white, last 6 black.

5.13.3.2 GLuint ChessSet::m_modelsList [private]

OpenGL display list index to all 3D models and translation combined.

Models translated and models itself.

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

- S:/dev/3dchess/src/gui/ChessSet.h
- S:/dev/3dchess/src/gui/ChessSet.cpp

5.14 ArrowNavigationHandler::Config Struct Reference

The Configuration.

Public Attributes

- unsigned int **throttleMilliseconds**
- bool **inverseNavigation**

5.14.1 Detailed Description

The Configuration.

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

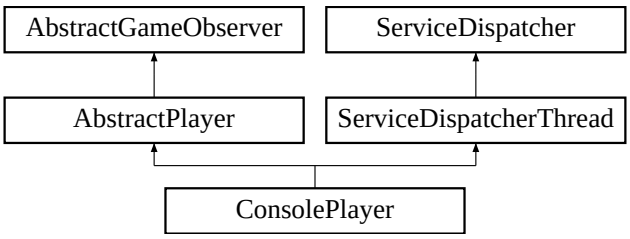
- S:/dev/3dchess/src/gui/ArrowNavigationHandler.h

5.15 ConsolePlayer Class Reference

Class which takes human player interaction from a console.

`#include <ConsolePlayer.h>`

Inheritance diagram for ConsolePlayer:



Public Member Functions

- virtual void onSetColor (PlayerColor color) override

  Notifies that player what color he will be playing.
- virtual void onGameStart (GameState state, GameConfiguration config) override

  Called when the game starts.
- virtual std::future< Turn > doMakeTurn (GameState state) override

  Asks the player to make his turn.
- virtual void onTurnEnd (PlayerColor color, Turn turn, GameState newState) override

  Called if a player ended its turn.
- virtual void doAbortTurn () override

  Asks the player to abort a turn asked for with doMakeTurn.
- virtual void onGameOver (GameState state, PlayerColor winner) override

  Called when a game started with onGameStart is over.

Private Attributes

- PlayerColor **m_color**

Additional Inherited Members

5.15.1 Detailed Description

Class which takes human player interaction from a console.

Warning

Has serious issues on turn timeout due to blocking console reads.

5.15.2 Member Function Documentation

5.15.2.1 void ConsolePlayer::doAbortTurn ( ) [override], [virtual]

Asks the player to abort a turn asked for with doMakeTurn.

When this is called the GameLogic will no longer react to the completion of the future for that turn. A use of this function is the abortion of a turn due to timeout.

Implements AbstractPlayer.

5.15.2.2 future< Turn > ConsolePlayer::doMakeTurn (GameState *state*) [override], [virtual]

Asks the player to make his turn.

Warning

This function must not block. It is to return immediatly. The players turn is to be set on the returned future.

Note

The game logic can abort its request for a player to make his turn using the doAbortTurn function at any time.

Parameters

state	Current state of the game.

Returns

A future to the turn to make.

Implements AbstractPlayer.

5.15.2.3 void ConsolePlayer::onGameOver (GameState *state*, PlayerColor *winner*) [override], [virtual]

Called when a game started with onGameStart is over.

Parameters

state	State on game over.
winner	Winner of the game.

Reimplemented from AbstractGameObserver.

5.15.2.4 void ConsolePlayer::onGameStart (GameState *state*, GameConfiguration *config*) [override], [virtual]

Called when the game starts.

Parameters

state	GameState on game start.
config	Valid GameConfiguration for this game.

Reimplemented from AbstractGameObserver.

5.15.2.5 void ConsolePlayer::onSetColor (PlayerColor *color*) [override], [virtual]

Notifies that player what color he will be playing.

Called before onGameStart.

Parameters

color	Color the player has.

Implements AbstractPlayer.

5.15.2.6 void ConsolePlayer::onTurnEnd (PlayerColor *who*, Turn *turn*, GameState *newState*) [override], [virtual]

Called if a player ended its turn.

Parameters

who	Color of the player doing the turn.
turn	Turn the player decided on.
newState	State after the player performed the turn.

Reimplemented from AbstractGameObserver.

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

- S:/dev/3dchess/src/misc/ConsolePlayer.h
- S:/dev/3dchess/src/misc/ConsolePlayer.cpp

5.16 ChessSet::Coord3D Struct Reference

Simple 3D Coord container.

Public Attributes

- float **x**
- float **y**
- float **z**

5.16.1 Detailed Description

Simple 3D Coord container.

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

- S:/dev/3dchess/src/gui/ChessSet.h

5.17 ChessSet::CorrectionValue Struct Reference

Coordination-correction container to statically adjust unproper 3D models.

Public Attributes

- int **x**
- int **y**
- int **z**
- float **scale**
- int **rotX**
- int **rotY**
- int **rotZ**

5.17.1 Detailed Description

Coordination-correction container to statically adjust unproper 3D models.

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

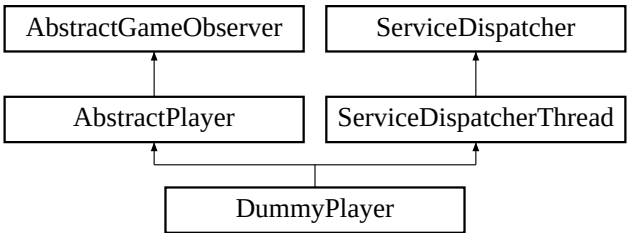
- S:/dev/3dchess/src/gui/ChessSet.h

5.18 DummyPlayer Class Reference

Player implementation which takes random turns after random amounts of time.

`#include <DummyPlayer.h>`

Inheritance diagram for DummyPlayer:



Public Member Functions

- **DummyPlayer** (int seed=1234)
- virtual void onSetColor (PlayerColor color) override

  Notifies that player what color he will be playing.
- virtual void doAbortTurn () override

  Asks the player to abort a turn asked for with doMakeTurn.
- virtual std::future< Turn > doMakeTurn (GameState state) override

  Asks the player to make his turn.

Private Attributes

- const unsigned int **m_seed**
- std::mt19937 **m_rng**
- std::uniform_int_distribution < int > **m_msDist**
- Logging::Logger **m_log**

Additional Inherited Members

5.18.1 Detailed Description

Player implementation which takes random turns after random amounts of time.

Warning

Does not react to doAbortTurn events.

5.18.2 Member Function Documentation

5.18.2.1 virtual void DummyPlayer::doAbortTurn ( ) [inline], [override], [virtual]

Asks the player to abort a turn asked for with doMakeTurn.

When this is called the GameLogic will no longer react to the completion of the future for that turn. A use of this function is the abortion of a turn due to timeout.

Implements AbstractPlayer.

5.18.2.2 virtual std::future<Turn> DummyPlayer::doMakeTurn (GameState *state*) [inline], [override], [virtual]

Asks the player to make his turn.

Warning

This function must not block. It is to return immediatly. The players turn is to be set on the returned future.

Note

The game logic can abort its request for a player to make his turn using the doAbortTurn function at any time.

Parameters

state	Current state of the game.

Returns

A future to the turn to make.

Implements AbstractPlayer.

5.18.2.3 virtual void DummyPlayer::onSetColor (PlayerColor *color*) [inline], [override], [virtual]

Notifies that player what color he will be playing.

Called before onGameStart.

Parameters

color	Color the player has.

Implements AbstractPlayer.

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

- S:/dev/3dchess/src/misc/DummyPlayer.h

5.19 StateMachine::EventMap Struct Reference

Structure for holding user events.

`#include <StateMachine.h>`

Public Attributes

- bool **mouseMoved** = false
- int **mouseX** = 0
- int **mouseY** = 0
- bool **mouseDown** = false
- bool **mouseUp** = false
- bool **keyLeft** = false
- bool **keyRight** = false
- bool **keyDown** = false
- bool **keyUp** = false
- bool **keyEscape** = false

- bool **keyReturn** = false
- bool **key0** = false
- bool **key1** = false
- bool **key2** = false
- bool **key3** = false
- bool **key4** = false
- bool **keyA** = false
- bool **keyY** = false
- bool **keyR** = false

5.19.1 Detailed Description

Structure for holding user events.

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

- S:/dev/3dchess/src/gui/StateMachine.h

5.20 freetype::font_data Struct Reference

This holds all of the information related to any freetype font that we want to create.

`#include <FreeType.h>`

Public Member Functions

- void **init** (const char *fname, unsigned int h)
- void **clean** ()

Public Attributes

- float h

  Holds the height of the font.
- GLuint * textures

  Holds the texture id's.
- GLuint list_base

  Holds the first display list id.

5.20.1 Detailed Description

This holds all of the information related to any freetype font that we want to create.

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

- S:/dev/3dchess/src/gui/FreeType.h
- S:/dev/3dchess/src/gui/FreeType.cpp

5.21 GuiWindow::fontObject Struct Reference

Describes a whole font object through color, size, position, font type and text.

Public Attributes

- int **x**
- int **y**
- float **red**
- float **green**
- float **blue**
- int **fontSize**
- freetype::font_data **font**
- std::string **text**

5.21.1 Detailed Description

Describes a whole font object through color, size, position, font type and text.

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

- S:/dev/3dchess/src/gui/GuiWindow.h

5.22 GameConfiguration Class Reference

Class for holding game configuration parameters.

`#include <GameConfiguration.h>`

Public Member Functions

- bool save (const std::string &path) const

  Saves this configuration to the given path.
- bool **operator==** (const GameConfiguration &other) const
- std::string **toString** () const

Static Public Member Functions

- static boost::optional < GameConfiguration > load (const std::string &path)

  Loads a game configuration from disk.
- static bool save (const GameConfiguration &config, const std::string &path)

  Saves a given game configuration to a file.

Public Attributes

- int timeBetweenTurnsInSeconds

  Minimum time between turns for display purposes.
- int maximumTurnTimeInSeconds

  Maximum time between turns after which to time out a move.
- std::string initialGameStateFEN

  Initial game state as FEN string.
- int aiSelected

  Selected ai configuration (must match entry in ai)
- std::vector< AIConfiguration > ai

  List of ai configurations ordered by difficulty (simplest first)

Private Member Functions

- template<class Archive >
  void **serialize** (Archive &ar, const unsigned int version)

Friends

- class **boost::serialization::access**

5.22.1 Detailed Description

Class for holding game configuration parameters.

Note

Can be stored and read from disc using save/load.

5.22.2 Member Function Documentation

5.22.2.1 static boost::optional<GameConfiguration> GameConfiguration::load (const std::string & *path*) [static]

Loads a game configuration from disk.

Parameters

path	Path to file.

Returns

GameConfiguration on success. boost::none on failure.

5.22.2.2 static bool GameConfiguration::save (const GameConfiguration & *config*, const std::string & *path*) [static]

Saves a given game configuration to a file.

Parameters

config	Configuration to save.
path	Path to save configuration to.

Returns

True on success.

5.22.2.3 bool GameConfiguration::save (const std::string & *path*) const

Saves this configuration to the given path.

Parameters

path	Path to file to save to.

Returns

True on success.

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

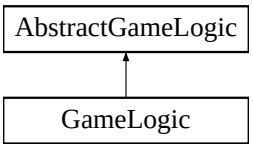
- S:/dev/3dchess/src/core/GameConfiguration.h
- S:/dev/3dchess/src/core/GameConfiguration.cpp

5.23 GameLogic Class Reference

GameLogic implementation for a game of chess with observers.

`#include <GameLogic.h>`

Inheritance diagram for GameLogic:



Public Member Functions

- GameLogic (AbstractPlayerPtr white, AbstractPlayerPtr black, GameConfigurationPtr config, GameState initialGameState=GameState())

  Sets up a GameLogic object for one chess game.
- virtual AbstractPlayerPtr **getWhitePlayer** () const override
- virtual AbstractPlayerPtr **getBlackPlayer** () const override
- virtual void addObserver (AbstractGameObserverPtr observer) override

  Registers an observer for game events.
- virtual bool isGameOver () const override
- virtual PlayerColor getWinner () const override
- virtual GameConfigurationPtr getConfiguration () const override
- virtual void stop () override

  Initiates a shutdown of the game logic.

Private Member Functions

- virtual void run () override

  Executes a blocking game loop implementation.
- template<typename Future >
  bool wait_for (Future &&fut, std::chrono::milliseconds waitInMs)

  Helper function for performing an interruptable wait on a future.
- void wait (std::chrono::milliseconds waitInMs) const

  Helper function for performing an interruptable wait.
- template<typename Function >
  void notify (Function &&f)

  Function to call a given function on all attached observers.
- AbstractPlayerPtr & getCurrentPlayer ()

Private Attributes

- std::chrono::milliseconds m_tickLength

  Interval in which the GameLogic should check for aborts (.
- bool m_abort

  If true the running game is aborted.
- std::vector
  < AbstractGameObserverPtr > m_observers

  List of observers for the game to be notified of game events (contains players)
- AbstractPlayerPtr **m_white**
- AbstractPlayerPtr **m_black**
- GameState **m_gameState**
- GameConfigurationPtr **m_config**
- Logging::Logger **m_log**

Additional Inherited Members

5.23.1 Detailed Description

GameLogic implementation for a game of chess with observers.

5.23.2 Constructor & Destructor Documentation

5.23.2.1 GameLogic::GameLogic (AbstractPlayerPtr *white*, AbstractPlayerPtr *black*, GameConfigurationPtr *config*, GameState *initialGameState* = GameState ())

Sets up a GameLogic object for one chess game.

Note

Don't forget to start operation by calling start.

Parameters

white	White player reference
black	Black player reference
config	Configuration for this game
initialGameState	Initial state when starting the game

5.23.3 Member Function Documentation

5.23.3.1 void GameLogic::addObserver (AbstractGameObserverPtr *observer*) [override], [virtual]

Registers an observer for game events.

See Also

AbstractGameObserver for the available events.

Parameters

observer	Observer to register.

Implements AbstractGameLogic.

5.23.3.2 GameConfigurationPtr GameLogic::getConfiguration ( ) const [override], [virtual]

Returns

GameConfiguration currently used.

Implements AbstractGameLogic.

5.23.3.3 AbstractPlayerPtr & GameLogic::getCurrentPlayer ( ) [private]

Returns

Returns a reference to the next player to make his turn.

5.23.3.4 PlayerColor GameLogic::getWinner ( ) const [override], [virtual]

Returns

If isGameOver returns the winner of the game.

Implements AbstractGameLogic.

5.23.3.5 bool GameLogic::isGameOver ( ) const [override], [virtual]

Returns

true if game has ended.

Implements AbstractGameLogic.

5.23.3.6 template<typename Function > void GameLogic::notify (Function && *f*) [inline], [private]

Function to call a given function on all attached observers.

Basically a observers.map(function).

Usage: notify([&](AbstractGameObserverPtr& obs) { // This is your function which is handed obs obs->someObserverFunction(parameters); });

Parameters

f	Function which takes an AbstractGameObserverPtr as an argument.

5.23.3.7 void GameLogic::run ( ) [override], [private], [virtual]

Executes a blocking game loop implementation.

Repeatedly asks the white and black player to take turns until one wins the game or another game terminating event occurs. Notifies registered observer of game state changes and handles timeout events.

Implements AbstractGameLogic.

5.23.3.8 void GameLogic::wait (std::chrono::milliseconds *waitInMs*) const [private]

Helper function for performing an interruptable wait.

Splits up a blocking wait into m_tickLength long waits with checks for the m_abort condition.

Parameters

waitInMs	Time to wait.

5.23.3.9 template<typename Future > bool GameLogic::wait_for (Future && *fut,* std::chrono::milliseconds *waitInMs*) [inline], [private]

Helper function for performing an interruptable wait on a future.

Splits up a usually uninterruptable wait on a future into m_tickLength long waits with checks for the m_abort condition.

See Also

std::future<>::wait_for

Parameters

fut	Future to wait on
waitInMs	Maximum waiting time

5.23.4 Member Data Documentation

5.23.4.1 std::chrono::milliseconds GameLogic::m_tickLength [private]

Interval in which the GameLogic should check for aborts (.

See Also

m_abort)

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

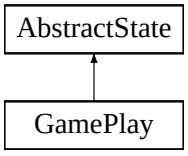
- S:/dev/3dchess/src/logic/GameLogic.h
- S:/dev/3dchess/src/logic/GameLogic.cpp

5.24 GamePlay Class Reference

Class which holds the state GamePlay.

`#include <GamePlay.h>`

Inheritance diagram for GamePlay:



Classes

- struct CapturedPieces

  Struct that contains all captured pieces for the black and white player as also the OpenGL display lists for the black/white bars.
- struct KeyboardCounter

  To stop triggering keys too often, this counter helps to delay each key stroke.
- struct MessageBox

  Struct that represents the message box on the top.
- struct PlayerTurn

  Struct which represents a players turn.

Public Types

- enum GameMode { **AI_VS_AI**, **PLAYER_VS_AI** }

  The possible game modes to chose.

Public Member Functions

- GamePlay (GameMode mode, PlayerColor humanPlayerColor, std::string initialFen="")

  Creates a new game.
- void enter () override

  Enters the state for the first time.
- AbstractState * run () override

  Runs the current state and does all the work.
- void exit () override

  Exits the current state and cleans up all allocated resources.
- void draw ()

  Draws all relevant and state related stuff on the screen.
- void startShowText (std::string text)

  Call this function to draw text on the right bottom side of the viewport.
- void switchToPlayerColor (PlayerColor color)

  When the other player is on turn, this method switched the camera position and shows a small text message which player is on turn.
- void setState (std::array< Piece, 64 > state, PlayerColor lastPlayer, Turn lastTurn)

  Method for setting the new chess state.
- void setState (std::array< Piece, 64 > state)

  Method for setting the new chess state.
- void setGameState (const GameState &gameState)

  Sets the game state to the given one.
- void onPlayerIsOnTurn (PlayerColor who)

  This method changed the internal state to interact with a human player if the game mode is PLAYER_VS_AI.
- void onPlayerAbortTurn ()

  If the human player aborts his current turn, this method switches to the AI player.
- std::future< Turn > doMakePlayerTurn ()

  Tells the human to make a turn.

Private Types

- enum States { **KEEP_CURRENT**, **BACK_TO_MENU** }

  The main states for the StateMachine.
- enum InternalState { **AI_ON_TURN**, **PLAYER_ON_TURN**, **PAUSE**, **SAVE_GAME** }

  Internal state in the GamePlay class.
- enum PlayerState { **NONE**, **CHOOSE_PROMOTION_TURN** }

  Internal player state (only available if the game mode is PLAYER_VS_AI).

Private Member Functions

- string getPieceName (int pieceNumber)

  The functions returns the name of the piece/model for the given number.
- void initLighting ()

  Initializes the OpenGL lightning for the scene.
- void initChessSet ()

  Initializes the whole chess set (all models and chess board).
- void initAnimationHelpers ()

  Initializes all the animation helpers.
- void initMenuPause ()

  Initializes the main pause menu with all the buttons.
- void initMenuSaveGame ()

  Initializes the save pause menu with all the buttons.
- void initPlayers ()

  Initializes the players depending on the game mode.
- void initGameLogic ()

  Initializes the game logic depending on the human player color and given FEN game state.
- void initMessageBox ()

  Initializes the message box to show text to the human player.
- void initCamera ()

  Initializes the camera rotation and initial position.
- void initCapturedPieces ()

  Initializes the widget for the captures pieces to show on the HUD for the human player.
- void initPieceCounters (GameState &initialGameState)

  Initializes the counters for the stricken models.
- void fadeBackgroundForOneTime ()

  Faded the background for exactly one time, when the game starts.
- void resetCapturedPieces ()

  Sets the number of captured pieces to zero for each color.
- void rotateCamera ()

  Rotates the camera with an animation helper if necessary and only if the animation time is not over.
- void setCameraPosition (float degree)

  Calculates the new camera coordinates from a given degree between 0-360 deg and positions the camera in the world space with respect to the animated rotation around the Y-axis.
- void draw2D ()

  Does all the 2D drawing action like menu, widgets and text rendering.
- void draw3D ()

  Does all the 3D drawing action like chess board, models and so on.
- void drawMessageBox ()

  Draws the message box at the initialized position and the set text.
- void drawLastTurns ()

Draws the last fice turns on the left bottom side of the viewport.

- void drawInfoBox (string msg)

  Draws the info string on the right bottom side of the viewport to show some extra information.
- void drawCapturedPieces ()

  Draws all the captured pieces statistic for the black and white player on the left top and right top side of the viewport.
- void drawPauseMenu ()

  Draws the pause menu.
- void drawPlayerActions ()

  Draws the human-interaction things like colorized tiles when a model is selected or the cursor-highlight-tile to choose a model.
- void enableLighting ()

  Enables lighting.
- void disableLighting ()

  Disables lighting.
- void handleEvents ()

  Handles all the human player keyboard and mouse events.
- void startCameraRotation ()

  Starts the camera rotation and updates the start and end position of the camera.
- void onPauseGame ()

  If the internal game state changed to PAUSE, this method is called.
- void onResumeGame ()

  If the internal game state was PAUSE and is now AI_ON_TURN or PLAYER_ON_TURN.
- void onSaveGame ()

  If the player wants to save the game, the internal game state changes to SAVE_GAME.
- void onSaveSlot1 ()

  This must be called when saving the current game to game slot 1.
- void onSaveSlot2 ()

  This must be called when saving the current game to game slot 2.
- void onSaveSlot3 ()

  This must be called when saving the current game to game slot 3.
- void saveGameToSlot (unsigned int slot)

  Saves the game at a given slot.
- void onMenuSaveBack ()

  Changes the internal state to PAUSE.
- void onLeaveGame ()

  Calls the players to abort the current turn and leaves the game.

Private Attributes

- StateMachine & m_fsm

  The state machine to access window functions.
- int m_rotateFrom

  Number in degree (0-360 deg) to rotate from/to.
- int **m_rotateTo**
- GameMode m_gameMode

  The game mode, one of: PLAYER_VS_AI or AI_VS_AI.
- PlayerColor m_humanPlayerColor

  The color of the human player.
- bool m_lockCamera

  Flag to lock the camera rotation on each turn change.
- ArrowNavigationHandlerPtr m_arrowNavHandler

Smart pointer to the keyboard navigation handler to manage human field navigation.

- ResourceInitializerPtr m_resourceInitializer

  Smart pointer to the resource initializer.
- std::vector< Turn > m_possibleTurns

  All possible turns to take for a selected figure/model.
- std::promise< Turn > m_promisedPlayerTurn

  Holds the promise during fulfillment.
- struct GamePlay::KeyboardCounter **m_kCounter**
- std::array< Piece, 64 > m_chessBoardState

  Holds the 64 field chess board state with models, types, colors, ...
- GameState m_gameState

  Holds the whole game state.
- struct GamePlay::CapturedPieces **m_capturedPieces**
- enum GamePlay::States **m_nextState**
- enum GamePlay::InternalState **m_internalState**
- enum GamePlay::InternalState **m_lastInternalState**
- enum GamePlay::PlayerState **m_playerState**
- Turn m_promotionTurns [4]

  Holds the possible promotion turns for the human player.
- std::deque< PlayerTurn > m_playerTurns

  Holds all the human player made turns.
- PlayerColor m_lastPlayer

  The last player who was on turn.
- Turn m_lastTurn

  The last turn which was made.
- bool m_firstTurn

  Flag, if the first turn was made. For camera rotation.
- AnimationHelperPtr m_animationHelperCamera

  Animation helpers to handle (time dependent) animations.
- AnimationHelperPtr **m_animationHelperBackground**
- ChessSetPtr m_chessSet

  Smart pointer to the chess set.
- Menu2DPtr m_pauseMenuMain

  Smart pointer to pause and save menu.
- Menu2DPtr **m_pauseMenuSave**
- struct GamePlay::MessageBox **m_messageBox**
- GLfloat m_lightPos0 [3]

  The first light position.
- GLfloat m_lightPos1 [3]

  The second light position.
- AbstractPlayerPtr m_firstPlayer

  Smart pointer for the player.
- AbstractPlayerPtr **m_secondPlayer**
- AbstractGameLogicPtr m_gameLogic

  Smart pointer for the game logic.
- GuiObserverPtr m_observer

  Smart pointer for the observer.
- ObserverDispatcherProxyPtr m_observerProxy

  Smart pointer for the observer proxy.
- PlayerDispatcherProxyPtr m_playerProxy

  Smart pointer for the player proxy.

- std::string m_initialFen

  The initial FEN notation string to load the game state from.
- Logging::Logger m_log

  boost::log Logger for universal info, debug and error logging.

5.24.1 Detailed Description

Class which holds the state GamePlay.

This state is the essential part of all states. The whole game play is hold in this state.

Note

To run() a state, first enter() the state.

5.24.2 Constructor & Destructor Documentation

5.24.2.1 GamePlay::GamePlay (GameMode *mode,* PlayerColor *humanPlayerColor,* std::string *initialFen* = " ")

Creates a new game.

Parameters

mode	The GameMode (*AI vs. AI* or *Player vs. AI*).
firstPlayerColor	The color of the player which takes the first turn.
initialFen	If set overrides the configured initial FEN

5.24.3 Member Function Documentation

5.24.3.1 std::future< Turn > GamePlay::doMakePlayerTurn ( )

Tells the human to make a turn.

Returns

The Turn as a future.

5.24.3.2 void GamePlay::enter ( ) [override], [virtual]

Enters the state for the first time.

This will setup all the state related stuff.

Note

To run() the current state, first enter() it.

Implements AbstractState.

5.24.3.3 void GamePlay::exit ( ) [override], [virtual]

Exits the current state and cleans up all allocated resources.

Note

This is the last method to call, before the object is deleted.

Implements AbstractState.

5.24.3.4 string GamePlay::getPieceName (int *pieceNumber*) [private]

The functions returns the name of the piece/model for the given number.

Parameters

pieceNumber	A number between 0 and 6 corresponding to the PieceType.

Returns

The name of the piece.

5.24.3.5 void GamePlay::initPieceCounters (GameState & *initialGameState*) [private]

Initializes the counters for the stricken models.

Parameters

initialGameState	The initial game state to init the game from.

5.24.3.6 void GamePlay::onPlayerAbortTurn ( )

If the human player aborts his current turn, this method switches to the AI player.

Note

This method currently only works for PLAYER_VS_AI. If there are in the future other game modes, this must be corrected.

5.24.3.7 void GamePlay::onPlayerIsOnTurn (PlayerColor *who*)

This method changed the internal state to interact with a human player if the game mode is PLAYER_VS_AI.

Parameters

who	The color of the player who's on turn.

Note

This method should be called on each turn start. Otherwise the GUI can't react to keyboard input for a human player.

5.24.3.8 AbstractState * GamePlay::run ( ) [override], [virtual]

Runs the current state and does all the work.

Returns

AbstractState* the state which should be run after this state. A nullptr if the game should be exited.

Implements AbstractState.

5.24.3.9 void GamePlay::saveGameToSlot (unsigned int *slot*) [private]

Saves the game at a given slot.

Parameters

slot	The slot number between 0-2.

5.24.3.10 void GamePlay::setCameraPosition (float *degree*) [private]

Calculates the new camera coordinates from a given degree between 0-360 deg and positions the camera in the world space with respect to the animated rotation around the Y-axis.

Parameters

degree	The angle in degree between 0 - 360.

5.24.3.11 void GamePlay::setGameState (const GameState & *gameState*)

Sets the game state to the given one.

Parameters

gameState	The new gameState to set.

5.24.3.12 void GamePlay::setState (std::array< Piece, 64 > *state,* PlayerColor *lastPlayer,* Turn *lastTurn*)

Method for setting the new chess state.

This method is non-blocking.

Parameters

state	The current chess board state to set.
lastPlayer	The player which was last on turn.
lastTurn	The last turn which was made.

5.24.3.13 void GamePlay::setState (std::array< Piece, 64 > *state*)

Method for setting the new chess state.

This method is non-blocking.

Parameters

state	The current chess board state to set.

Note

This should only be called one time, when the game starts.

5.24.3.14 void GamePlay::startShowText (std::string *text*)

Call this function to draw text on the right bottom side of the viewport.

Parameters

text	The string to show.

5.24.3.15 void GamePlay::switchToPlayerColor (PlayerColor *color*)

When the other player is on turn, this method switched the camera position and shows a small text message which player is on turn.

Parameters

color	The PlayerColor of the current player, which is on turn.

Note

This should always be called to show a message to the user.

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

- S:/dev/3dchess/src/gui/states/GamePlay.h
- S:/dev/3dchess/src/gui/states/GamePlay.cpp

5.25 GameState Class Reference

Facade class for the game logic, holds the chessboard and the turn generator.

`#include <GameState.h>`

Public Member Functions

- **GameState** (const ChessBoard &chessBoard)
- std::vector< Turn > getTurnList () const

  Returns a list with all possible and legal turns.
- void applyTurn (const Turn &turn)

  Applies the given turn on current chessboard.
- PlayerColor getNextPlayer () const

  Return next player to make a turn.
- const ChessBoard & getChessBoard () const

  Provides access to the chessboard.
- Piece getLastCapturedPiece () const

  Returns the captured piece from the last turn or Piece(NoPlayer, NoType) if no piece was captured.
- bool isGameOver () const

  Returns true if the game is over.
- PlayerColor getWinner () const

  Returns the winner of the game.
- bool isDrawDueTo50MovesRule () const

  Returns true if the game is draw due to the 50 moves rule.
- Score getScore (size_t depth=0) const

  Returns current score estimate from next players POV.
- Hash getHash () const

  Returns hash for current position.
- std::string toFEN () const

  Converts the current game state into FEN notation.
- bool **operator==** (const GameState &other) const
- bool **operator!=** (const GameState &other) const
- std::string **toString** () const

Static Public Member Functions

- static GameState fromFEN (const std::string &fen)

  Create a GameState from a Forsyth-Edwards Notation string.

Private Member Functions

- void init ()

  Initialize the turn generator with the given chessboard.

Private Attributes

- ChessBoard m_chessBoard

  Chessboard representation and logic.
- TurnGenerator m_turnGen

  Turn generator and gameover detection.

5.25.1 Detailed Description

Facade class for the game logic, holds the chessboard and the turn generator.

It's mainly purpose is to provide access to functions relevant for the game.

5.25.2 Member Function Documentation

5.25.2.1 GameState GameState::fromFEN (const std::string & *fen*) [static]

Create a GameState from a Forsyth-Edwards Notation string.

http://en.wikipedia.org/wiki/Forsyth%E2%80%93Edwards_Notation

Warning

This function does no validation. Do not pass invalid FEN.

Parameters

fen	FEN String.

5.25.2.2 PlayerColor GameState::getWinner ( ) const

Returns the winner of the game.

Returns Player color or NoPlayer on draw.

5.25.2.3 std::string GameState::toFEN ( ) const

Converts the current game state into FEN notation.

Returns

State in FEN notation.

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

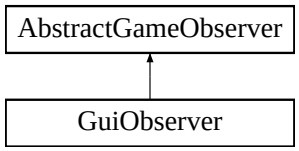
- S:/dev/3dchess/src/logic/GameState.h
- S:/dev/3dchess/src/logic/GameState.cpp

5.26 GuiObserver Class Reference

Allows to observe relevant GameEvents inside the GameLogic.

`#include <GuiObserver.h>`

Inheritance diagram for GuiObserver:



Public Member Functions

- GuiObserver (ChessSetPtr chessSetPtr, GamePlay &gamePlayState)

  Creates a new observer object.
- void onGameStart (GameState state, GameConfiguration config) override

  Called when the game starts.
- void onTurnStart (PlayerColor who) override

  Called if a player is asked to perform a turn.
- void onTurnEnd (PlayerColor who, Turn turn, GameState newState) override

  Called if a player ended its turn.
- void onTurnTimeout (PlayerColor who, std::chrono::seconds timeout) override

  Called if a players turn is aborted due to timeout.
- void onGameOver (GameState state, PlayerColor winner) override

  Called when a game started with onGameStart is over.

Private Attributes

- ChessSetPtr m_chessSetPtr

  Shared pointer to the ChessSet.
- GamePlay & m_gamePlayState

  Shared pointer to the GamePlay state.

5.26.1 Detailed Description

Allows to observe relevant GameEvents inside the GameLogic.

Classes of this type can be registered with the GameLogic to be notified of relevant game events.

Note

A Observer is only required to stay in a valid state for one game. It is free to halt its operations after the end of the game.

Warning

None of the functions in the class must block.

5.26.2 Constructor & Destructor Documentation

5.26.2.1 GuiObserver::GuiObserver (ChessSetPtr *chessSetPtr,* GamePlay & *gamePlayState*)

Creates a new observer object.

Parameters

chessSetPtr	A shared pointer to the ChessSet object.
gamePlayState	A reference to the GamePlay state.

5.26.3 Member Function Documentation

5.26.3.1 void GuiObserver::onGameOver (GameState *state,* PlayerColor *winner*) [override], [virtual]

Called when a game started with onGameStart is over.

Parameters

state	State on game over.
winner	Winner of the game.

Reimplemented from AbstractGameObserver.

5.26.3.2 void GuiObserver::onGameStart (GameState *state,* GameConfiguration *config*) [override], [virtual]

Called when the game starts.

Parameters

state	GameState on game start.
config	Valid GameConfiguration for this game.

Reimplemented from AbstractGameObserver.

5.26.3.3 void GuiObserver::onTurnEnd (PlayerColor *who,* Turn *turn,* GameState *newState*) [override], [virtual]

Called if a player ended its turn.

Parameters

who	Color of the player doing the turn.
turn	Turn the player decided on.

newState	State after the player performed the turn.

Reimplemented from AbstractGameObserver.

5.26.3.4 void GuiObserver::onTurnStart (PlayerColor *who*) [override], [virtual]

Called if a player is asked to perform a turn.

Parameters

who	Color of the player doing the turn.

Reimplemented from AbstractGameObserver.

5.26.3.5 void GuiObserver::onTurnTimeout (PlayerColor *who*, std::chrono::seconds *timeout*) [override], [virtual]

Called if a players turn is aborted due to timeout.

Parameters

who	Color of the player who got interrupted.
timeout	Length of the time limit that got violated.

Reimplemented from AbstractGameObserver.

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

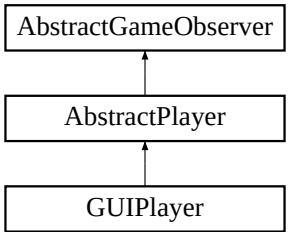
- S:/dev/3dchess/src/gui/GuiObserver.h
- S:/dev/3dchess/src/gui/GuiObserver.cpp

5.27 GUIPlayer Class Reference

Player implementation for a real/human user.

`#include <GUIPlayer.h>`

Inheritance diagram for GUIPlayer:



Public Member Functions

- GUIPlayer (GamePlay &gp)

  Creates a new human player.
- virtual void onSetColor (PlayerColor color) override

  Notifies that player what color he will be playing.
- virtual std::future< Turn > doMakeTurn (GameState state) override

  Asks the player to make his turn.
- virtual void doAbortTurn () override

  Asks the player to abort a turn asked for with doMakeTurn.

Private Attributes

- Logging::Logger m_log

  The boost::Logger.
- GamePlay & m_gameplay

  Reference to the GamePlay state.

5.27.1 Detailed Description

Player implementation for a real/human user.

5.27.2 Constructor & Destructor Documentation

5.27.2.1 GUIPlayer::GUIPlayer (GamePlay & *gp*) [inline]

Creates a new human player.

Parameters

gp	The reference to the GamePlay state.

5.27.3 Member Function Documentation

5.27.3.1 virtual void GUIPlayer::doAbortTurn ( ) [inline], [override], [virtual]

Asks the player to abort a turn asked for with doMakeTurn.

When this is called the GameLogic will no longer react to the completion of the future for that turn. A use of this function is the abortion of a turn due to timeout.

Implements AbstractPlayer.

5.27.3.2 virtual std::future<Turn> GUIPlayer::doMakeTurn (GameState *state*) [inline], [override], [virtual]

Asks the player to make his turn.

Warning

This function must not block. It is to return immediatly. The players turn is to be set on the returned future.

Note

The game logic can abort its request for a player to make his turn using the doAbortTurn function at any time.

Parameters

state	Current state of the game.

Returns

A future to the turn to make.

Implements AbstractPlayer.

5.27.3.3 virtual void GUIPlayer::onSetColor (PlayerColor *color*) [inline],[override],[virtual]

Notifies that player what color he will be playing.

Called before onGameStart.

Parameters

color	Color the player has.

Implements AbstractPlayer.

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

- S:/dev/3dchess/src/gui/GUIPlayer.h

5.28 GuiWindow Class Reference

This class is a wrapper which holds the window with the OpenGL context.

`#include <GuiWindow.h>`

Classes

- struct fontObject

  Describes a whole font object through color, size, position, font type and text.

Public Types

- enum WindowMode { **FULLSCREEN**, **WINDOW** }

  Available window modes.
- enum fontSize { **HEADLINE** = 42, **SUB_HEADLINE** = 28, **TEXT** = 20, **TEXT_SMALL** = 15 }

  The available font sizes.

Public Member Functions

- GuiWindow (std::string title, bool fullscreen, int width, int height)

  Creates a new GUI window.
- void exec ()

  Inits the window and starts the execution loop.
- int getWidth ()

  Gets the width of the window.
- int getHeight ()

  Gets the height of the window.
- int getCameraDistanceToOrigin ()

  Gets the distance between the camera and the world coordinate origin.
- bool isFullscreen ()

  Checks if the window is currently in fullscreen mode.
- void set2DMode ()

  Set the model view matrix to draw 2D.
- void set3DMode ()

  Set the model view matrix to draw 3D.
- void swapFrameBufferNow ()

  The frame buffer will normally swapped at the end of the execution loop.
- void switchWindowMode (WindowMode mode)

  Switches the window mode to one of the available modes.
- void printHeadline (std::string text)

  Prints the headline text at the top left location.

- void printSubHeadline (std::string text)

  Prints the subheadline text at the top left location directly under the headline.
- void printTextCenter (float red, float green, float blue, std::string text)

  Prints text at the center of the window's viewport.
- void printText (int x, int y, float red, float green, float blue, std::string text)

  Prints text at the given position of the window's viewport with normal text size.
- void printTextSmall (int x, int y, float red, float green, float blue, std::string text)

  Prints text at the given position of the window's viewport with small text size.

Public Attributes

- float m_cX

  Camera position in world coordinates.
- float **m_cY**
- float **m_cZ**
- float m_cameraAngleX

  Camera angle in degree.
- float **m_cameraAngleY**
- float **m_cameraAngleZ**
- float m_fov

  field of view (is the extent of the observable world that is seen at any given moment)

Private Member Functions

- void handleEvents ()

  Handles mouse and keyboard events by using the SDL library.
- void init ()

  Inits the window by using the SDL, creates the OpenGL context and call loadFonts() to load all the needed fonts.
- void loadFonts ()

  Loads all the fonts.
- void terminate ()

  Destroys the OpenGL context and closes the window.
- void exit ()

  Sets a flag to close the window.
- void makeFrustum (double fovY, double aspectRatio, double front, double back)

  Calculates the frustum by providing the field of view (FOV), an aspect ratio and a front and back clipping plane.
- void drawText (fontObject fo)

  Draws the given font object.

Private Attributes

- SDL_Window * window

  The pointer to the SDL window.
- SDL_Event evt

  SDL events.
- SDL_GLContext ogl

  SDL OpenGL context.
- int m_oldMouseX

  The old mouse coordinates.
- int **m_oldMouseY**

- bool m_quit = false

  Flag that indicates whether the execution loop should end.
- std::string m_title

  The window title.
- bool m_fullscreen

  Flag, if the window is in fullscreen mode.
- int m_width

  The width of the window.
- int m_height

  The height of the window.
- int m_widthOld

  Old window dimensions (needed when switching window modes).
- int **m_heightOld**
- int m_depthBits

  Bitdepth.
- int m_antiAlias

  Anti-Alis factor.
- bool m_reloadState

  Flag that indicates of the window mode changed, so that all textures must be initialized again.
- float m_zNear

  Near and far clipping plane.
- float **m_zFar**
- StateMachine & m_fsm

  The state machine.
- freetype::font_data fontHeadline

  The different fonts with different sizes.
- freetype::font_data **fontSubHeadline**
- freetype::font_data **fontText**
- freetype::font_data **fontTextSmall**

5.28.1 Detailed Description

This class is a wrapper which holds the window with the OpenGL context.

The GuiWindow will handle keyboard and mouse events and provides methods to switch OpenGL matrix modes and camera position. The window can also toggle between fullscreen and window mode.

5.28.2 Constructor & Destructor Documentation

5.28.2.1 GuiWindow::GuiWindow (std::string *title*, bool *fullscreen*, int *width*, int *height*)

Creates a new GUI window.

Parameters

title	The title/name of the window which is shown in the top window location.
fullscreen	True to start in fullscreen, false to start in window mode.
width	The width of the window.
height	The height of the window.

5.28.3 Member Function Documentation

5.28.3.1 void GuiWindow::drawText (fontObject *fo*) [private]

Draws the given font object.

Parameters

fo	The configured font object.

5.28.3.2 void GuiWindow::exit ( ) [private]

Sets a flag to close the window.

This is a soft quit and will let the execution loop execute the last round softly.

5.28.3.3 int GuiWindow::getCameraDistanceToOrigin ( )

Gets the distance between the camera and the world coordinate origin.

Returns

The distance between camera and world origin.

5.28.3.4 int GuiWindow::getHeight ( )

Gets the height of the window.

Returns

The height of the window.

5.28.3.5 int GuiWindow::getWidth ( )

Gets the width of the window.

Returns

The width of the window.

5.28.3.6 bool GuiWindow::isFullscreen ( )

Checks if the window is currently in fullscreen mode.

Returns

True if the window is in fullscreen mode, false if not.

5.28.3.7 void GuiWindow::loadFonts ( ) [private]

Loads all the fonts.

Note

This method is called by init().

5.28.3.8 void GuiWindow::makeFrustum (double *fovY,* double *aspectRatio,* double *front,* double *back*) [private]

Calculates the frustum by providing the field of view (FOV), an aspect ratio and a front and back clipping plane.

Parameters

fovY	The field of view in degree.
aspectRatio	The ratio between width and height (width/height)
front	The position of the front clipping plane.
back	The position of the back clipping plane.

5.28.3.9 void GuiWindow::printHeadline (std::string *text*)

Prints the headline text at the top left location.

Parameters

text	The text to draw.

5.28.3.10 void GuiWindow::printSubHeadline (std::string *text*)

Prints the subheadline text at the top left location directly under the headline.

Parameters

text	The text to draw.

5.28.3.11 void GuiWindow::printText (int *x,* int *y,* float *red,* float *green,* float *blue,* std::string *text*)

Prints text at the given position of the window's viewport with normal text size.

Parameters

x	The x location in the viewport.
y	The y location in the viewport.
red	The red amount of color between 0.0 and 1.0
green	The green amount of color between 0.0 and 1.0
blue	The blue amount of color between 0.0 and 1.0
text	The text to draw.

Note

The origin of the viewport is the upper left corner.

5.28.3.12 void GuiWindow::printTextCenter (float *red,* float *green,* float *blue,* std::string *text*)

Prints text at the center of the window's viewport.

Parameters

red	The red amount of color between 0.0 and 1.0
green	The green amount of color between 0.0 and 1.0
blue	The blue amount of color between 0.0 and 1.0
text	The text to draw.

5.28.3.13 void GuiWindow::printTextSmall (int *x,* int *y,* float *red,* float *green,* float *blue,* std::string *text*)

Prints text at the given position of the window's viewport with small text size.

Parameters

x	The x location in the viewport.
y	The y location in the viewport.
red	The red amount of color between 0.0 and 1.0
green	The green amount of color between 0.0 and 1.0
blue	The blue amount of color between 0.0 and 1.0
text	The text to draw.

Note

The origin of the viewport is the upper left corner.

5.28.3.14 void GuiWindow::swapFrameBufferNow ( )

The frame buffer will normally swapped at the end of the execution loop.

If you want to swap it earlier, use this method to force a frame buffer swap immediately.

5.28.3.15 void GuiWindow::switchWindowMode (WindowMode *mode*)

Switches the window mode to one of the available modes.

Parameters

mode	A window mode, see above.

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

- S:/dev/3dchess/src/gui/GuiWindow.h
- S:/dev/3dchess/src/gui/GuiWindow.cpp

5.29 has_toString< T > Struct Template Reference

Public Types

- enum { **value** = std::is_same<decltype(test<T>(0)), yes>::value }

Private Types

- typedef std::true_type **yes**
- typedef std::false_type **no**

Static Private Member Functions

- template<typename U >
  static auto **test** (int) -> decltype((void)(std::declval< U >().toString()==""), yes())
- template<typename >
  static no **test** (...)

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

- S:/dev/3dchess/src/misc/helper.h

5.30 IncrementalZobristHasher::HashConstants Class Reference

Public Member Functions

- Hash forPieceSquare (PieceType pieceType, Field field, PlayerColor playerColor) const

  Typesafe accessor for constants.
- Hash **forCastlingRightsShort** (PlayerColor player) const
- Hash **forCastlingRightsLong** (PlayerColor player) const
- Hash **forEnPassantRights** (File file) const
- Hash **forSideToMove** (PlayerColor player) const

Private Attributes

- std::array< std::array
  < std::array< Hash, NUM_FIELDS >
  , NUM_PLAYERS >
  , NUM_PIECETYPES > **pieceSquares**
- Hash **sideToMove**
- std::array< Hash, NUM_PLAYERS > **castlingRightsShort**
- std::array< Hash, NUM_PLAYERS > **castlingRightsLong**
- std::array< Hash, NUM_FILES > **enPassantRights**

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

- S:/dev/3dchess/src/logic/IncrementalZobristHasher.h
- S:/dev/3dchess/src/logic/IncrementalZobristHasher.cpp

5.31 IncrementalMaterialAndPSTEvaluator Class Reference

Class for incrementally estimating game state using PST and Material.

`#include <IncrementalMaterialAndPSTEvaluator.h>`

Public Member Functions

- IncrementalMaterialAndPSTEvaluator ()

  Initializes the evaluator for a prestine board.
- IncrementalMaterialAndPSTEvaluator (const std::array< Piece, 64 > &board)

  Initializes the evaluator for an already played board.
- void moveIncrement (const Turn &turn)

  Updates estimate for the moving of the piece in give turn.
- void captureIncrement (Field field, const Piece &piece)

  Updates estimate for a capture of the given piece on the given field.
- void promotionIncrement (const Turn &turn, PieceType targetType)

  Updates estimate for the promotion of a piece.
- Score getScore (PlayerColor color) const

  Returns the score from the perspective of the given player color.
- bool **operator==** (const IncrementalMaterialAndPSTEvaluator &other) const

Static Public Member Functions

- static Score estimateFullBoard (const std::array< Piece, 64 > &board)

  Gives a full estimate for the given board.

Private Attributes

- Score m_estimatedScore

  Score estimation for white player.

5.31.1 Detailed Description

Class for incrementally estimating game state using PST and Material.

Uses fixed piece square tables and a fixed material evaluation to incrementally calculate a score for the current board position during the game.

Warning

Does not handle game over conditions

See Also

ChessBoard

Note

Not valid once game is over.

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

- S:/dev/3dchess/src/logic/IncrementalMaterialAndPSTEvaluator.h
- S:/dev/3dchess/src/logic/IncrementalMaterialAndPSTEvaluator.cpp

5.32 IncrementalZobristHasher Class Reference

Incremental polyglot constants based Zobrist-Hash implementation.

`#include <IncrementalZobristHasher.h>`

Classes

- class HashConstants

Public Types

- using **Hash** = uint64_t

Public Member Functions

- **IncrementalZobristHasher** (const ChessBoard &board)
- Hash getHash () const

  Returns the current zobrist hash.
- void clearedEnPassantSquare (Field enPassantSquare)

  Called when the en passant field is cleared.
- void moveIncrement (const Turn &turn)

  Called for a move update.
- void promotionIncrement (const Turn &turn, PieceType targetType)

  Called for the promotion of a pawn.
- void captureIncrement (Field field, const Piece &capturedPiece)

  Called when a piece is captured.
- void turnAppliedIncrement ()

  Updates hash for now active player.
- void newEnPassantPossibility (const Turn &turn, BitBoard opposingPawns)

  Called when turn might give the enemy an en passant possibility.
- void updateCastlingRights (const std::array< bool, NUM_PLAYERS > &prevShortCastleLeft, const std::array< bool, NUM_PLAYERS > &prevLongCastleRight, const std::array< bool, NUM_PLAYERS > &shortCastleRight, const std::array< bool, NUM_PLAYERS > &longCastleRight)

  Called to potentially update castling rights.
- bool **operator==** (const IncrementalZobristHasher &other) const

Static Public Member Functions

- static Hash hashFullBoard (const ChessBoard &board)

  Gives a full estimate for the given board.

Static Private Member Functions

- static bool isPolyglotEnPassant (const ChessBoard &board)

  Return true if en passant according to polyglot rules.

Private Attributes

- Hash **m_hash**
- bool **m_isEnPassantApplied**

Static Private Attributes

- static const HashConstants **m_hashConstants** = IncrementalZobristHasher::HashConstants()

5.32.1 Detailed Description

Incremental polyglot constants based Zobrist-Hash implementation.

5.32.2 Member Function Documentation

5.32.2.1 bool IncrementalZobristHasher::isPolyglotEnPassant (const ChessBoard & *board*) [static], [private]

Return true if en passant according to polyglot rules.

Polyglot uses a en passant definition that differs from FEN. It only integrates the file if there are pawns neighbouring the pawn that opened the en passant possibility.

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

- S:/dev/3dchess/src/logic/IncrementalZobristHasher.h
- S:/dev/3dchess/src/logic/IncrementalZobristHasher.cpp

5.33 GamePlay::KeyboardCounter Struct Reference

To stop triggering keys too often, this counter helps to delay each key stroke.

Public Attributes

- std::chrono::time_point
  < std::chrono::system_clock > **keyR**
- std::chrono::time_point
  < std::chrono::system_clock > **keyReturn**

5.33.1 Detailed Description

To stop triggering keys too often, this counter helps to delay each key stroke.

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

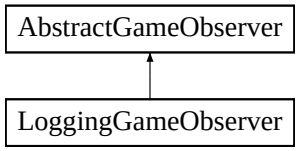
- S:/dev/3dchess/src/gui/states/GamePlay.h

5.34 LoggingGameObserver Class Reference

AbstractGameObserver which simply logs occuring events.

`#include <LoggingGameObserver.h>`

Inheritance diagram for LoggingGameObserver:



Public Member Functions

- void onGameStart (GameState state, GameConfiguration config) override

  Called when the game starts.
- void onTurnStart (PlayerColor who) override

  Called if a player is asked to perform a turn.

- void onTurnEnd (PlayerColor who, Turn turn, GameState newState) override

  Called if a player ended its turn.
- void onTurnTimeout (PlayerColor who, std::chrono::seconds timeout) override

  Called if a players turn is aborted due to timeout.
- void onGameOver (GameState state, PlayerColor winner) override

  Called when a game started with onGameStart is over.

Private Attributes

- Logging::Logger **m_log**

5.34.1 Detailed Description

AbstractGameObserver which simply logs occuring events.

5.34.2 Member Function Documentation

5.34.2.1 void LoggingGameObserver::onGameOver (GameState *state*, PlayerColor *winner*) [override], [virtual]

Called when a game started with onGameStart is over.

Parameters

state	State on game over.
winner	Winner of the game.

Reimplemented from AbstractGameObserver.

5.34.2.2 void LoggingGameObserver::onGameStart (GameState *state*, GameConfiguration *config*) [override], [virtual]

Called when the game starts.

Parameters

state	GameState on game start.
config	Valid GameConfiguration for this game.

Reimplemented from AbstractGameObserver.

5.34.2.3 void LoggingGameObserver::onTurnEnd (PlayerColor *who*, Turn *turn*, GameState *newState*) [override], [virtual]

Called if a player ended its turn.

Parameters

who	Color of the player doing the turn.
turn	Turn the player decided on.
newState	State after the player performed the turn.

Reimplemented from AbstractGameObserver.

5.34.2.4 void LoggingGameObserver::onTurnStart (PlayerColor *who*) [override],[virtual]

Called if a player is asked to perform a turn.

Parameters

who	Color of the player doing the turn.

Reimplemented from AbstractGameObserver.

5.34.2.5 void LoggingGameObserver::onTurnTimeout (PlayerColor *who*, std::chrono::seconds *timeout*) [override], [virtual]

Called if a players turn is aborted due to timeout.

Parameters

who	Color of the player who got interrupted.
timeout	Length of the time limit that got violated.

Reimplemented from AbstractGameObserver.

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

- S:/dev/3dchess/src/misc/LoggingGameObserver.h
- S:/dev/3dchess/src/misc/LoggingGameObserver.cpp

5.35 Menu2DItem Class Reference

This class describes a button of a menu.

`#include <Menu2DItem.h>`

Public Member Functions

- Menu2DItem (std::string filename, int width, int height)

  Creates a new menu button item.
- void setPosition (int x, int y)

  Sets the buttons position in viewport coordinates.
- void draw ()

  Draws the button on the previously set position.
- void mouseMoved (int x, int y)

  Updates the mouse's pointer/cursor position.
- void mousePressed (int x, int y)

  Sets the coordinates, where the mouse clicked in the viewport.
- void mouseReleased (int x, int y)

  Sets the coordinates, where the mouse click was released in the viewport.
- void onClick (const boost::function< void()> &slot)

  Add a function or method which should be called via boost signals when the button is clicked.
- void unClick ()

  Remove all click signals.

Private Types

- using Signal = boost::signals2::signal< void()>

  Boost signals2 to provide callback functionality.

Private Member Functions

- bool inBoundingBox ()

  Checks whether the mouse is currently above the button.

Private Attributes

- int m_width

  The width of the button.
- int m_height

  The height of the button.
- std::string m_filename

  The filename (without prefix) for the three textures.
- int m_positionX

  The button's x position.
- int m_positionY

  The button's y position.
- int m_mousePosX = 0

  The current mouse's x position.
- int m_mousePosY = 0

  The current mouse's x position.
- GLuint m_texture [3]

  The button's state textures.
- bool m_hovered

  Flag, if the button is hovered at this moment.
- bool m_activated = false

  Flag, if the button is activated at this moment.
- Signal **m_clicked**

5.35.1 Detailed Description

This class describes a button of a menu.

The button is a rectangle with textures depending on one of three states (normal, hover, active). The buttons can be used with the mouse cursor.

5.35.2 Constructor & Destructor Documentation

5.35.2.1 Menu2DItem::Menu2DItem (std::string *filename*, int *width*, int *height*)

Creates a new menu button item.

Parameters

filename	The filename relative to the executable located in resources/bt_n<filename>.
width	The width of the button.
height	The height of the button.

Note

You must provide a texture for each state in the /resources folder relative to the executable.

For example:

- bt_nBack.png for the normal (no action, simple button) state.
- bt_aBack.png for the active (pressed) state.
- bt_hBack.png for the hover (mouse above the button) state.

Provide the filename without the prefix *bt_n*, *bt_a* and *bt_h*, this is automatically added.

5.35.3 Member Function Documentation

5.35.3.1 void Menu2DItem::draw ( )

Draws the button on the previously set position.

This method will also consider the button state.

Note

To provide the correct button state, you must update the mouse position. See the methods below.

5.35.3.2 bool Menu2DItem::inBoundingBox ( ) [private]

Checks whether the mouse is currently above the button.

Returns

True if the mouse is above the button, false otherwise.

5.35.3.3 void Menu2DItem::mouseMoved (int *x*, int *y*)

Updates the mouse's pointer/cursor position.

Parameters

x	The mouse's x position.
x	The mouse's y position.

Note

You must use this method only if the mouse is moved but the mouse button is neither pressed nor released.

5.35.3.4 void Menu2DItem::mousePressed (int *x*, int *y*)

Sets the coordinates, where the mouse clicked in the viewport.

Parameters

x	The mouse's x position.
x	The mouse's y position.

Note

You must use this method only if the mouse was clicked but the mouse button is neither moved nor released.

5.35.3.5 void Menu2DItem::mouseReleased (int *x*, int *y*)

Sets the coordinates, where the mouse click was released in the viewport.

Parameters

x	The mouse's x position.
x	The mouse's y position.

Note

You must use this method only if the mouse was released but the mouse button is neither pressed nor the mouse is moved.

5.35.3.6 void Menu2DItem::onClick (const boost::function< void() > & *slot*)

Add a function or method which should be called via boost signals when the button is clicked.

So the given method can do something.

Parameters

slot	The function/method to call when the button is clicked.

5.35.3.7 void Menu2DItem::setPosition (int *x*, int *y*)

Sets the buttons position in viewport coordinates.

Parameters

x	The x coordinate.
y	The y coordinate.

Note

The origin of the viewport is the upper left corner.

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

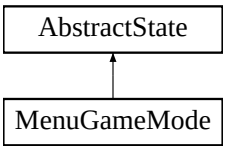
- S:/dev/3dchess/src/gui/Menu2DItem.h
- S:/dev/3dchess/src/gui/Menu2DItem.cpp

5.36 MenuGameMode Class Reference

Class which holds the state GameMode.

`#include <MenuGameMode.h>`

Inheritance diagram for MenuGameMode:



Public Member Functions

- MenuGameMode ()

  Creates a new menu GameMode State object.
- void enter () override

  Enters the state for the first time.
- AbstractState * run () override

  Runs the current state and does all the work.
- void exit () override

  Exits the current state and cleans up all allocated resources.
- void draw ()

  Draws something state related stuff on the screen.
- void onModeAIVsAI ()

  This method is called if the user chose the _AI vs.
- void onModePlayerVsAI ()

  This method is called if the user chose the _Player vs.
- void onMenuBack ()

  This method is called if the user chose the back button.

Private Types

- enum States { **KEEP_CURRENT**, **GAME_PLAY**, **MENU_PLAYER_COLOR**, **MENU_MAIN** }

  Internal GameMode states.

Private Attributes

- StateMachine & fsm

  Reference to the StateMachine.
- States m_nextState

  The next State for the StateMachine to enter.
- Menu2DPtr menu

  Shared pointer for better garbage handling.

5.36.1 Detailed Description

Class which holds the state GameMode.

This state let the user choose one of two modes. The *AI vs. AI* mode which shows a chess match between two artificial computer players where the user can only watch the game. In the *Player vs. AI* mode, the user can play against an artificial computer player.

Note

To run() a state, first enter() the state.

5.36.2 Member Function Documentation

5.36.2.1 void MenuGameMode::enter ( ) [override], [virtual]

Enters the state for the first time.

This will setup all the state related stuff.

Note

To run() the current state, first enter() it.

Implements AbstractState.

5.36.2.2 void MenuGameMode::exit ( ) [override], [virtual]

Exits the current state and cleans up all allocated resources.

Note

This is the last method to call, before the object is deleted.

Implements AbstractState.

5.36.2.3 void MenuGameMode::onModeAIVsAI ( )

This method is called if the user chose the _AI vs.

AI_ mode.

5.36.2.4 void MenuGameMode::onModePlayerVsAI ( )

This method is called if the user chose the _Player vs.

AI_ mode.

5.36.2.5 AbstractState * MenuGameMode::run ( ) [override], [virtual]

Runs the current state and does all the work.

Returns

AbstractState* the state which should be run after this state. A nullptr if the game should be exited.

Implements AbstractState.

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

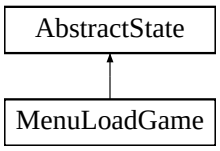
- S:/dev/3dchess/src/gui/states/MenuGameMode.h
- S:/dev/3dchess/src/gui/states/MenuGameMode.cpp

5.37 MenuLoadGame Class Reference

Class which holds the state LoadGame.

`#include <MenuLoadGame.h>`

Inheritance diagram for MenuLoadGame:



Public Member Functions

- MenuLoadGame ()

  Creates a new menu LoadGame State object.
- void enter () override

  Enters the state for the first time.
- AbstractState * run () override

  Runs the current state and does all the work.
- void exit () override

  Exits the current state and cleans up all allocated resources.
- void draw ()

  Draws something state related stuff on the screen.
- void onMenuBack ()

  This method is called if the user chose the back button.

Private Types

- enum States {
  KEEP_CURRENT, **LOAD_SLOT_A**, **LOAD_SLOT_B**, **LOAD_SLOT_C**,
  MENU_MAIN }

  Internal GameMode states.

Private Attributes

- StateMachine & fsm

  Reference to the StateMachine.
- States m_nextState

  The next State for the StateMachine to enter.
- Menu2DPtr menu

  Shared pointer for better garbage handling.

5.37.1 Detailed Description

Class which holds the state LoadGame.

The user can load a previously saved game from one of three game slots.

Note

To run() a state, first enter() the state.

5.37.2 Member Function Documentation

5.37.2.1 void MenuLoadGame::enter ( ) [override], [virtual]

Enters the state for the first time.

This will setup all the state related stuff.

Note

To run() the current state, first enter() it.

Implements AbstractState.

5.37.2.2 void MenuLoadGame::exit ( ) [override], [virtual]

Exits the current state and cleans up all allocated resources.

Note

This is the last method to call, before the object is deleted.

Implements AbstractState.

5.37.2.3 AbstractState * MenuLoadGame::run ( ) [override], [virtual]

Runs the current state and does all the work.

Returns

AbstractState* the state which should be run after this state. A nullptr if the game should be exited.

Implements AbstractState.

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

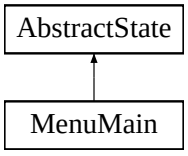
- S:/dev/3dchess/src/gui/states/MenuLoadGame.h
- S:/dev/3dchess/src/gui/states/MenuLoadGame.cpp

5.38 MenuMain Class Reference

Class which holds the state MenuMain.

`#include <MenuMain.h>`

Inheritance diagram for MenuMain:



Public Member Functions

- MenuMain ()

  Creates a new menu MainMenu State object.
- void enter () override

  Enters the state for the first time.
- AbstractState * run () override

  Runs the current state and does all the work.
- void exit () override

  Exits the current state and cleans up all allocated resources.
- void draw ()

  Draws something state related stuff on the screen.
- void onNewGame ()

  This method is called if the user chose to play a new game.
- void onLoadGame ()

  This method is called if the user chose to load a game.
- void onOptions ()

  This method is called if the user chose to go to the options menu.
- void onExitGame ()

  This method is called if the user chose to exit the game.

Private Types

- enum States {
  KEEP_CURRENT, **NEW_GAME**, **LOAD_GAME**, **OPTIONS**,
  EXIT_GAME }

  Internal GameMode states.

Private Attributes

- StateMachine & fsm

  Reference to the StateMachine.
- States m_nextState

  The next State for the StateMachine to enter.
- Menu2DPtr menu

  Shared pointer for better garbage handling.

5.38.1 Detailed Description

Class which holds the state MenuMain.

in this menu, the user can start a new game, load a previously saved game, go to the options menu or quit the game.

Note

To run() a state, first enter() the state.

5.38.2 Member Function Documentation

5.38.2.1 void MenuMain::enter ( ) [override], [virtual]

Enters the state for the first time.

This will setup all the state related stuff.

Note

To run() the current state, first enter() it.

Implements AbstractState.

5.38.2.2 void MenuMain::exit ( ) [override], [virtual]

Exits the current state and cleans up all allocated resources.

Note

This is the last method to call, before the object is deleted.

Implements AbstractState.

5.38.2.3 AbstractState * MenuMain::run ( ) [override], [virtual]

Runs the current state and does all the work.

Returns

AbstractState* the state which should be run after this state. A nullptr if the game should be exited.

Implements AbstractState.

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

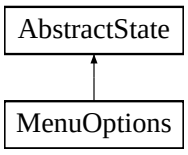
- S:/dev/3dchess/src/gui/states/MenuMain.h
- S:/dev/3dchess/src/gui/states/MenuMain.cpp

5.39 MenuOptions Class Reference

Class which holds the state MenuOption.

`#include <MenuOptions.h>`

Inheritance diagram for MenuOptions:



Public Member Functions

- MenuOptions ()

  Creates a new menu Options State object.
- void enter () override

  Enters the state for the first time.
- AbstractState * run () override

  Runs the current state and does all the work.
- void exit () override

  Exits the current state and cleans up all allocated resources.
- void draw ()

  Draws something state related stuff on the screen.
- void onResolutionChange ()

  This method is called if the user chose to change the resolution.
- void onMenuBack ()

  This method is called if the user chose to go back to the menu he was, before he get here.

Private Types

- enum States { **KEEP_CURRENT**, **MENU_MAIN** }

  Internal GameMode states.

Private Attributes

- StateMachine & fsm

  Reference to the StateMachine.
- States m_nextState

  The next State for the StateMachine to enter.
- Menu2DPtr menu

  Shared pointer for better garbage handling.

5.39.1 Detailed Description

Class which holds the state MenuOption.

This state let the user toggle between the fullscreen view or the windowed mode of the game.

Note

To run() a state, first enter() the state.

5.39.2 Member Function Documentation

5.39.2.1 void MenuOptions::enter ( ) [override], [virtual]

Enters the state for the first time.

This will setup all the state related stuff.

Note

To run() the current state, first enter() it.

Implements AbstractState.

5.39.2.2 void MenuOptions::exit ( ) [override], [virtual]

Exits the current state and cleans up all allocated resources.

Note

This is the last method to call, before the object is deleted.

Implements AbstractState.

5.39.2.3 AbstractState * MenuOptions::run ( ) [override], [virtual]

Runs the current state and does all the work.

Returns

AbstractState* the state which should be run after this state. A nullptr if the game should be exited.

Implements AbstractState.

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

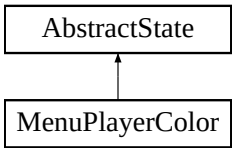
- S:/dev/3dchess/src/gui/states/MenuOptions.h
- S:/dev/3dchess/src/gui/states/MenuOptions.cpp

5.40 MenuPlayerColor Class Reference

Class which holds the state PlayerColor.

`#include <MenuPlayerColor.h>`

Inheritance diagram for MenuPlayerColor:



Public Member Functions

- MenuPlayerColor ()
  Creates a new menu PlayerColor State object.
- void enter () override
  Enters the state for the first time.
- AbstractState * run () override
  Runs the current state and does all the work.
- void exit () override
  Exits the current state and cleans up all allocated resources.
- void draw ()
  Draws something state related stuff on the screen.
- void onColorWhite ()
  This method is called if the user chose the white color as player color.
- void onColorBlack ()
  This method is called if the user chose the black color as player color.
- void onMenuBack ()
  This method is called if the user chose to go back to the menu he was, before he get here.

Private Types

- enum States { **KEEP_CURRENT**, **GAME_PLAY**, **MENU_GAME_MODE** }

  Internal GameMode states.

Private Attributes

- StateMachine & m_fsm

  Reference to the StateMachine.
- bool m_colorWhite

  Workaround to start game with white or black color.
- States m_nextState

  The next State for the StateMachine to enter.
- Menu2DPtr m_menu

  Shared pointer for better garbage handling.

5.40.1 Detailed Description

Class which holds the state PlayerColor.

This state let the user choose between black or white for the chess model figures.

Note

To run() a state, first enter() the state.

5.40.2 Member Function Documentation

5.40.2.1 void MenuPlayerColor::enter ( ) [override], [virtual]

Enters the state for the first time.

This will setup all the state related stuff.

Note

To run() the current state, first enter() it.

Implements AbstractState.

5.40.2.2 void MenuPlayerColor::exit ( ) [override], [virtual]

Exits the current state and cleans up all allocated resources.

Note

This is the last method to call, before the object is deleted.

Implements AbstractState.

5.40.2.3 AbstractState * MenuPlayerColor::run ( ) [override], [virtual]

Runs the current state and does all the work.

Returns

AbstractState* the state which should be run after this state. A nullptr if the game should be exited.

Implements AbstractState.

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

- S:/dev/3dchess/src/gui/states/MenuPlayerColor.h
- S:/dev/3dchess/src/gui/states/MenuPlayerColor.cpp

5.41 Mesh Class Reference

Wrapper class for the Assimp library.

`#include <Mesh.h>`

Public Member Functions

- Mesh (unsigned int numVertices, aiVector3D *vertices, aiVector3D *normals, unsigned int numFaces, aiFace *faces)

  Creates a new Mesh object.

Public Attributes

- GLuint m_numVertices

  The number of vertices.
- aiVector3D * m_vertices

  The model's vertices.
- aiVector3D * m_normals

  The model's normals.
- aiVector3D * m_textureCoords

  The model's texture coordinates.
- GLuint * m_indices

  The model's indices.
- GLuint m_numIndices

  The number of indices.

5.41.1 Detailed Description

Wrapper class for the Assimp library.

5.41.2 Constructor & Destructor Documentation

5.41.2.1 Mesh::Mesh (unsigned int *numVertices*, aiVector3D * *vertices*, aiVector3D * *normals*, unsigned int *numFaces*, aiFace * *faces*)

Creates a new Mesh object.

Parameters

numVertices	The number of model vertices.
vertices	The model's vertices itself.
normals	The model's normals itself.
numFaces	The number of model faces.
faces	The model's faces itself.

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

- S:/dev/3dchess/src/gui/Mesh.h
- S:/dev/3dchess/src/gui/Mesh.cpp

5.42 GamePlay::MessageBox Struct Reference

Struct that represents the message box on the top.

Public Attributes

- unsigned int width
  width of the box
- unsigned int height
  height of the box
- unsigned int padding
  inner padding to the edges
- unsigned int showDuration
  currently not used
- std::string text
  text to show on viewport
- unsigned int shownSince
  currently not used
- unsigned int windowPosX
  viewport x coordinate
- unsigned int windowPosY
  viewport y coordinate
- GLuint displayList
  OpenGL display list which stores the OpenGL background part.

5.42.1 Detailed Description

Struct that represents the message box on the top.

If this box gets more fancy or even more complex this should be moved to a separate class.

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

- S:/dev/3dchess/src/gui/states/GamePlay.h

5.43 Model Class Reference

Representing a chess figure (e.g.

```
#include <Model.h>
```

Classes

- struct Position

  Structure for the model's world coordinates.

Public Types

- enum Color { **BLACK**, **WHITE** }

  Possible model colors.

Public Member Functions

- Model (std::string file)

  Loads the model from the filesystem.
- void loadScene ()

  Imports the model from filesystem.
- void setCorrectionValues (int localX, int localY, int localZ, float scaleFactor, int rotateX, int rotateY, int rotateZ)

  Corrects the model positioning if the model (in the given file) is not proper located at 0/0/0 local space coordinates, the rotation or the scaling factor is wrong.
- void setColor (Color color)

  Sets the models color.
- void setPosition (int globalX, int globalY, int globalZ)

  Sets a new global position (world coordinates) for the model.
- void draw ()

  Draws the model at configured world coordinates.

Private Attributes

- std::string m_file

  Filename (an path) relative to the executable, which contains the meshes.
- Color m_color

  Color of the model.
- Position m_position

  The model's position in world coordinates.
- float m_correctScaling

  Scaling factor of the model.
- Position m_correctPosition

  The local correction values for correcting unproper model coordinates.
- Position m_correctRotation

  The local correction values for correcting unproper model rotation.
- AssimpHelperPtr model

  Pointer to the AssimpHelper, which holds the meshes.

5.43.1 Detailed Description

Representing a chess figure (e.g.

King, Queen, ...).

5.43.2 Constructor & Destructor Documentation

5.43.2.1 Model::Model (std::string *file*)

Loads the model from the filesystem.

Parameters

file	The filename with directory relative to the game's executable file.

5.43.3 Member Function Documentation

5.43.3.1 void Model::setColor (Color *color*)

Sets the models color.

Parameters

color	The color of the model.

5.43.3.2 void Model::setCorrectionValues (int *localX,* int *localY,* int *localZ,* float *scaleFactor,* int *rotateX,* int *rotateY,* int *rotateZ*)

Corrects the model positioning if the model (in the given file) is not proper located at 0/0/0 local space coordinates, the rotation or the scaling factor is wrong.

Note

This should only be used if there's no proper model file available.

Parameters

localX	Sets the local x coordinate.
localY	Sets the local y coordinate.
localZ	Sets the local z coordinate.
scaleFactor	The scaling factor to shrink or enlarge.
rotateX	The rotation in degree along the x axis.
rotateY	The rotation in degree along the y axis.
rotateZ	The rotation in degree along the z axis.

5.43.3.3 void Model::setPosition (int *globalX,* int *globalY,* int *globalZ*)

Sets a new global position (world coordinates) for the model.

Parameters

globalX	The global x coordinate.
globalY	The global y coordinate.
globalZ	The global z coordinate.

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

- S:/dev/3dchess/src/gui/Model.h
- S:/dev/3dchess/src/gui/Model.cpp

5.44 PolyglotBookEntry::Move Struct Reference

Chess move.

`#include <PolyglotBook.h>`

Public Member Functions

- bool **operator==** (const Move &other) const
- std::string **toString** () const

Public Attributes

- Field from

  Source field. For castling king source.
- Field to

  Target field. For castling king target.
- PieceType promotion_piece

  If promotion piece type to promote to.

5.44.1 Detailed Description

Chess move.

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

- S:/dev/3dchess/src/ai/PolyglotBook.h
- S:/dev/3dchess/src/ai/PolyglotBook.cpp

5.45 Negamax< TGameState, AB_CUTOFF_ENABLED, MOVE_ORDERING_ENABLED, TRANSPOSITION_TABLES_ENABLED > Class Template Reference

Implementation of a Negamax algorithm.

`#include <Negamax.h>`

Classes

- class Option

  Helper class for holding a move option in move ordering.
- struct PerfCounters

  Structure with performance counters used for debugging and evaluation.

Public Member Functions

- Negamax ()

  Creates a new algorithm instance.
- NegamaxResult search (const TGameState &state, size_t maxDepth)

  Search given state up to maxDepth full turns.
- void abort ()

  Aborts the currently running calculation.

Public Attributes

- struct Negamax::PerfCounters **m_counters**

Private Member Functions

- NegamaxResult search_recurse (TGameState state, size_t depth, const size_t maxDepth, Score alpha, Score beta)

  Recursive Negamax search with optional Alpha-Beta cutoff.
- Score estimateScoreFor (const TGameState &state, size_t depth) const

  Estimates score for given state.

Private Attributes

- TranspositionTable **m_transpositionTable**
- std::atomic< bool > m_abort

  Abort flag.
- Logging::Logger **m_log**

5.45.1 Detailed Description

template<typename TGameState = GameState, bool AB_CUTOFF_ENABLED = true, bool MOVE_ORDERING_ENABLED = true, bool TRANSPOSITION_TABLES_ENABLED = true>class Negamax< TGameState, AB_CUTOFF_ENABLED, MOVE_ORDERING_ENABLED, TRANSPOSITION_TABLES_ENABLED >

Implementation of a Negamax algorithm.

Template Parameters

TGameState	Type of game state so GameState is mockable.
AB_CUTOFF_ENABLE	If false Alpha-Beta cutoff feature is disabled.
MOVE_ORDERING_ENABLED	If false move ordering is disabled.
TRANSPOSITION_TABLES_ENABLED	If false transposition tables are disabled.

5.45.2 Member Function Documentation

5.45.2.1 template<typename TGameState = GameState, bool AB_CUTOFF_ENABLED = true, bool MOVE_ORDERING_ENABLED = true, bool TRANSPOSITION_TABLES_ENABLED = true> void Negamax< TGameState, AB_CUTOFF_ENABLED, MOVE_ORDERING_ENABLED, TRANSPOSITION_TABLES_ENABLED >::abort ( ) [inline]

Aborts the currently running calculation.

Call from another thread to abort currently running search.

5.45.2.2 template<typename TGameState = GameState, bool AB_CUTOFF_ENABLED = true, bool MOVE_ORDERING_ENABLED = true, bool TRANSPOSITION_TABLES_ENABLED = true> Score Negamax< TGameState, AB_CUTOFF_ENABLED, MOVE_ORDERING_ENABLED, TRANSPOSITION_TABLES_ENABLED >::estimateScoreFor (const TGameState & *state*, size_t *depth*) const [inline], [private]

Estimates score for given state.

Used for move ordering.

Note

Assumes state has opponent as next to move.

Parameters

state	State to estimate.
depth	Depth in plies the given state has. Used to penalize deep wins or shallow losses.

Returns

Estimated score between WIN_SCORE and LOOSE_SCORE

5.45.2.3 template<typename TGameState = GameState, bool AB_CUTOFF_ENABLED = true, bool MOVE_ORDERING_ENABLED = true, bool TRANSPOSITION_TABLES_ENABLED = true> NegamaxResult Negamax< TGameState, AB_CUTOFF_ENABLED, MOVE_ORDERING_ENABLED, TRANSPOSITION_TABLES_ENABLED >::search (const TGameState & *state*, size_t *maxDepth*) [inline]

Search given state up to maxDepth full turns.

Parameters

state	Game state to search.
maxDepthIn-Turns	Number of full turns (ply and return ply) to search.

Returns

Result of the search.

5.45.2.4 template<typename TGameState = GameState, bool AB_CUTOFF_ENABLED = true, bool MOVE_ORDERING_ENABLED = true, bool TRANSPOSITION_TABLES_ENABLED = true> NegamaxResult Negamax< TGameState, AB_CUTOFF_ENABLED, MOVE_ORDERING_ENABLED, TRANSPOSITION_TABLES_ENABLED >::search_recurse (TGameState *state*, size_t *depth*, const size_t *maxDepth*, Score *alpha*, Score *beta*) [inline], [private]

Recursive Negamax search with optional Alpha-Beta cutoff.

Parameters

state	Game state to search from.
depth	Depth in plys already searched.
maxDepth	Maximum depth in plys to search.
alpha	Minimum score current (maximizing) player is assured of
beta	Maximum score enemy (minimizing) player is assured of

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

- S:/dev/3dchess/src/ai/Negamax.h

5.46 NegamaxResult Struct Reference

Structure for holding search results.

`#include <Negamax.h>`

Public Member Functions

- NegamaxResult operator- () const

  Negates score. Syntax sugar to get closer to algorithm notation.

- bool isVictoryCertain () const

  Returns true if the search found a certain victory.
- bool **operator<** (const NegamaxResult &other)
- bool **operator<=** (const NegamaxResult &other)
- bool **operator>=** (const NegamaxResult &other)
- bool **operator>** (const NegamaxResult &other)
- bool **operator==** (const NegamaxResult &other) const
- std::string **toString** () const

Public Attributes

- Score score

  Evaluator score estimation for this turn.
- boost::optional< Turn > turn

  Turn to make to advance towards score.

5.46.1 Detailed Description

Structure for holding search results.

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

- S:/dev/3dchess/src/ai/Negamax.h

5.47 ObjectHelper Class Reference

Helper class for creating static OpenGL display lists to boost the drawing of OpenGL objects.

`#include <ObjectHelper.h>`

Static Public Member Functions

- static GLuint createCubeList (float size, float x, float y, float z)

  Creates a new OpenGL display list for a cube.
- static GLuint create2DRectList (float width, float height, float viewportX, float viewportY, float colorR, float colorG, float colorB)

  Creates a new OpenGL display list for a 2D rectangle box.
- static GLuint create2DGradientRectList (float width, float height, float viewportX, float viewportY, float fromColorR, float fromColorG, float fromColorB, float toColorR, float toColorG, float toColorB)

  Creates a new OpenGL display list for a 2D rectangle box with gradient color from top to bottom.

Private Member Functions

- ObjectHelper ()

  No constructor needed.

5.47.1 Detailed Description

Helper class for creating static OpenGL display lists to boost the drawing of OpenGL objects.

Note

See http://www.opengl.org/documentation/specs/version1.1/glspec1.1/node123.html for more details about display lists.

5.47.2 Member Function Documentation

5.47.2.1 GLuint ObjectHelper::create2DGradientRectList (float *width*, float *height*, float *viewportX*, float *viewportY*, float *fromColorR*, float *fromColorG*, float *fromColorB*, float *toColorR*, float *toColorG*, float *toColorB*) [static]

Creates a new OpenGL display list for a 2D rectangle box with gradient color from top to bottom.

Parameters

width	The width of the rectangle.
height	The height of the rectangle.
viewportX	The viewport x coordinate from the left top corner.
viewportY	The viewport y coordinate from the left top corner.
fromColorR	The red color value between 0.0 and 1.0 at the top edge of the rectangle.
fromColorG	The green color value between 0.0 and 1.0 at the top edge of the rectangle.
fromColorB	The blue color value between 0.0 and 1.0 at the top edge of the rectangle.
toColorR	The red color value between 0.0 and 1.0 at the bottom edge of the rectangle.
toColorG	The green color value between 0.0 and 1.0 at the bottom edge of the rectangle.
toColorB	The blue color value between 0.0 and 1.0 at the bottom edge of the rectangle.

Returns

GLuint A display list index which holds the compiled rectangle.

5.47.2.2 GLuint ObjectHelper::create2DRectList (float *width*, float *height*, float *viewportX*, float *viewportY*, float *colorR*, float *colorG*, float *colorB*) [static]

Creates a new OpenGL display list for a 2D rectangle box.

Parameters

width	The width of the rectangle.
height	The height of the rectangle.
viewportX	The viewport x coordinate from the left top corner.
viewportY	The viewport y coordinate from the left top corner.
colorR	The red color value between 0.0 and 1.0.
colorG	The green color value between 0.0 and 1.0.
colorB	The blue color value between 0.0 and 1.0.

Returns

GLuint A display list index which holds the compiled rectangle.

5.47.2.3 GLuint ObjectHelper::createCubeList (float *size*, float *x*, float *y*, float *z*) [static]

Creates a new OpenGL display list for a cube.

Parameters

size	The size of an edge of the cube.
x	The position of the cube in x world coordinate.
y	The position of the cube in y world coordinate.
z	The position of the cube in z world coordinate.

Returns

GLuint A display list index which holds the compiled cube.

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

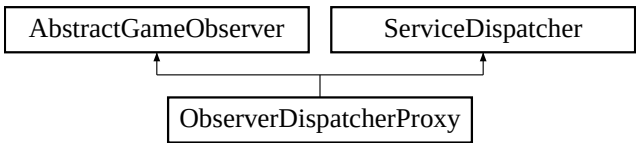
- S:/dev/3dchess/src/gui/ObjectHelper.h
- S:/dev/3dchess/src/gui/ObjectHelper.cpp

5.48 ObserverDispatcherProxy Class Reference

Proxy for transporting AbstractGameObserver events between threads.

`#include <ObserverDispatcherProxy.h>`

Inheritance diagram for ObserverDispatcherProxy:



Public Member Functions

- **ObserverDispatcherProxy** (AbstractGameObserverPtr observer)
- virtual void onGameStart (GameState state, GameConfiguration config) override

  Called when the game starts.
- virtual void onTurnStart (PlayerColor who) override

  Called if a player is asked to perform a turn.
- virtual void onTurnEnd (PlayerColor who, Turn turn, GameState newState) override

  Called if a player ended its turn.
- virtual void onTurnTimeout (PlayerColor who, std::chrono::seconds timeout) override

  Called if a players turn is aborted due to timeout.
- virtual void onGameOver (GameState state, PlayerColor winner) override

  Called when a game started with onGameStart is over.

Private Attributes

- AbstractGameObserverPtr **m_observer**

Additional Inherited Members

5.48.1 Detailed Description

Proxy for transporting AbstractGameObserver events between threads.

As the GameLogic and other game components run on different threads it is essential to safely transport game events between them. Without any additional precautions AbstractGameObserver implementations will have their handlers called on the GameLogic thread they are registered on with all implied thread safety concerns.

This proxy will serialize calls coming in from the game logic in a thread-safe way and replay them once its poll method is called in the customers thread.

5.48.2 Member Function Documentation

5.48.2.1 virtual void ObserverDispatcherProxy::onGameOver (GameState *state*, PlayerColor *winner*) [inline], [override], [virtual]

Called when a game started with onGameStart is over.

Parameters

state	State on game over.
winner	Winner of the game.

Reimplemented from AbstractGameObserver.

5.48.2.2 virtual void ObserverDispatcherProxy::onGameStart (GameState *state*, GameConfiguration *config*) [inline], [override], [virtual]

Called when the game starts.

Parameters

state	GameState on game start.
config	Valid GameConfiguration for this game.

Reimplemented from AbstractGameObserver.

5.48.2.3 virtual void ObserverDispatcherProxy::onTurnEnd (PlayerColor *who*, Turn *turn*, GameState *newState*) [inline], [override], [virtual]

Called if a player ended its turn.

Parameters

who	Color of the player doing the turn.
turn	Turn the player decided on.
newState	State after the player performed the turn.

Reimplemented from AbstractGameObserver.

5.48.2.4 virtual void ObserverDispatcherProxy::onTurnStart (PlayerColor *who*) [inline], [override], [virtual]

Called if a player is asked to perform a turn.

Parameters

who	Color of the player doing the turn.

Reimplemented from AbstractGameObserver.

5.48.2.5 virtual void ObserverDispatcherProxy::onTurnTimeout (PlayerColor *who,* std::chrono::seconds *timeout*) [inline],[override],[virtual]

Called if a players turn is aborted due to timeout.

Parameters

who	Color of the player who got interrupted.
timeout	Length of the time limit that got violated.

Reimplemented from AbstractGameObserver.

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

- S:/dev/3dchess/src/logic/threading/ObserverDispatcherProxy.h

5.49 Negamax< TGameState, AB_CUTOFF_ENABLED, MOVE_ORDERING_ENABLED, TRANSPOSITION_TABLES_ENABLED >::Option Class Reference

Helper class for holding a move option in move ordering.

Public Member Functions

- Option (TGameState &state, Turn &turn, Score score)

  Create options for move ordering.
- bool operator< (const Option &other) const

  Odering operator which makes sort output descending by score.

Public Attributes

- TGameState * **state**
- Turn * **turn**

Private Attributes

- Score score

  Score estimation for this option.

5.49.1 Detailed Description

template<typename TGameState = GameState, bool AB_CUTOFF_ENABLED = true, bool MOVE_ORDERING_ENABLED = true, bool TRANSPOSITION_TABLES_ENABLED = true>class Negamax< TGameState, AB_CUTOFF_ENABLED, MOVE_ORDERING_ENABLED, TRANSPOSITION_TABLES_ENABLED >::Option

Helper class for holding a move option in move ordering.

5.49.2 Constructor & Destructor Documentation

5.49.2.1 template<typename TGameState = GameState, bool AB_CUTOFF_ENABLED = true, bool MOVE_ORDERING_ENABLED = true, bool TRANSPOSITION_TABLES_ENABLED = true> Negamax< TGameState, AB_CUTOFF_ENABLED, MOVE_ORDERING_ENABLED, TRANSPOSITION_TABLES_ENABLED >::Option::Option (TGameState & *state,* Turn & *turn,* Score *score*) [inline]

Create options for move ordering.

Parameters

state	State *after* turn has been applied
turn	Turn leading to this option.
score	Score estimation for this option.

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

- S:/dev/3dchess/src/ai/Negamax.h

5.50 Negamax< TGameState, AB_CUTOFF_ENABLED, MOVE_ORDERING_ENABLED, TRANSPOSITION_TABLES_ENABLED >::PerfCounters Struct Reference

Structure with performance counters used for debugging and evaluation.

`#include <Negamax.h>`

Public Member Functions

- std::string **toString** () const

Public Attributes

- uint64_t nodes

  Number of nodes searched.
- uint64_t cutoffs

  Number of branches cut-off using Alpha-Beta.
- uint64_t updates

  Number of best result updates during search.
- uint64_t transpositionTableHits

  Number of transposition table hits during search.
- std::chrono::milliseconds duration

  Time taken for last search.

5.50.1 Detailed Description

template<typename TGameState = GameState, bool AB_CUTOFF_ENABLED = true, bool MOVE_ORDERING_ENABLED = true, bool TRANSPOSITION_TABLES_ENABLED = true>struct Negamax< TGameState, AB_CUTOFF_ENABLED, MOVE_ORDERING_ENABLED, TRANSPOSITION_TABLES_ENABLED >::PerfCounters

Structure with performance counters used for debugging and evaluation.

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

- S:/dev/3dchess/src/ai/Negamax.h

5.51 Piece Struct Reference

Public Member Functions

- **Piece** (PlayerColor player, PieceType pieceType)
- bool **operator==** (const Piece &other) const

Public Attributes

- PlayerColor **player**
- PieceType **type**

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

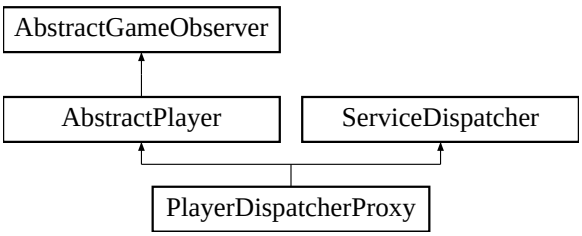
- S:/dev/3dchess/src/logic/ChessTypes.h
- S:/dev/3dchess/src/logic/ChessTypes.cpp

5.52 PlayerDispatcherProxy Class Reference

Proxy for transporting AbstractGamePlayer events between threads.

`#include <PlayerDispatcherProxy.h>`

Inheritance diagram for PlayerDispatcherProxy:



Public Member Functions

- **PlayerDispatcherProxy** (AbstractPlayerPtr player)
- virtual void onSetColor (PlayerColor color) override

  Notifies that player what color he will be playing.
- virtual std::future< Turn > doMakeTurn (GameState state) override

  Asks the player to make his turn.
- virtual void doAbortTurn () override

  Asks the player to abort a turn asked for with doMakeTurn.
- virtual void onGameStart (GameState state, GameConfiguration config) override

  Called when the game starts.
- virtual void onTurnStart (PlayerColor who) override

  Called if a player is asked to perform a turn.
- virtual void onTurnEnd (PlayerColor who, Turn turn, GameState newState) override

  Called if a player ended its turn.
- virtual void onTurnTimeout (PlayerColor who, std::chrono::seconds timeout) override

  Called if a players turn is aborted due to timeout.
- virtual void onGameOver (GameState state, PlayerColor winner) override

  Called when a game started with onGameStart is over.

Private Attributes

- AbstractPlayerPtr **m_player**

Additional Inherited Members

5.52.1 Detailed Description

Proxy for transporting AbstractGamePlayer events between threads.

As the GameLogic and other game components run on different threads it is essential to safely transport game events between them. Without any additional precautions AbstractGamePlayer implementations will have their handlers called on the GameLogic thread they are registered on with all implied thread safety concerns.

This proxy will serialize calls coming in from the game logic in a thread-safe way and replay them once its poll method is called in the customers thread.

5.52.2 Member Function Documentation

5.52.2.1 virtual void PlayerDispatcherProxy::doAbortTurn ( ) [inline], [override], [virtual]

Asks the player to abort a turn asked for with doMakeTurn.

When this is called the GameLogic will no longer react to the completion of the future for that turn. A use of this function is the abortion of a turn due to timeout.

Implements AbstractPlayer.

5.52.2.2 virtual std::future<Turn> PlayerDispatcherProxy::doMakeTurn (GameState *state*) [inline], [override], [virtual]

Asks the player to make his turn.

Warning

This function must not block. It is to return immediatly. The players turn is to be set on the returned future.

Note

The game logic can abort its request for a player to make his turn using the doAbortTurn function at any time.

Parameters

state	Current state of the game.

Returns

A future to the turn to make.

Implements AbstractPlayer.

5.52.2.3 virtual void PlayerDispatcherProxy::onGameOver (GameState *state*, PlayerColor *winner*) [inline], [override], [virtual]

Called when a game started with onGameStart is over.

Parameters

state	State on game over.
winner	Winner of the game.

Reimplemented from AbstractGameObserver.

5.52.2.4 virtual void PlayerDispatcherProxy::onGameStart (GameState *state*, GameConfiguration *config*) [inline], [override], [virtual]

Called when the game starts.

Parameters

state	GameState on game start.
config	Valid GameConfiguration for this game.

Reimplemented from AbstractGameObserver.

5.52.2.5 virtual void PlayerDispatcherProxy::onSetColor (PlayerColor *color*) [inline], [override], [virtual]

Notifies that player what color he will be playing.

Called before onGameStart.

Parameters

color	Color the player has.

Implements AbstractPlayer.

5.52.2.6 virtual void PlayerDispatcherProxy::onTurnEnd (PlayerColor *who*, Turn *turn*, GameState *newState*) [inline], [override], [virtual]

Called if a player ended its turn.

Parameters

who	Color of the player doing the turn.
turn	Turn the player decided on.
newState	State after the player performed the turn.

Reimplemented from AbstractGameObserver.

5.52.2.7 virtual void PlayerDispatcherProxy::onTurnStart (PlayerColor *who*) [inline], [override], [virtual]

Called if a player is asked to perform a turn.

Parameters

who	Color of the player doing the turn.

Reimplemented from AbstractGameObserver.

5.52.2.8 virtual void PlayerDispatcherProxy::onTurnTimeout (PlayerColor *who*, std::chrono::seconds *timeout*) [inline], [override], [virtual]

Called if a players turn is aborted due to timeout.

Parameters

who	Color of the player who got interrupted.
timeout	Length of the time limit that got violated.

Reimplemented from AbstractGameObserver.

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

- S:/dev/3dchess/src/logic/threading/PlayerDispatcherProxy.h

5.53 GamePlay::PlayerTurn Struct Reference

Struct which represents a players turn.

Public Attributes

- PlayerColor **who**
- Turn **turn**

5.53.1 Detailed Description

Struct which represents a players turn.

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

- S:/dev/3dchess/src/gui/states/GamePlay.h

5.54 PoF Struct Reference

Public Member Functions

- **PoF** (Piece piece, Field field)

Public Attributes

- Piece **piece**
- Field **field**

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

- S:/dev/3dchess/src/logic/ChessBoard.h

5.55 PolyglotBook Class Reference

Class able to lookup entries from a polyglot opening file.

`#include <PolyglotBook.h>`

Public Member Functions

- PolyglotBook (int seed=5235)

  Creates a new book instance.
- bool open (const std::string &book)

  Opens a given book file and reads it into memory.
- std::vector< PolyglotBookEntry > lookup (uint64_t key) const

  Performs a lookup for the given key and returns all entries with matching key.
- boost::optional < PolyglotBookEntry > getWeightedEntry (uint64_t key)

  Selects a entry based on the relative weights of the results from a lookup of key.
- boost::optional < PolyglotBookEntry > getBestEntry (uint64_t key) const

  Selects the entry with maximum weight from a lookup of key.
- size_t getNumberOfEntries () const

  Returns the number of entries in the book.

Private Attributes

- std::vector< PolyglotBookEntry > m_book

  Book as a vector of entries sorted by key.
- std::mt19937 **m_rng**
- Logging::Logger **m_log**

5.55.1 Detailed Description

Class able to lookup entries from a polyglot opening file.

Format as described on http://hgm.nubati.net/book_format.html.

Note

Book is held in memory for the lifetime of the object.

5.55.2 Constructor & Destructor Documentation

5.55.2.1 PolyglotBook::PolyglotBook (int *seed* = 5235) [explicit]

Creates a new book instance.

See Also

open

Parameters

seed	Seed which to use for selections with chance.

5.55.3 Member Function Documentation

5.55.3.1 boost::optional< PolyglotBookEntry > PolyglotBook::getBestEntry (uint64_t *key*) const

Selects the entry with maximum weight from a lookup of key.

Parameters

key	Zobrist hash for position

Returns

boost::none if no turn found.

5.55.3.2 boost::optional< PolyglotBookEntry > PolyglotBook::getWeightedEntry (uint64_t *key*)

Selects a entry based on the relative weights of the results from a lookup of key.

A turns probability of being chosen is weight/sum(weights)

Parameters

key	Zobrist hash for position

Returns

boost::none if no turn found.

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

- S:/dev/3dchess/src/ai/PolyglotBook.h
- S:/dev/3dchess/src/ai/PolyglotBook.cpp

5.56 PolyglotBookEntry Struct Reference

Single entry in in polyglot book adjusted for this engine.

`#include <PolyglotBook.h>`

Classes

- struct Move

  Chess move.

Public Member Functions

- bool **isPromotion** () const
- bool mightBeCastlingMove () const

  Returns true if this might be a castling move.
- Field getKingCastlingTarget () const

  Returns the target of the king piece for this move if it were a castling one.
- bool **operator==** (const PolyglotBookEntry &other) const
- std::string **toString** () const

Public Attributes

- uint64_t key

  Entry key (Zobrist hash)
- struct PolyglotBookEntry::Move **move**
- uint16_t weight

  Score for move from book.

5.56.1 Detailed Description

Single entry in in polyglot book adjusted for this engine.

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

- S:/dev/3dchess/src/ai/PolyglotBook.h
- S:/dev/3dchess/src/ai/PolyglotBook.cpp

5.57 Model::Position Struct Reference

Structure for the model's world coordinates.

Public Attributes

- int **x**
- int **y**
- int **z**

5.57.1 Detailed Description

Structure for the model's world coordinates.

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

- S:/dev/3dchess/src/gui/Model.h

5.58 ResourceInitializer Class Reference

This class will initialize the chess figures/models and the chess board.

`#include <ResourceInitializer.h>`

Public Member Functions

- ResourceInitializer ()

  Creates a new ResourceInitializer object.
- ChessSetPtr load ()

  Loads the whole chess set, shows the progress bar and the file which is loaded.

Private Member Functions

- void onBeforeLoadNextResource (string resourceName)

  The callback function to call before a resource is loaded.

Private Attributes

- StateMachine & m_fsm

  The state machine for accessing the OpenGL context.
- ChessSetPtr m_chessSet

The chess set to load.

- size_t m_resourcesLoaded

  The number of resources which are currently loaded.

- size_t m_resourcesTotal

  The total number of resources to load.

5.58.1 Detailed Description

This class will initialize the chess figures/models and the chess board.

It will also show the status with a progress bar and the model which is loading.

5.58.2 Member Function Documentation

5.58.2.1 ChessSetPtr ResourceInitializer::load ( )

Loads the whole chess set, shows the progress bar and the file which is loaded.

Returns

The smart pointer to the chess set.

5.58.2.2 void ResourceInitializer::onBeforeLoadNextResource (string *resourceName*) [private]

The callback function to call before a resource is loaded.

Parameters

resourceName	The name of the resource to load next.

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

- S:/dev/3dchess/src/gui/ResourceInitializer.h
- S:/dev/3dchess/src/gui/ResourceInitializer.cpp

5.59 SaveGame Class Reference

SaveGame class for a single savegame.

`#include <SaveGame.h>`

Public Member Functions

- **SaveGame** (std::string fen_, GamePlay::GameMode gameMode_, PlayerColor humanPlayerColor_)
- bool save (const std::string &path) const

  Saves this game to the given path.

- bool saveToSlot (int slot)

  Convinience function which saves to a path determined by the slot.

Static Public Member Functions

- static boost::optional< SaveGame > load (const std::string &path)
  Loads a savegame from disk.
- static boost::optional< SaveGame > loadFromSlot (int slot)
  Loads a savegame from a slot path.
- static bool save (const SaveGame &saveGame, const std::string &path)
  Saves a given save game to a file.

Public Attributes

- std::string fen
  Saved state in fen notation.
- GamePlay::GameMode gameMode
  Game mode (ai vs human etc.)
- PlayerColor humanPlayerColor
  Color of the human player if human vs ai.

Private Member Functions

- template<class Archive >
  void **serialize** (Archive &ar, const unsigned int)

Static Private Member Functions

- static std::string pathForSlot (int slot)
  Returns the path a given save slot has.

Friends

- class **boost::serialization::access**

5.59.1 Detailed Description

SaveGame class for a single savegame.

5.59.2 Member Function Documentation

5.59.2.1 boost::optional< SaveGame > SaveGame::load (const std::string & *path*) [static]

Loads a savegame from disk.

Parameters

path	Path to file.

Returns

SaveGame on success. boost::none on failure.

5.59.2.2 boost::optional< SaveGame > SaveGame::loadFromSlot (int *slot*) [static]

Loads a savegame from a slot path.

Parameters

slot	number

Returns

SaveGame on success. boost::none on failure.

5.59.2.3 bool SaveGame::save (const SaveGame & *saveGame,* const std::string & *path*) [static]

Saves a given save game to a file.

Parameters

saveGame	Save game to save.
path	Path to save file to.

Returns

True on success.

5.59.2.4 bool SaveGame::save (const std::string & *path*) const

Saves this game to the given path.

Parameters

path	Path to file to save to.

Returns

True on success.

5.59.2.5 bool SaveGame::saveToSlot (int *slot*)

Convinience function which saves to a path determined by the slot.

Returns

true on success

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

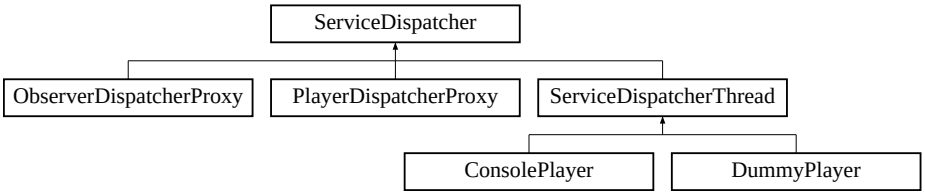
- S:/dev/3dchess/src/gui/SaveGame.h
- S:/dev/3dchess/src/gui/SaveGame.cpp

5.60 ServiceDispatcher Class Reference

Provides functionality for safely running operations in a thread.

`#include <ServiceDispatcher.h>`

Inheritance diagram for ServiceDispatcher:



Public Member Functions

- void poll ()

  Replays all posted functions in the calling thread.

Protected Member Functions

- template<typename Function >
  void post (Function &&function)

  Store a given function.
- template<typename Function >
  auto postPromise (Function &&function) -> decltype(std::promise< typename std::result_of< Function()>-
  ::type >().get_future())

  Stores a given function and returns a future on its return value.
- void run ()

  Runs underlying boost asio io_service.
- void resetWork ()

  Drops queued functions.
- void stopService ()

  Stops underlying service.

Private Attributes

- boost::asio::io_service m_service

  Object providing event loop queuing and dispatching functionality.
- std::unique_ptr
  < boost::asio::io_service::work > m_work

  Work object preventing service run loop from exiting on dry queue.

5.60.1 Detailed Description

Provides functionality for safely running operations in a thread.

For components running on different threads it is essential to safely transport events between them. Without any additional precautions functions will execute on the thread they are called.

This dispatcher can store functions in a thread-safe way and replay them once its poll method is called in the customers thread.

5.60.2 Member Function Documentation

5.60.2.1 void ServiceDispatcher::poll ( ) [inline]

Replays all posted functions in the calling thread.

See Also

post
postPromise

5.60.2.2 template<typename Function > void ServiceDispatcher::post (Function && *function*) [inline], [protected]

Store a given function.

Parameters

function	Function to store and later replay.

5.60.2.3 template<typename Function > auto ServiceDispatcher::postPromise (Function && *function*) -> decltype(std::promise<typename std::result_of<Function()>::type>().get_future()) [inline], [protected]

Stores a given function and returns a future on its return value.

Parameters

function	Function to store and later replay.

Returns

Future on result of given function.

5.60.2.4 void ServiceDispatcher::run ( ) [inline], [protected]

Runs underlying boost asio io_service.

Note

Will block until work is completed.

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

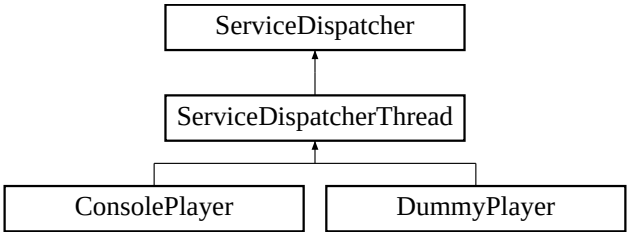
- S:/dev/3dchess/src/logic/threading/ServiceDispatcher.h

5.61 ServiceDispatcherThread Class Reference

Provides functionality for safely running operations in a thread.

`#include <ServiceDispatcherThread.h>`

Inheritance diagram for ServiceDispatcherThread:



Public Member Functions

- ServiceDispatcherThread ()

  Creates a ServiceDispatcherThread.
- virtual ~ServiceDispatcherThread ()

  Destroy dispatcher.
- virtual void start ()

  Start the dispatcher thread.
- virtual void stop (bool force=false)

  Stops the execution of this tread.

Public Attributes

- std::thread m_thread

  Thread this object is running its event loop on after start.

Additional Inherited Members

5.61.1 Detailed Description

Provides functionality for safely running operations in a thread.

Uses ServiceDispatcher to move function calls into its own thread and execute them.

5.61.2 Constructor & Destructor Documentation

5.61.2.1 ServiceDispatcherThread::ServiceDispatcherThread ( ) [inline]

Creates a ServiceDispatcherThread.

Note

Don't forget to start() it.

5.61.2.2 virtual ServiceDispatcherThread::~ServiceDispatcherThread ( ) [inline], [virtual]

Destroy dispatcher.

Stops internal thread and discards all remaining calls.

5.61.3 Member Function Documentation

5.61.3.1 virtual void ServiceDispatcherThread::stop (bool *force* = false) [inline], [virtual]

Stops the execution of this tread.

Parameters

force	If true remaining calls are dropped. Otherwise shutdown is deferred until all calls currently in the queue are processed.

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

- S:/dev/3dchess/src/logic/threading/ServiceDispatcherThread.h

5.62 StateMachine Class Reference

Class which manages the states.

`#include <StateMachine.h>`

Classes

- struct EventMap

  Structure for holding user events.

Public Member Functions

- void setStartState (AbstractState *startState)

  Sets the start state and setup the state.
- AbstractState * run ()

  Runs the current state.
- void setNextState (AbstractState *state)

  Sets the next state which should be run.

Static Public Member Functions

- static StateMachine & getInstance ()

  Gets an instance of the StateMachine.

Public Attributes

- struct StateMachine::EventMap **eventmap**
- GuiWindow * window

  Holds the pointer to the GuiWindow object, to access gui related methods.

Private Member Functions

- StateMachine ()

  For singleton reasons no public constructor.
- **StateMachine** (const StateMachine &)
- StateMachine & **operator=** (const StateMachine &)

Private Attributes

- AbstractState * m_currentState

  The current state.

5.62.1 Detailed Description

Class which manages the states.

Note

This is a singleton, you can get only one instance of the StateMachine. Don't forget to update the events if they occur.

5.62.2 Member Function Documentation

5.62.2.1 static StateMachine& StateMachine::getInstance ( ) [inline], [static]

Gets an instance of the StateMachine.

Note

This is a singleton. So you can only get one instance.

Returns

StateMachine& A reference to the StateMachine.

5.62.2.2 AbstractState * StateMachine::run ( )

Runs the current state.

Returns

The AbstractState pointer to the state which must be run() the next time.

5.62.2.3 void StateMachine::setNextState (AbstractState * *state*)

Sets the next state which should be run.

Parameters

state	The next state.

5.62.2.4 void StateMachine::setStartState (AbstractState * *startState*)

Sets the start state and setup the state.

Parameters

startState	The start state.

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

- S:/dev/3dchess/src/gui/StateMachine.h
- S:/dev/3dchess/src/gui/StateMachine.cpp

5.63 ChessSet::StrikedModel Struct Reference

Striked model for animation.

Public Attributes

- Piece **piece**
- Field **field**

5.63.1 Detailed Description

Striked model for animation.

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

- S:/dev/3dchess/src/gui/ChessSet.h

5.64 TranspositionTable Class Reference

Transposition table with fixed size.

`#include <TranspositionTable.h>`

Public Member Functions

- TranspositionTable (size_t tablesize=4000037)
  Creates an empty transposition table of given size.
- void maybeUpdate (TranspositionTableEntry entry)
  Stores the given entry if it meets table replacement criteria.
- boost::optional
  < TranspositionTableEntry > lookup (Hash hash) const
  Lookup hash in table.
- size_t getTableSize () const
  Returns the number of possible independent table entries.

Private Attributes

- std::vector
  < TranspositionTableEntry > m_table
  Hashtable with transpositions.
- const size_t m_tablesize
  Size set for this table.

5.64.1 Detailed Description

Transposition table with fixed size.

Hashed on hash of transposition table entry. Offers limited internal collision detection against class 2 errors by checking hash in entry before returning. Class 1 errors should handled externally if problematic.

5.64.2 Constructor & Destructor Documentation

5.64.2.1 TranspositionTable::TranspositionTable (size_t *tablesize* = `4000037`) [inline]

Creates an empty transposition table of given size.

Parameters

tablesize	Number of independent spaces in hashtable.

Note

To ensure even distribution tablesize should be prime.

5.64.3 Member Function Documentation

5.64.3.1 boost::optional<TranspositionTableEntry> TranspositionTable::lookup (Hash *hash*) const [inline]

Lookup hash in table.

Note

Not secure against zobrist hash collisions.

Returns

Option to entry if in table. boost::none otherwise.

5.64.3.2 void TranspositionTable::maybeUpdate (TranspositionTableEntry *entry*) [inline]

Stores the given entry if it meets table replacement criteria.

Stores the given entry either if it belongs to a different position than the current one or if its depth is greater than the previous entry for this position. This relies on the assumption that deeper entries most likely took more positions into account thus representing a greater investment in compute time.

Parameters

entry	Entry to store.

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

- S:/dev/3dchess/src/ai/TranspositionTable.h

5.65 TranspositionTableEntry Struct Reference

Single entry in transposition table.

`#include <TranspositionTable.h>`

Public Types

- enum BoundType { LOWER, UPPER, EXACT }
  Describes the guarantees for the entry.

Public Member Functions

- bool isLowerBound () const
  Returns true if entry score is lower bound to score attainable by turn.
- bool isUpperBound () const
  Returns true if entry score is upper bound to score attainable by turn.
- bool isExactBound () const
  Returns true if score is exactly what is attainable by turn.
- std::string **toString** () const

Public Attributes

- Hash hash

  Hash identifying position (might collide)
- Turn turn

  Best turn from this position.
- Score score

  Estimated score (.
- enum TranspositionTableEntry::BoundType **boundType**
- size_t depth

  Search depth used to evaluate position.

5.65.1 Detailed Description

Single entry in transposition table.

See Also

TranspositionTable

5.65.2 Member Enumeration Documentation

5.65.2.1 enum TranspositionTableEntry::BoundType

Describes the guarantees for the entry.

Enumerator

LOWER Score is lower bound to score attainable by turn.

UPPER Score is upper bound to score attainable by turn.

EXACT Score is exactly what is attainable by turn.

5.65.3 Member Data Documentation

5.65.3.1 Score TranspositionTableEntry::score

Estimated score (.

See Also

boundType,
depth)

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

- S:/dev/3dchess/src/ai/TranspositionTable.h

5.66 Turn Class Reference

Represents a chess turn.

`#include <Turn.h>`

Public Types

- enum **Action** {
  Move, **Castle**, **Forfeit**, **Pass**,
  PromotionQueen, **PromotionBishop**, **PromotionKnight**, **PromotionRook** }

Public Member Functions

- **Turn** (Piece piece, Field from, Field to, Action action)
- bool **isMove** () const
- bool **isCastling** () const
- bool **isPromotion** () const
- bool **isForfeit** () const
- bool **isPass** () const
- PieceType **getPromotionPieceType** () const
- bool **operator==** (const Turn &other) const
- bool **operator!=** (const Turn &other) const
- std::string **toString** () const

Static Public Member Functions

- static Turn **move** (Piece piece, Field from, Field to)
- static Turn **castle** (Piece piece, Field from, Field to)
- static Turn **promotionQueen** (Piece piece, Field from, Field to)
- static Turn **promotionBishop** (Piece piece, Field from, Field to)
- static Turn **promotionRook** (Piece piece, Field from, Field to)
- static Turn **promotionKnight** (Piece piece, Field from, Field to)
- static Turn **pass** (PlayerColor player)

Public Attributes

- Piece **piece**
- Field **from**
- Field **to**
- enum Turn::Action **action**

5.66.1 Detailed Description

Represents a chess turn.

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

- S:/dev/3dchess/src/logic/Turn.h
- S:/dev/3dchess/src/logic/Turn.cpp

5.67 TurnGenerator Class Reference

Turn generation (based on bitboards) and gameover detection.

`#include <TurnGenerator.h>`

Public Member Functions

- std::vector< Turn > getTurnList () const

  Returns the generated turns.
- void generateTurns (PlayerColor player, ChessBoard &cb)

  Generates turns for the given player color, based on the given chessboard.
- void initFlags (ChessBoard &cb)

  Sets the kingInCheck-Flag, based on the given chessboard.
- void bitBoardToTurns (Piece piece, Field from, BitBoard bbTurns, BitBoard bbAllOppTurns, ChessBoard &cb, Turns &turnsOut)

  Creates turn objects from bitboards and adds it to turnsOut list.
- BitBoard calcMoveTurns (Piece piece, BitBoard bbPiece, BitBoard bbAllOppTurns, const ChessBoard &cb)

  Calculates all "normal" move turns.
- BitBoard calcAllOppTurns (PlayerColor opp, const ChessBoard &cb)

  Calculates a bitboard with all possible opponent turns.
- BitBoard calcUnCheckFields (PlayerColor opp, const ChessBoard &cb)

  If king is in check position, this function calculates a bitboard with possible fields to uncheck the king.
- BitBoard calcShortCastleTurns (PlayerColor player, BitBoard bbAllPieces, BitBoard bbAllOppTurns)

  Checks the requirements for the short castle turn.
- BitBoard calcLongCastleTurns (PlayerColor player, BitBoard bbAllPieces, BitBoard bbAllOppTurns)

  Checks the requirements for the long castle turn.
- BitBoard calcBishopTurns (BitBoard bishops, BitBoard allOppPieces, BitBoard allPieces) const

  Turn calculation for bishops.
- BitBoard calcRookTurns (BitBoard rooks, BitBoard allOppPieces, BitBoard allPieces) const

  Turn calculation for rooks.
- BitBoard calcQueenTurns (BitBoard queens, BitBoard allOppPieces, BitBoard allPieces) const

  Turn calculation for queen(s), combination of the the two previously.
- BitBoard calcKingTurns (BitBoard king, BitBoard allOwnPieces, BitBoard allOppTurns) const

  Turn calculation for the king.
- BitBoard calcKnightTurns (BitBoard knights, BitBoard allOwnPieces) const

  Turn calculation for knights.
- BitBoard calcPawnTurns (BitBoard pawns, BitBoard allPieces, BitBoard allOppPieces, PlayerColor player, Field enPassantSquare) const

  Turn calculation for pawns (move and attack turns).
- BitBoard calcPawnMoveTurns (BitBoard pawns, BitBoard allPieces, PlayerColor player) const

  Calculates the move turns for pawns.
- BitBoard calcPawnAttackTurns (BitBoard pawns, BitBoard allOppPieces, PlayerColor player, Field enPassantSquare) const

  Calculates the attack turns for pawns.
- BitBoard **maskRank** (Rank rank) const
- BitBoard **clearRank** (Rank rank) const
- BitBoard **maskFile** (File file) const
- BitBoard **clearFile** (File file) const
- BitBoard **getBitsE** (BitBoard bbPiece) const
- BitBoard **getBitsW** (BitBoard bbPiece) const
- BitBoard **getBitsN** (BitBoard bbPiece) const
- BitBoard **getBitsS** (BitBoard bbPiece) const
- BitBoard **getBitsNE** (BitBoard bbPiece) const
- BitBoard **getBitsNW** (BitBoard bbPiece) const
- BitBoard **getBitsSE** (BitBoard bbPiece) const
- BitBoard **getBitsSW** (BitBoard bbPiece) const

Public Attributes

- std::vector< Turn > turnList

  Contains the generated turns.

5.67.1 Detailed Description

Turn generation (based on bitboards) and gameover detection.

5.67.2 Member Function Documentation

5.67.2.1 std::vector< Turn > TurnGenerator::getTurnList ( ) const

Returns the generated turns.

Warning

The generateTurns-function needs to be called previously.

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

- S:/dev/3dchess/src/logic/TurnGenerator.h
- S:/dev/3dchess/src/logic/TurnGenerator.cpp

Index