

tAltris  
v1.0

Generated by Doxygen 1.8.13



# Contents

<b>1</b>	<b>Data Structure Index</b>	<b>1</b>
1.1	Data Structures . . . . .	1
<b>2</b>	<b>File Index</b>	<b>3</b>
2.1	File List . . . . .	3
<b>3</b>	<b>Data Structure Documentation</b>	<b>5</b>
3.1	AiBest Struct Reference . . . . .	5
3.1.1	Field Documentation . . . . .	5
3.1.1.1	piece . . . . .	6
3.1.1.2	score . . . . .	6
3.2	AiCoefs Struct Reference . . . . .	6
3.2.1	Field Documentation . . . . .	6
3.2.1.1	agg_height . . . . .	6
3.2.1.2	bumpiness . . . . .	6
3.2.1.3	clears . . . . .	7
3.2.1.4	holes . . . . .	7
3.3	Board Struct Reference . . . . .	7
3.3.1	Field Documentation . . . . .	7
3.3.1.1	cells . . . . .	7
3.3.1.2	height . . . . .	7
3.3.1.3	width . . . . .	8
3.4	Candidate Struct Reference . . . . .	8
3.4.1	Field Documentation . . . . .	8

3.4.1.1	coefs . . . . .	8
3.4.1.2	fitness . . . . .	9
3.5	Piece Struct Reference . . . . .	9
3.5.1	Field Documentation . . . . .	9
3.5.1.1	angle . . . . .	9
3.5.1.2	shape . . . . .	10
3.5.1.3	type . . . . .	10
3.5.1.4	x . . . . .	10
3.5.1.5	y . . . . .	10
3.6	PieceQueue Struct Reference . . . . .	10
3.6.1	Field Documentation . . . . .	10
3.6.1.1	data . . . . .	10
3.6.1.2	length . . . . .	11
3.6.1.3	seed . . . . .	11
3.7	PieceShape Struct Reference . . . . .	11
3.7.1	Field Documentation . . . . .	11
3.7.1.1	fill . . . . .	11
3.7.1.2	shape . . . . .	11
3.8	State Struct Reference . . . . .	12
3.8.1	Field Documentation . . . . .	12
3.8.1.1	board . . . . .	12
3.8.1.2	broken_lines . . . . .	13
3.8.1.3	current_piece . . . . .	13
3.8.1.4	input_counts . . . . .	13
3.8.1.5	level . . . . .	13
3.8.1.6	next_piece . . . . .	13
3.8.1.7	piece_queue . . . . .	13
3.8.1.8	piece_queue_index . . . . .	13
3.8.1.9	score . . . . .	13
3.8.1.10	step . . . . .	13

<b>4</b>	<b>File Documentation</b>	<b>15</b>
4.1	src/ai/genetic/candidate.c File Reference	15
4.1.1	Detailed Description	16
4.1.2	Function Documentation	16
4.1.2.1	genetic_candidate_create()	16
4.1.2.2	genetic_candidate_create_random()	16
4.1.2.3	genetic_candidate_crossover()	16
4.1.2.4	genetic_candidate_free()	16
4.1.2.5	genetic_candidate_mutate()	16
4.1.2.6	genetic_candidate_normalize()	17
4.2	src/ai/genetic/candidate.h File Reference	17
4.2.1	Detailed Description	18
4.2.2	Function Documentation	18
4.2.2.1	genetic_candidate_create()	18
4.2.2.2	genetic_candidate_crossover()	18
4.2.2.3	genetic_candidate_free()	18
4.2.2.4	genetic_candidate_mutate()	19
4.2.2.5	genetic_candidate_normalize()	19
4.3	src/ai/genetic/core.c File Reference	19
4.3.1	Detailed Description	19
4.3.2	Function Documentation	20
4.3.2.1	genetic_show_stats()	20
4.4	src/ai/genetic/core.h File Reference	20
4.4.1	Detailed Description	21
4.4.2	Function Documentation	21
4.4.2.1	genetic_show_stats()	21
4.5	src/ai/genetic/engine.c File Reference	21
4.5.1	Detailed Description	22
4.5.2	Function Documentation	22
4.5.2.1	_genetic_best()	22

4.5.2.2	genetic_aibest_create()	22
4.5.2.3	genetic_aibest_free()	22
4.5.2.4	genetic_aicoefs_free()	23
4.5.2.5	genetic_aicoefs_random()	23
4.5.2.6	genetic_best()	23
4.5.2.7	genetic_coefs_get()	23
4.5.2.8	genetic_get_rank()	23
4.6	src/ai/genetic/engine.h File Reference	23
4.6.1	Detailed Description	24
4.6.2	Function Documentation	24
4.6.2.1	genetic_aibest_create()	25
4.6.2.2	genetic_aibest_free()	25
4.6.2.3	genetic_aicoefs_free()	25
4.6.2.4	genetic_aicoefs_random()	25
4.6.2.5	genetic_coefs_get()	25
4.6.2.6	genetic_get_rank()	25
4.7	src/ai/genetic/tools.c File Reference	26
4.7.1	Detailed Description	26
4.7.2	Function Documentation	26
4.7.2.1	aggregate_height()	27
4.7.2.2	board_height()	27
4.7.2.3	board_heights()	27
4.7.2.4	bumpiness()	27
4.7.2.5	clears()	27
4.7.2.6	hole()	27
4.7.2.7	holes()	28
4.7.2.8	show_features()	28
4.8	src/ai/genetic/tools.h File Reference	28
4.8.1	Detailed Description	29
4.8.2	Macro Definition Documentation	29

4.8.2.1	ABS . . . . .	29
4.8.3	Function Documentation . . . . .	29
4.8.3.1	aggregate_height() . . . . .	29
4.8.3.2	board_height() . . . . .	30
4.8.3.3	board_heights() . . . . .	30
4.8.3.4	bumpiness() . . . . .	30
4.8.3.5	clears() . . . . .	30
4.8.3.6	coalescent_clears() . . . . .	30
4.8.3.7	hole() . . . . .	30
4.8.3.8	holes() . . . . .	31
4.8.3.9	show_features() . . . . .	31
4.9	src/debug/debug.h File Reference . . . . .	31
4.9.1	Detailed Description . . . . .	32
4.9.2	Macro Definition Documentation . . . . .	32
4.9.2.1	DEBUG_TAG . . . . .	32
4.10	src/debug/engine/debug_state.c File Reference . . . . .	32
4.10.1	Detailed Description . . . . .	33
4.10.2	Function Documentation . . . . .	33
4.10.2.1	debug_state_print() . . . . .	33
4.10.2.2	debug_state_print_cell() . . . . .	33
4.10.2.3	debug_state_print_infos() . . . . .	33
4.10.2.4	debug_state_print_line_number() . . . . .	34
4.10.2.5	debug_state_print_next_piece() . . . . .	34
4.11	src/debug/engine/debug_state.h File Reference . . . . .	34
4.11.1	Detailed Description . . . . .	35
4.11.2	Macro Definition Documentation . . . . .	35
4.11.2.1	DEBUG_STATE_COLOR . . . . .	35
4.11.2.2	DEBUG_STATE_NAME . . . . .	35
4.11.2.3	DEBUG_STATE_TAG . . . . .	35
4.11.3	Function Documentation . . . . .	36

4.11.3.1	debug_state_print()	36
4.11.3.2	debug_state_print_cell()	36
4.11.3.3	debug_state_print_infos()	36
4.11.3.4	debug_state_print_line_number()	36
4.11.3.5	debug_state_print_next_piece()	36
4.12	src/engine/angle.h File Reference	37
4.12.1	Detailed Description	37
4.12.2	Macro Definition Documentation	38
4.12.2.1	ANGLE_ESIZE	38
4.12.3	Enumeration Type Documentation	38
4.12.3.1	Angle	38
4.12.3.2	Rotation	38
4.13	src/engine/board.c File Reference	38
4.13.1	Detailed Description	39
4.13.2	Function Documentation	39
4.13.2.1	board_break_lines()	40
4.13.2.2	board_copy()	40
4.13.2.3	board_create()	40
4.13.2.4	board_free()	40
4.13.2.5	board_get_completed_lines()	40
4.13.2.6	board_init()	40
4.13.2.7	board_merge_piece()	41
4.14	src/engine/board.h File Reference	41
4.14.1	Detailed Description	42
4.14.2	Macro Definition Documentation	42
4.14.2.1	BOARD_HEIGHT	42
4.14.2.2	BOARD_HIDDEN	42
4.14.2.3	board_reverse_y	43
4.14.2.4	BOARD_WIDTH	43
4.14.3	Function Documentation	43



4.14.3.1	board_break_lines()	43
4.14.3.2	board_copy()	43
4.14.3.3	board_create()	43
4.14.3.4	board_free()	43
4.14.3.5	board_get_completed_lines()	44
4.14.3.6	board_init()	44
4.14.3.7	board_merge_piece()	44
4.15	src/engine/cell.h File Reference	44
4.15.1	Detailed Description	45
4.15.2	Macro Definition Documentation	45
4.15.2.1	CELL_ESIZE	45
4.15.3	Enumeration Type Documentation	45
4.15.3.1	Cell	45
4.16	src/engine/input.h File Reference	46
4.16.1	Detailed Description	46
4.16.2	Macro Definition Documentation	46
4.16.2.1	INPUT_ESIZE	47
4.16.3	Enumeration Type Documentation	47
4.16.3.1	Input	47
4.17	src/engine/motion.c File Reference	47
4.17.1	Detailed Description	48
4.17.2	Function Documentation	48
4.17.2.1	motion_can_move()	48
4.17.2.2	motion_can_rotate()	48
4.17.2.3	motion_is_valid()	48
4.17.2.4	motion_try_down()	49
4.17.2.5	motion_try_move()	49
4.17.2.6	motion_try_rotate()	49
4.18	src/engine/motion.h File Reference	49
4.18.1	Detailed Description	50

4.18.2	Function Documentation . . . . .	50
4.18.2.1	motion_can_move() . . . . .	50
4.18.2.2	motion_can_rotate() . . . . .	51
4.18.2.3	motion_is_valid() . . . . .	51
4.18.2.4	motion_try_down() . . . . .	51
4.18.2.5	motion_try_move() . . . . .	51
4.18.2.6	motion_try_rotate() . . . . .	51
4.19	src/engine/piece/piece.c File Reference . . . . .	52
4.19.1	Detailed Description . . . . .	52
4.19.2	Function Documentation . . . . .	52
4.19.2.1	piece_copy() . . . . .	53
4.19.2.2	piece_create() . . . . .	53
4.19.2.3	piece_free() . . . . .	53
4.19.2.4	piece_random() . . . . .	53
4.20	src/engine/piece/piece.h File Reference . . . . .	53
4.20.1	Detailed Description . . . . .	55
4.20.2	Function Documentation . . . . .	55
4.20.2.1	piece_copy() . . . . .	55
4.20.2.2	piece_create() . . . . .	55
4.20.2.3	piece_free() . . . . .	55
4.20.2.4	piece_random() . . . . .	55
4.21	src/engine/piece/piece_queue.c File Reference . . . . .	56
4.21.1	Detailed Description . . . . .	56
4.21.2	Function Documentation . . . . .	57
4.21.2.1	piece_queue_create() . . . . .	57
4.21.2.2	piece_queue_extend() . . . . .	57
4.21.2.3	piece_queue_fill_data() . . . . .	57
4.21.2.4	piece_queue_free() . . . . .	57
4.21.2.5	piece_queue_get() . . . . .	57
4.22	src/engine/piece/piece_queue.h File Reference . . . . .	58

4.22.1 Detailed Description . . . . .	59
4.22.2 Macro Definition Documentation . . . . .	59
4.22.2.1 PIECE_QUEUE_LENGTH . . . . .	59
4.22.3 Function Documentation . . . . .	59
4.22.3.1 piece_queue_create() . . . . .	59
4.22.3.2 piece_queue_extend() . . . . .	60
4.22.3.3 piece_queue_fill_data() . . . . .	60
4.22.3.4 piece_queue_free() . . . . .	60
4.22.3.5 piece_queue_get() . . . . .	60
4.23 src/engine/piece/piece_shape.h File Reference . . . . .	60
4.23.1 Detailed Description . . . . .	61
4.23.2 Macro Definition Documentation . . . . .	61
4.23.2.1 PIECE_SHAPE_HEIGHT . . . . .	62
4.23.2.2 PIECE_SHAPE_WIDTH . . . . .	62
4.24 src/engine/piece/piece_type.h File Reference . . . . .	62
4.24.1 Detailed Description . . . . .	63
4.24.2 Macro Definition Documentation . . . . .	63
4.24.2.1 PIECE_TYPE_ESIZE . . . . .	63
4.24.3 Enumeration Type Documentation . . . . .	63
4.24.3.1 PieceType . . . . .	63
4.25 src/engine/piece/seven_bag.c File Reference . . . . .	64
4.25.1 Detailed Description . . . . .	64
4.25.2 Function Documentation . . . . .	65
4.25.2.1 seven_bag_draw() . . . . .	65
4.25.2.2 seven_bag_init() . . . . .	65
4.25.2.3 seven_bag_shuffle() . . . . .	65
4.25.2.4 seven_bag_swap() . . . . .	65
4.26 src/engine/piece/seven_bag.h File Reference . . . . .	65
4.26.1 Detailed Description . . . . .	66
4.26.2 Function Documentation . . . . .	66

4.26.2.1	seven_bag_draw()	66
4.26.2.2	seven_bag_init()	67
4.26.2.3	seven_bag_shuffle()	67
4.26.2.4	seven_bag_swap()	67
4.27	src/engine/score.c File Reference	67
4.27.1	Detailed Description	68
4.27.2	Function Documentation	68
4.27.2.1	score_compute_break()	68
4.28	src/engine/score.h File Reference	68
4.28.1	Detailed Description	69
4.28.2	Macro Definition Documentation	69
4.28.2.1	SCORE_DOUBLE	70
4.28.2.2	SCORE_HDROP	70
4.28.2.3	SCORE_LVL_PER_LINE	70
4.28.2.4	SCORE_SDROP	70
4.28.2.5	SCORE_SINGLE	70
4.28.2.6	SCORE_TETRIS	70
4.28.2.7	SCORE_TRIPLE	70
4.28.3	Function Documentation	70
4.28.3.1	score_compute_break()	71
4.29	src/engine/state.c File Reference	71
4.29.1	Detailed Description	71
4.29.2	Function Documentation	72
4.29.2.1	state_apply_input()	72
4.29.2.2	state_apply_inputs()	72
4.29.2.3	state_can_apply_input()	72
4.29.2.4	state_can_apply_inputs()	72
4.29.2.5	state_copy()	72
4.29.2.6	state_create()	73
4.29.2.7	state_create_piece()	73

4.29.2.8	state_free()	73
4.29.2.9	state_init()	73
4.29.2.10	state_next_piece()	73
4.29.2.11	state_step()	73
4.30	src/engine/state.h File Reference	74
4.30.1	Detailed Description	75
4.30.2	Function Documentation	75
4.30.2.1	state_apply_input()	75
4.30.2.2	state_apply_inputs()	75
4.30.2.3	state_can_apply_input()	76
4.30.2.4	state_can_apply_inputs()	76
4.30.2.5	state_copy()	76
4.30.2.6	state_create()	76
4.30.2.7	state_create_piece()	76
4.30.2.8	state_free()	76
4.30.2.9	state_init()	77
4.30.2.10	state_next_piece()	77
4.30.2.11	state_step()	77
4.31	src/tAltris.c File Reference	77
4.31.1	Detailed Description	78
4.31.2	Function Documentation	78
4.31.2.1	main()	78
4.32	src/utls/ansi_code.h File Reference	78
4.32.1	Detailed Description	80
4.32.2	Macro Definition Documentation	80
4.32.2.1	ANSI_BG_BBLACK	80
4.32.2.2	ANSI_BG_BBLUE	80
4.32.2.3	ANSI_BG_BCYAN	80
4.32.2.4	ANSI_BG_BGREEN	80
4.32.2.5	ANSI_BG_BLACK	80

4.32.2.6 ANSI_BG_BLUE . . . . .	81
4.32.2.7 ANSI_BG_BMAGENTA . . . . .	81
4.32.2.8 ANSI_BG_BRED . . . . .	81
4.32.2.9 ANSI_BG_BWHITE . . . . .	81
4.32.2.10 ANSI_BG_BYELLOW . . . . .	81
4.32.2.11 ANSI_BG_CYAN . . . . .	81
4.32.2.12 ANSI_BG_DEFAULT . . . . .	81
4.32.2.13 ANSI_BG_GREEN . . . . .	81
4.32.2.14 ANSI_BG_MAGENTA . . . . .	82
4.32.2.15 ANSI_BG_RED . . . . .	82
4.32.2.16 ANSI_BG_WHITE . . . . .	82
4.32.2.17 ANSI_BG_YELLOW . . . . .	82
4.32.2.18 ANSI_BOLD . . . . .	82
4.32.2.19 ANSI_CROSSEDOUT . . . . .	82
4.32.2.20 ANSI_ENCIRCLED . . . . .	82
4.32.2.21 ANSI_ESC . . . . .	82
4.32.2.22 ANSI_FAINT . . . . .	83
4.32.2.23 ANSI_FG_BBLACK . . . . .	83
4.32.2.24 ANSI_FG_BBLUE . . . . .	83
4.32.2.25 ANSI_FG_BCYAN . . . . .	83
4.32.2.26 ANSI_FG_BGREEN . . . . .	83
4.32.2.27 ANSI_FG_BLACK . . . . .	83
4.32.2.28 ANSI_FG_BLUE . . . . .	83
4.32.2.29 ANSI_FG_BMAGENTA . . . . .	83
4.32.2.30 ANSI_FG_BRED . . . . .	84
4.32.2.31 ANSI_FG_BWHITE . . . . .	84
4.32.2.32 ANSI_FG_BYELLOW . . . . .	84
4.32.2.33 ANSI_FG_CYAN . . . . .	84
4.32.2.34 ANSI_FG_DEFAULT . . . . .	84
4.32.2.35 ANSI_FG_GREEN . . . . .	84

4.32.2.36 ANSI_FG_MAGENTA . . . . .	84
4.32.2.37 ANSI_FG_RED . . . . .	84
4.32.2.38 ANSI_FG_WHITE . . . . .	85
4.32.2.39 ANSI_FG_YELLOW . . . . .	85
4.32.2.40 ANSI_FRAMED . . . . .	85
4.32.2.41 ANSI_ITALIC . . . . .	85
4.32.2.42 ANSI_OVERLINED . . . . .	85
4.32.2.43 ANSI_RBLINK . . . . .	85
4.32.2.44 ANSI_RESET . . . . .	85
4.32.2.45 ANSI_SBLINK . . . . .	85
4.32.2.46 ANSI_SGR . . . . .	86
4.32.2.47 ANSI_UNDERLINE . . . . .	86
4.33 src/utils/random.h File Reference . . . . .	86
4.33.1 Detailed Description . . . . .	87
4.34 src/utils/safe_op.h File Reference . . . . .	87
4.34.1 Detailed Description . . . . .	88
4.34.2 Macro Definition Documentation . . . . .	89
4.34.2.1 SAFE_OP_OVERFLOW . . . . .	89
4.34.2.2 SAFE_OP_SUCCESS . . . . .	89
4.34.2.3 SAFE_OP_UNDERFLOW . . . . .	89

<b>Index</b>	<b>91</b>
--------------	-----------





# Chapter 1

## Data Structure Index

### 1.1 Data Structures

Here are the data structures with brief descriptions:

<b>AiBest</b>	5
<b>AiCoefs</b>	6
<b>Board</b>	7
<b>Candidate</b>	8
<b>Piece</b>	9
<b>PieceQueue</b>	10
<b>PieceShape</b>	11
<b>State</b>	12



## Chapter 2

# File Index

### 2.1 File List

Here is a list of all files with brief descriptions:

src/ <b>tAltris.c</b>	
Main file . . . . .	77
src/ai/genetic/ <b>candidate.c</b>	
No description . . . . .	15
src/ai/genetic/ <b>candidate.h</b>	
No description . . . . .	17
src/ai/genetic/ <b>core.c</b>	
Core of the genetic algorithm . . . . .	19
src/ai/genetic/ <b>core.h</b>	
Core of the genetic algorithm . . . . .	20
src/ai/genetic/ <b>engine.c</b>	
Engine for the genetic algorithm . . . . .	21
src/ai/genetic/ <b>engine.h</b>	
Engine for the genetic algorithm . . . . .	23
src/ai/genetic/ <b>tools.c</b>	
Tools for the genetic algorithm . . . . .	26
src/ai/genetic/ <b>tools.h</b>	
Tools for the genetic algorithm . . . . .	28
src/debug/ <b>debug.h</b>	
Debug . . . . .	31
src/debug/engine/ <b>debug_state.c</b>	
Debug state . . . . .	32
src/debug/engine/ <b>debug_state.h</b>	
Debug state . . . . .	34
src/engine/ <b>angle.h</b>	
Angle . . . . .	37
src/engine/ <b>board.c</b>	
<b>Board</b> (p. 7) . . . . .	38
src/engine/ <b>board.h</b>	
<b>Board</b> (p. 7) . . . . .	41
src/engine/ <b>cell.h</b>	
Cell . . . . .	44
src/engine/ <b>input.h</b>	
Input . . . . .	46
src/engine/ <b>motion.c</b>	
Motion . . . . .	47

src/engine/ <b>motion.h</b>	
Motion . . . . .	49
src/engine/ <b>score.c</b>	
Scoring system . . . . .	67
src/engine/ <b>score.h</b>	
Scoring system . . . . .	68
src/engine/ <b>state.c</b>	
<b>State</b> (p. 12) . . . . .	71
src/engine/ <b>state.h</b>	
<b>State</b> (p. 12) . . . . .	74
src/engine/piece/ <b>piece.c</b>	
<b>Piece</b> (p. 9) . . . . .	52
src/engine/piece/ <b>piece.h</b>	
<b>Piece</b> (p. 9) . . . . .	53
src/engine/piece/ <b>piece_queue.c</b>	
<b>Piece</b> (p. 9) queue . . . . .	56
src/engine/piece/ <b>piece_queue.h</b>	
<b>Piece</b> (p. 9) queue . . . . .	58
src/engine/piece/ <b>piece_shape.h</b>	
<b>Piece</b> (p. 9) shape . . . . .	60
src/engine/piece/ <b>piece_type.h</b>	
<b>Piece</b> (p. 9) type . . . . .	62
src/engine/piece/ <b>seven_bag.c</b>	
7-Bag generator . . . . .	64
src/engine/piece/ <b>seven_bag.h</b>	
7-Bag generator . . . . .	65
src/utls/ <b>ansi_code.h</b>	
ANSI escape code . . . . .	78
src/utls/ <b>random.h</b>	
Random number generation . . . . .	86
src/utls/ <b>safe_op.h</b>	
Safe operations . . . . .	87

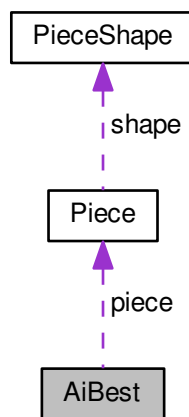
## Chapter 3

# Data Structure Documentation

### 3.1 AiBest Struct Reference

```
#include <engine.h>
```

Collaboration diagram for AiBest:



#### Data Fields

- **Piece \* piece**
- double **score**

#### 3.1.1 Field Documentation

#### 3.1.1.1 piece

**Piece\*** piece

#### 3.1.1.2 score

double score

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

- src/ai/genetic/ **engine.h**

## 3.2 AiCoefs Struct Reference

```
#include <engine.h>
```

### Data Fields

- double **agg\_height**
- double **holes**
- double **clears**
- double **bumpiness**

### 3.2.1 Field Documentation

#### 3.2.1.1 agg\_height

double agg\_height

#### 3.2.1.2 bumpiness

double bumpiness

#### 3.2.1.3 clears

```
double clears
```

#### 3.2.1.4 holes

```
double holes
```

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

- src/ai/genetic/ **engine.h**

## 3.3 Board Struct Reference

```
#include <board.h>
```

### Data Fields

- int **width**
- int **height**
- **Cell** \* **cells**

### 3.3.1 Field Documentation

#### 3.3.1.1 cells

```
Cell* cells
```

#### 3.3.1.2 height

```
int height
```

### 3.3.1.3 width

```
int width
```

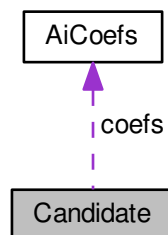
The documentation for this struct was generated from the following file:

- src/engine/ **board.h**

## 3.4 Candidate Struct Reference

```
#include <candidate.h>
```

Collaboration diagram for Candidate:



### Data Fields

- **AiCoefs** \* **coefs**
- double **fitness**

### 3.4.1 Field Documentation

#### 3.4.1.1 coefs

**AiCoefs**\* coefs



### 3.4.1.2 fitness

```
double fitness
```

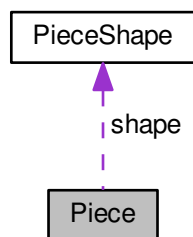
The documentation for this struct was generated from the following file:

- `src/ai/genetic/ candidate.h`

## 3.5 Piece Struct Reference

```
#include <piece.h>
```

Collaboration diagram for Piece:



### Data Fields

- **PieceType** type
- `const PieceShape * shape`
- `int x`
- `int y`
- **Angle** angle

### 3.5.1 Field Documentation

#### 3.5.1.1 angle

**Angle** angle

### 3.5.1.2 shape

```
const PieceShape* shape
```

### 3.5.1.3 type

```
PieceType type
```

### 3.5.1.4 x

```
int x
```

### 3.5.1.5 y

```
int y
```

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

- src/engine/piece/ **piece.h**

## 3.6 PieceQueue Struct Reference

```
#include <piece_queue.h>
```

### Data Fields

- unsigned int **seed**
- size\_t **length**
- **PieceType** \* **data**

### 3.6.1 Field Documentation

#### 3.6.1.1 data

```
PieceType* data
```

### 3.6.1.2 length

```
size_t length
```

### 3.6.1.3 seed

```
unsigned int seed
```

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

- src/engine/piece/ **piece\_queue.h**

## 3.7 PieceShape Struct Reference

```
#include <piece_shape.h>
```

### Data Fields

- int **shape** [ **ANGLE\_ESIZE**][ **PIECE\_SHAPE\_HEIGHT**][ **PIECE\_SHAPE\_WIDTH**]
- Cell **fill**

### 3.7.1 Field Documentation

#### 3.7.1.1 fill

```
Cell fill
```

#### 3.7.1.2 shape

```
int shape[ ANGLE_ESIZE][ PIECE_SHAPE_HEIGHT][ PIECE_SHAPE_WIDTH]
```

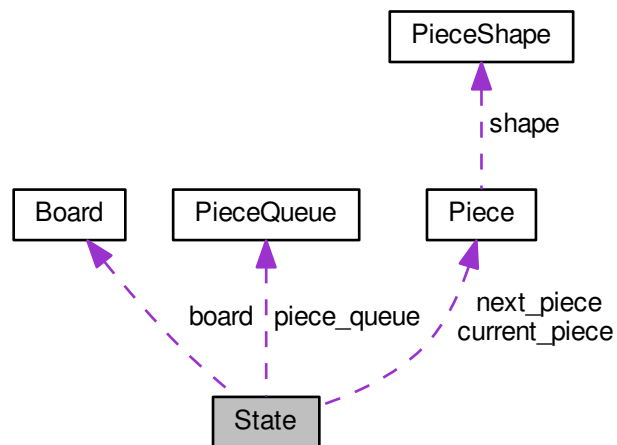
The documentation for this struct was generated from the following file:

- src/engine/piece/ **piece\_shape.h**

### 3.8 State Struct Reference

```
#include <state.h>
```

Collaboration diagram for State:



#### Data Fields

- unsigned int **score**
- unsigned int **level**
- unsigned int **broken\_lines**
- unsigned int **step**
- unsigned int **input\_counts**
- **Board \* board**
- **PieceQueue \* piece\_queue**
- size\_t **piece\_queue\_index**
- **Piece \* current\_piece**
- **Piece \* next\_piece**

#### 3.8.1 Field Documentation

##### 3.8.1.1 board

```
Board* board
```

### 3.8.1.2 broken\_lines

unsigned int broken\_lines

### 3.8.1.3 current\_piece

**Piece\*** current\_piece

### 3.8.1.4 input\_counts

unsigned int input\_counts

### 3.8.1.5 level

unsigned int level

### 3.8.1.6 next\_piece

**Piece\*** next\_piece

### 3.8.1.7 piece\_queue

**PieceQueue\*** piece\_queue

### 3.8.1.8 piece\_queue\_index

size\_t piece\_queue\_index

### 3.8.1.9 score

unsigned int score

### 3.8.1.10 step

unsigned int step

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

- src/engine/ **state.h**



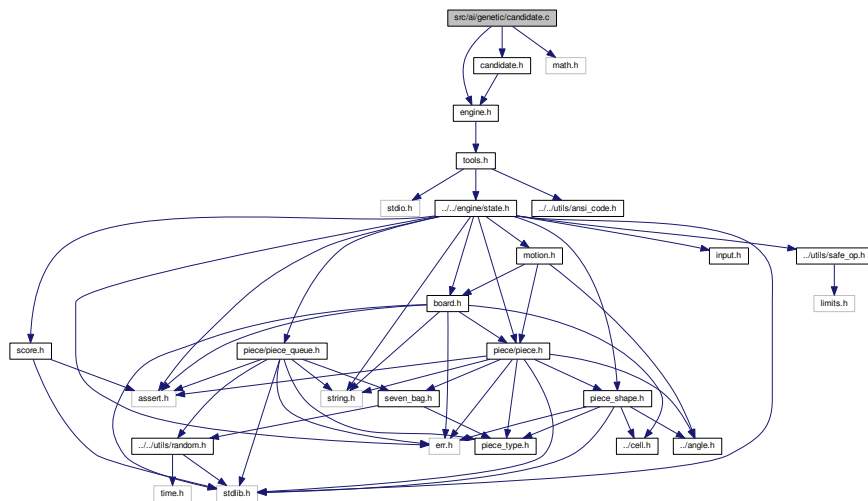
## Chapter 4

# File Documentation

### 4.1 src/ai/genetic/candidate.c File Reference

No description.

```
#include "candidate.h"  
#include "math.h"  
#include "engine.h"  
Include dependency graph for candidate.c:
```



### Functions

- **Candidate \*** `genetic_candidate_create_random ()`
- **Candidate \*** `genetic_candidate_create ()`
- void `genetic_candidate_free (Candidate *candidate)`
- void `genetic_candidate_normalize (Candidate *candidate)`
- **Candidate \*** `genetic_candidate_crossover (Candidate *cdt1, Candidate *cdt2)`
- void `genetic_candidate_mutate (Candidate *cdt)`

### 4.1.1 Detailed Description

No description.

Author

S4MasterRace

Version

2.0

### 4.1.2 Function Documentation

#### 4.1.2.1 genetic\_candidate\_create()

```
Candidate* genetic_candidate_create ( )
```

#### 4.1.2.2 genetic\_candidate\_create\_random()

```
Candidate* genetic_candidate_create_random ( )
```

#### 4.1.2.3 genetic\_candidate\_crossover()

```
Candidate* genetic_candidate_crossover (
    Candidate * cdt1,
    Candidate * cdt2 )
```

#### 4.1.2.4 genetic\_candidate\_free()

```
void genetic_candidate_free (
    Candidate * candidate )
```

#### 4.1.2.5 genetic\_candidate\_mutate()

```
void genetic_candidate_mutate (
    Candidate * cdt )
```



## 4.1.2.6 genetic\_candidate\_normalize()

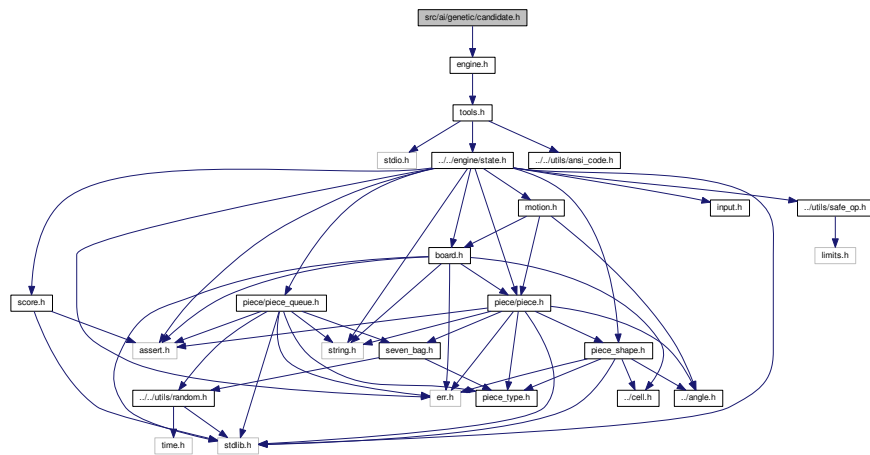
```
void genetic_candidate_normalize (
    Candidate * candidate )
```

## 4.2 src/ai/genetic/candidate.h File Reference

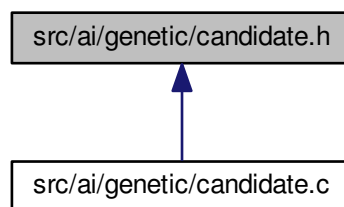
No description.

```
#include "engine.h"
```

Include dependency graph for candidate.h:



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



## Data Structures

- struct **Candidate**

## Functions

- **Candidate** \* **genetic\_candidate\_create** ( )
- void **genetic\_candidate\_free** ( **Candidate** \*candidate)
- void **genetic\_candidate\_normalize** ( **Candidate** \*candidate)
- **Candidate** \* **genetic\_candidate\_crossover** ( **Candidate** \*cdt1, **Candidate** \*cdt2)
- void **genetic\_candidate\_mutate** ( **Candidate** \*cdt)

### 4.2.1 Detailed Description

No description.

#### Author

S4MasterRace

#### Version

2.0

### 4.2.2 Function Documentation

#### 4.2.2.1 **genetic\_candidate\_create()**

```
Candidate* genetic_candidate_create ( )
```

#### 4.2.2.2 **genetic\_candidate\_crossover()**

```
Candidate* genetic_candidate_crossover (
    Candidate * cdt1,
    Candidate * cdt2 )
```

#### 4.2.2.3 **genetic\_candidate\_free()**

```
void genetic_candidate_free (
    Candidate * candidate )
```

## 4.2.2.4 genetic\_candidate\_mutate()

```
void genetic_candidate_mutate (
    Candidate * cdt )
```

## 4.2.2.5 genetic\_candidate\_normalize()

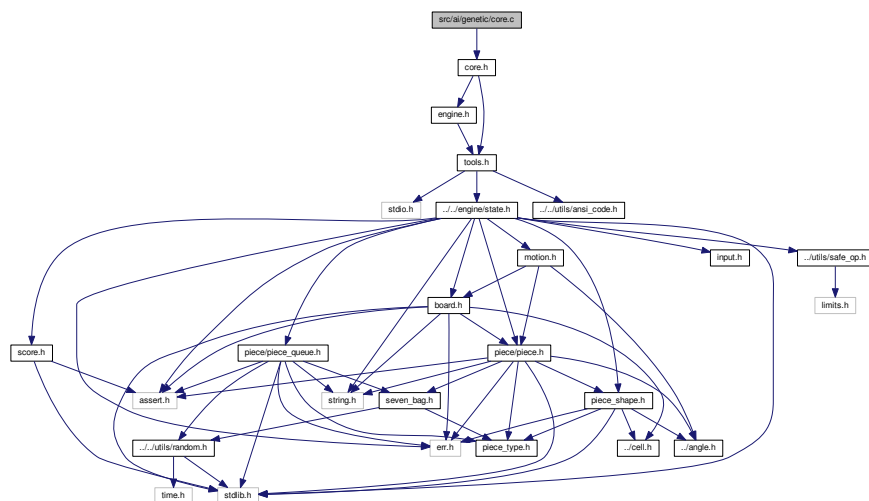
```
void genetic_candidate_normalize (
    Candidate * candidate )
```

## 4.3 src/ai/genetic/core.c File Reference

Core of the genetic algorithm.

```
#include "core.h"
```

Include dependency graph for core.c:



## Functions

- void **genetic\_show\_stats** ( **State** \*state)

## 4.3.1 Detailed Description

Core of the genetic algorithm.

Author

S4MasterRace

Version

2.0

### 4.3.2 Function Documentation

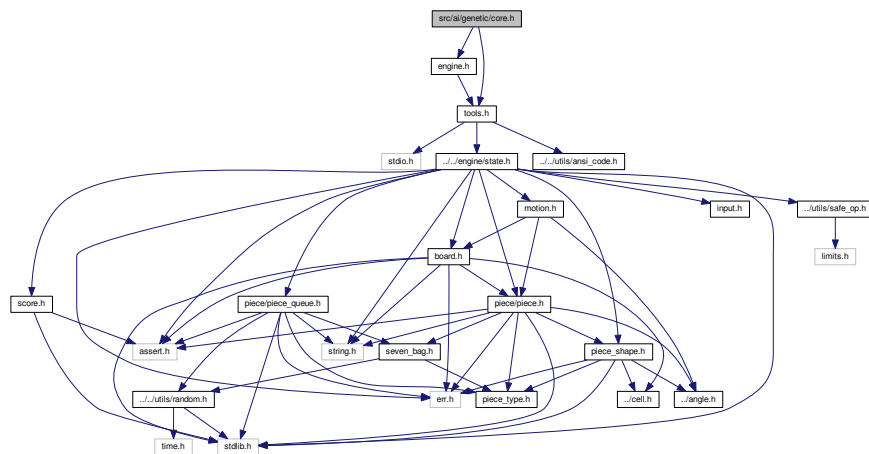
#### 4.3.2.1 genetic\_show\_stats()

```
void genetic_show_stats (
    State * state )
```

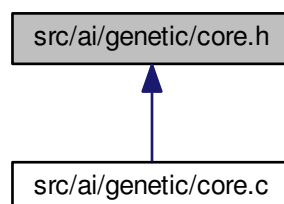
## 4.4 src/ai/genetic/core.h File Reference

Core of the genetic algorithm.

```
#include "engine.h"
#include "tools.h"
Include dependency graph for core.h:
```



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



## Functions

- void **genetic\_show\_stats** ( **State** \*state)

### 4.4.1 Detailed Description

Core of the genetic algorithm.

Author

S4MasterRace

Version

2.0

### 4.4.2 Function Documentation

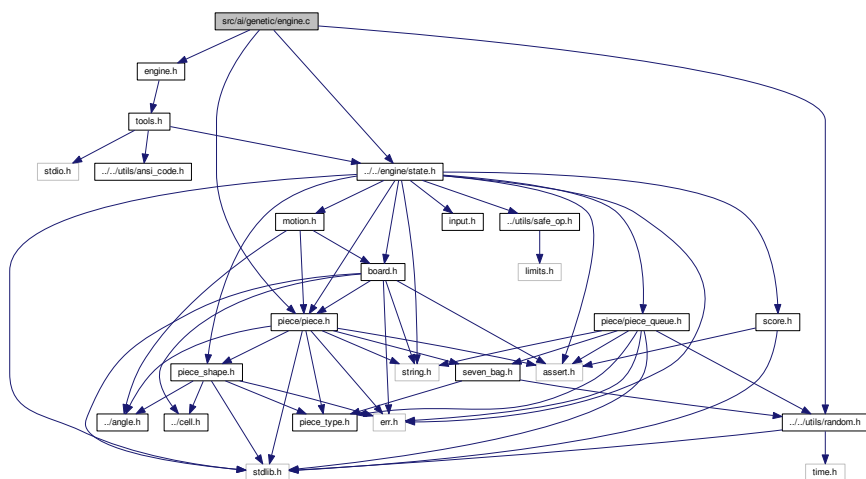
#### 4.4.2.1 genetic\_show\_stats()

```
void genetic_show_stats (
    State * state )
```

## 4.5 src/ai/genetic/engine.c File Reference

Engine for the genetic algorithm.

```
#include "engine.h"
#include "../../utils/random.h"
#include "../../engine/state.h"
#include "../../engine/piece/piece.h"
Include dependency graph for engine.c:
```



## Functions

- double **genetic\_get\_rank** ( *State* \*state)
- *AiCoefs* \* **genetic\_coefs\_get** ()
- *AiCoefs* \* **genetic\_aicoefs\_random** ()
- void **genetic\_aicoefs\_free** ( *AiCoefs* \*coefs)
- *AiBest* \* **genetic\_aibest\_create** ( *Piece* \*p, double s)
- void **genetic\_aibest\_free** ( *AiBest* \*ab)
- *AiBest* \* **\_genetic\_best** ( *State* \*state, int workingPiecelIdx)
- *Piece* \* **genetic\_best** ( *State* \*state)

### 4.5.1 Detailed Description

Engine for the genetic algorithm.

Author

S4MasterRace

Version

2.0

### 4.5.2 Function Documentation

#### 4.5.2.1 \_genetic\_best()

```
AiBest* _genetic_best (
    State * state,
    int workingPieceIdx )
```

#### 4.5.2.2 genetic\_aibest\_create()

```
AiBest* genetic_aibest_create (
    Piece * p,
    double s )
```

#### 4.5.2.3 genetic\_aibest\_free()

```
void genetic_aibest_free (
    AiBest * ab )
```

## 4.5.2.4 genetic\_aicoefs\_free()

```
void genetic_aicoefs_free (
    AiCoefs * coefs )
```

## 4.5.2.5 genetic\_aicoefs\_random()

```
AiCoefs* genetic_aicoefs_random ( )
```

## 4.5.2.6 genetic\_best()

```
Piece* genetic_best (
    State * state )
```

## 4.5.2.7 genetic\_coefs\_get()

```
AiCoefs* genetic_coefs_get ( )
```

## 4.5.2.8 genetic\_get\_rank()

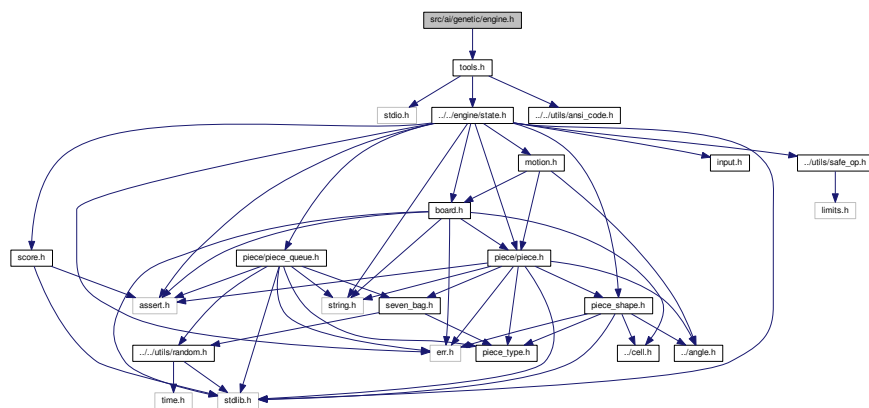
```
double genetic_get_rank (
    State * state )
```

## 4.6 src/ai/genetic/engine.h File Reference

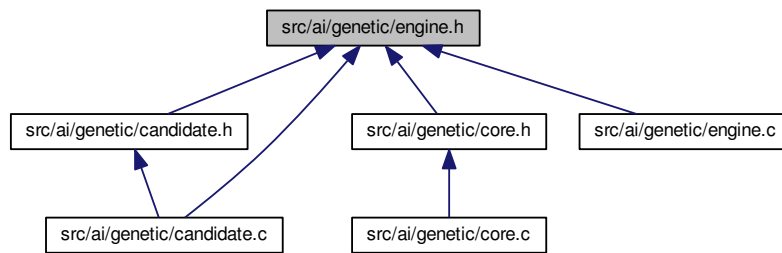
Engine for the genetic algorithm.

```
#include "tools.h"
```

Include dependency graph for engine.h:



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



## Data Structures

- struct **AiBest**
- struct **AiCoefs**

## Functions

- double **genetic\_get\_rank** ( **State** \*state)
- **AiCoefs** \* **genetic\_coefs\_get** ()
- **AiCoefs** \* **genetic\_aicoefs\_random** ()
- void **genetic\_aicoefs\_free** ( **AiCoefs** \*coefs)
- **AiBest** \* **genetic\_aibest\_create** ( **Piece** \*p, double s)
- void **genetic\_aibest\_free** ( **AiBest** \*ab)

### 4.6.1 Detailed Description

Engine for the genetic algorithm.

#### Author

S4MasterRace

#### Version

2.0

### 4.6.2 Function Documentation



#### 4.6.2.1 genetic\_aibest\_create()

```
AiBest* genetic_aibest_create (
    Piece * p,
    double s )
```

#### 4.6.2.2 genetic\_aibest\_free()

```
void genetic_aibest_free (
    AiBest * ab )
```

#### 4.6.2.3 genetic\_aicoefs\_free()

```
void genetic_aicoefs_free (
    AiCoefs * coefs )
```

#### 4.6.2.4 genetic\_aicoefs\_random()

```
AiCoefs* genetic_aicoefs_random ( )
```

#### 4.6.2.5 genetic\_coefs\_get()

```
AiCoefs* genetic_coefs_get ( )
```

#### 4.6.2.6 genetic\_get\_rank()

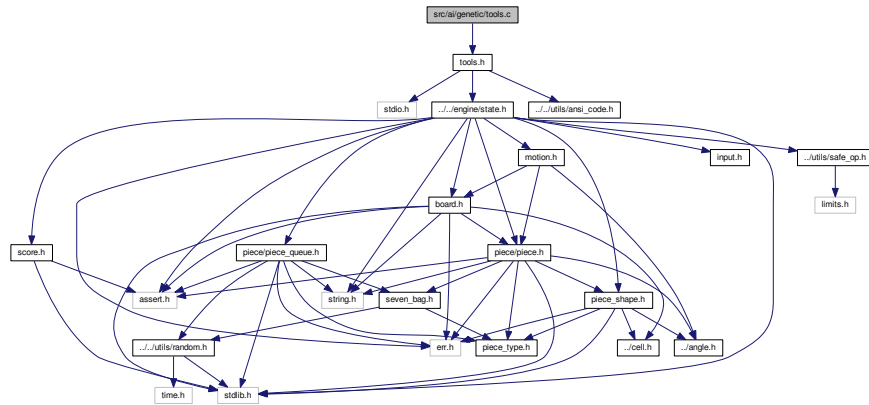
```
double genetic_get_rank (
    State * state )
```

## 4.7 src/ai/genetic/tools.c File Reference

Tools for the genetic algorithm.

```
#include "tools.h"
```

Include dependency graph for tools.c:



### Functions

- void **board\_heights** (const **Board** \*brd, int \*heights)
- int **board\_height** (const **Board** \*brd, int x)
- int **bumpiness** (const **Board** \*brd)
- int **aggregate\_height** (const **Board** \*brd)
- int **hole** (const **Board** \*brd, int x)
- int **holes** (const **Board** \*brd)
- int **clears** (const **Board** \*brd)
- void **show\_features** (const **Board** \*brd)

### 4.7.1 Detailed Description

Tools for the genetic algorithm.

Author

S4MasterRace

Version

2.0

### 4.7.2 Function Documentation

#### 4.7.2.1 aggregate\_height()

```
int aggregate_height (
    const Board * brd )
```

#### 4.7.2.2 board\_height()

```
int board_height (
    const Board * brd,
    int x )
```

#### 4.7.2.3 board\_heights()

```
void board_heights (
    const Board * brd,
    int * heights )
```

#### 4.7.2.4 bumpiness()

```
int bumpiness (
    const Board * brd )
```

#### 4.7.2.5 clears()

```
int clears (
    const Board * brd )
```

#### 4.7.2.6 hole()

```
int hole (
    const Board * brd,
    int x )
```

## 4.7.2.7 holes()

```
int holes (
    const Board * brd )
```

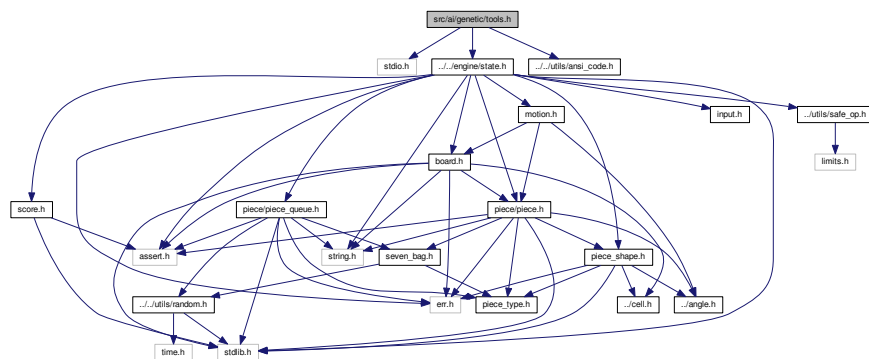
## 4.7.2.8 show\_features()

```
void show_features (
    const Board * brd )
```

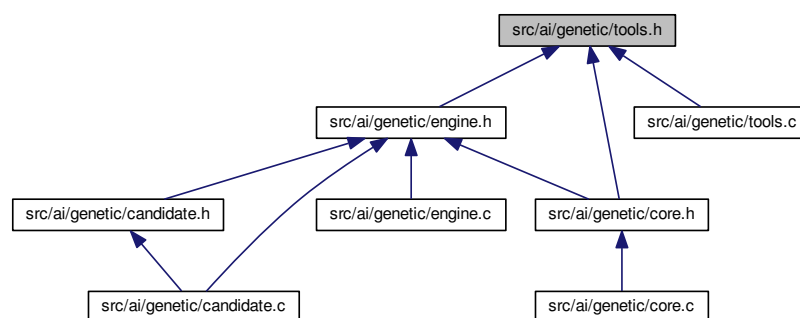
## 4.8 src/ai/genetic/tools.h File Reference

Tools for the genetic algorithm.

```
#include <stdio.h>
#include "../engine/state.h"
#include "../utils/ansi_code.h"
Include dependency graph for tools.h:
```



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



## Macros

- `#define ABS(X) (((X) < 0) ? (-1 * (X)) : (X))`

## Functions

- `int board_height (const Board *brd, int x)`
- `void board_heights (const Board *brd, int *heights)`
- `int bumpiness (const Board *brd)`
- `int aggregate_height (const Board *brd)`
- `int hole (const Board *brd, int x)`
- `int holes (const Board *brd)`
- `size_t coalescent_clears (const Board *brd)`
- `int clears (const Board *brd)`
- `void show_features (const Board *brd)`

### 4.8.1 Detailed Description

Tools for the genetic algorithm.

#### Author

S4MasterRace

#### Version

2.0

### 4.8.2 Macro Definition Documentation

#### 4.8.2.1 ABS

```
#define ABS(  
    X ) ((X) < 0) ? (-1 * (X)) : (X)
```

### 4.8.3 Function Documentation

#### 4.8.3.1 aggregate\_height()

```
int aggregate_height (  
    const Board * brd )
```

#### 4.8.3.2 board\_height()

```
int board_height (
    const Board * brd,
    int x )
```

#### 4.8.3.3 board\_heights()

```
void board_heights (
    const Board * brd,
    int * heights )
```

#### 4.8.3.4 bumpiness()

```
int bumpiness (
    const Board * brd )
```

#### 4.8.3.5 clears()

```
int clears (
    const Board * brd )
```

#### 4.8.3.6 coalescent\_clears()

```
size_t coalescent_clears (
    const Board * brd )
```

#### 4.8.3.7 hole()

```
int hole (
    const Board * brd,
    int x )
```

## 4.8.3.8 holes()

```
int holes (
    const Board * brd )
```

## 4.8.3.9 show\_features()

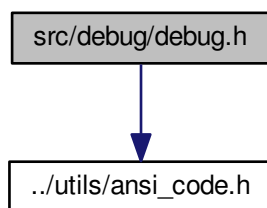
```
void show_features (
    const Board * brd )
```

## 4.9 src/debug/debug.h File Reference

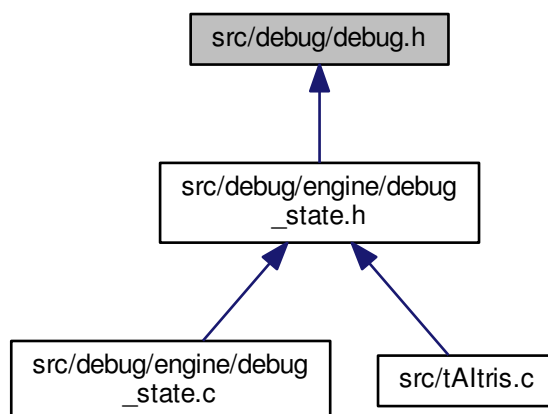
Debug.

```
#include "../utils/ansi_code.h"
```

Include dependency graph for debug.h:



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



- #define **DEBUG\_TAG**(\_name\_, \_color\_)

Debug.

## S4MasterRace

2.0

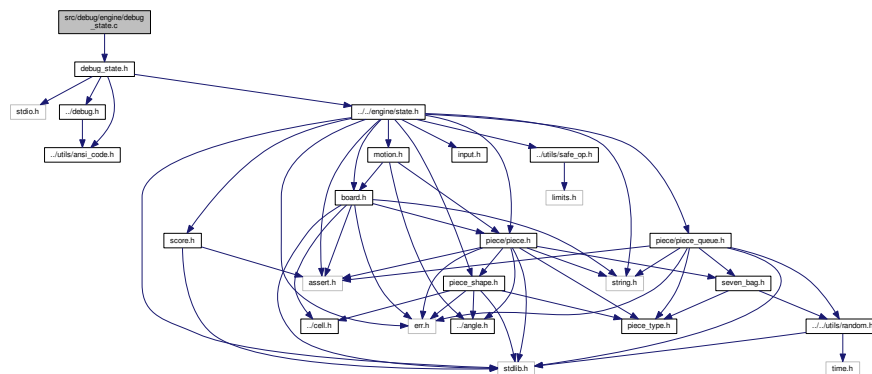
#### 4.9.2.1 DEBUG\_TAG

**Value:**

#### 4.10 src/debug/engine/debug\_state.c File Reference

```
#include "debug_state.h"
```

Include dependency graph for debug\_state.c:





## Functions

- void **debug\_state\_print\_line\_number** (const **Board** \*brd, int y)
- void **debug\_state\_print\_cell** ( **Cell** c)
- void **debug\_state\_print\_infos** (const **State** \*state, int y)
- void **debug\_state\_print\_next\_piece** (const **Piece** \*pc, int y)
- void **debug\_state\_print** (const **State** \*state)

### 4.10.1 Detailed Description

Debug state.

Author

S4MasterRace

Version

2.0

### 4.10.2 Function Documentation

#### 4.10.2.1 debug\_state\_print()

```
void debug_state_print (
    const State * state )
```

#### 4.10.2.2 debug\_state\_print\_cell()

```
void debug_state_print_cell (
    Cell c )
```

#### 4.10.2.3 debug\_state\_print\_infos()

```
void debug_state_print_infos (
    const State * state,
    int y )
```

#### 4.10.2.4 debug\_state\_print\_line\_number()

```
void debug_state_print_line_number (
    const Board * brd,
    int y )
```

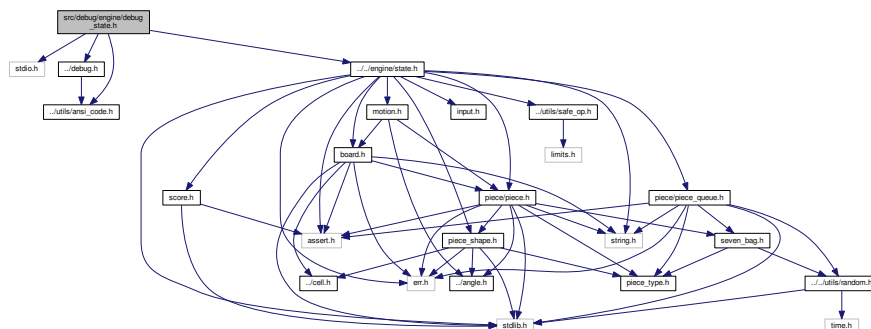
#### 4.10.2.5 debug\_state\_print\_next\_piece()

```
void debug_state_print_next_piece (
    const Piece * pc,
    int y )
```

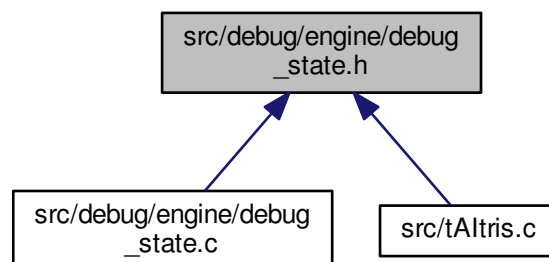
### 4.11 src/debug/engine/debug\_state.h File Reference

Debug state.

```
#include <stdio.h>
#include "../debug.h"
#include "../../engine/state.h"
#include "../../utils/ansi_code.h"
Include dependency graph for debug_state.h:
```



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



## Macros

- `#define DEBUG_STATE_NAME "State"`
- `#define DEBUG_STATE_COLOR ANSI_FG_MAGENTA`
- `#define DEBUG_STATE_TAG DEBUG_TAG( DEBUG_STATE_NAME, DEBUG_STATE_COLOR)`

## Functions

- void **debug\_state\_print\_line\_number** (const **Board** \*brd, int y)
- void **debug\_state\_print\_cell** ( **Cell** c)
- void **debug\_state\_print\_infos** (const **State** \*state, int y)
- void **debug\_state\_print\_next\_piece** (const **Piece** \*pc, int y)
- void **debug\_state\_print** (const **State** \*state)

### 4.11.1 Detailed Description

Debug state.

#### Author

S4MasterRace

#### Version

2.0

### 4.11.2 Macro Definition Documentation

#### 4.11.2.1 **DEBUG\_STATE\_COLOR**

```
#define DEBUG_STATE_COLOR ANSI_FG_MAGENTA
```

#### 4.11.2.2 **DEBUG\_STATE\_NAME**

```
#define DEBUG_STATE_NAME "State"
```

#### 4.11.2.3 **DEBUG\_STATE\_TAG**

```
#define DEBUG_STATE_TAG DEBUG_TAG( DEBUG_STATE_NAME, DEBUG_STATE_COLOR)
```

### 4.11.3 Function Documentation

#### 4.11.3.1 debug\_state\_print()

```
void debug_state_print (
    const State * state )
```

#### 4.11.3.2 debug\_state\_print\_cell()

```
void debug_state_print_cell (
    Cell c )
```

#### 4.11.3.3 debug\_state\_print\_infos()

```
void debug_state_print_infos (
    const State * state,
    int y )
```

#### 4.11.3.4 debug\_state\_print\_line\_number()

```
void debug_state_print_line_number (
    const Board * brd,
    int y )
```

#### 4.11.3.5 debug\_state\_print\_next\_piece()

```
void debug_state_print_next_piece (
    const Piece * pc,
    int y )
```



## 4.12.2 Macro Definition Documentation

### 4.12.2.1 ANGLE\_ESIZE

```
#define ANGLE_ESIZE 4
```

## 4.12.3 Enumeration Type Documentation

### 4.12.3.1 Angle

```
enum Angle
```

Enumerator

ANGLE_UP	
ANGLE_RIGHT	
ANGLE_DOWN	
ANGLE_LEFT	

### 4.12.3.2 Rotation

```
enum Rotation
```

Enumerator

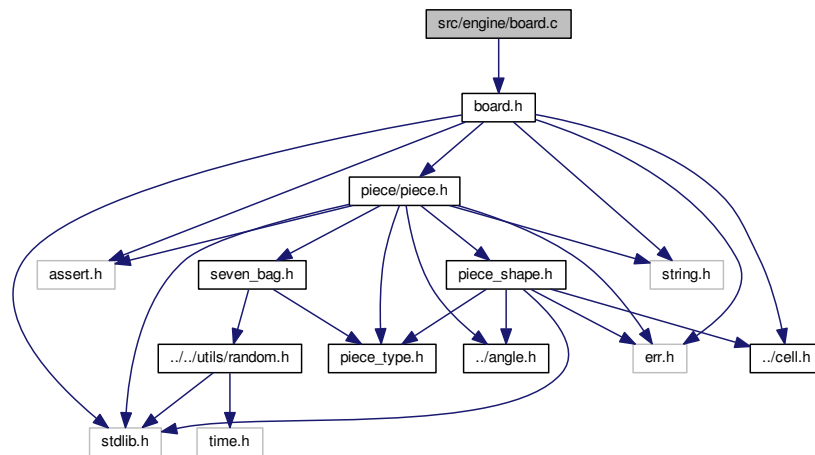
ROTATE_LEFT	
ROTATE_RIGHT	

## 4.13 src/engine/board.c File Reference

**Board** (p. 7).

```
#include "board.h"
```

Include dependency graph for board.c:



## Functions

- **Board \*** **board\_create** (int width, int height)
- void **board\_init** ( **Board** \*brd)
- void **board\_free** ( **Board** \*brd)
- **Board \*** **board\_copy** ( **Board** \*brd)
- size\_t **board\_get\_completed\_lines** (const **Board** \*brd, int \*hist)
- void **board\_break\_lines** ( **Board** \*brd, const int \*hist)
- int **board\_merge\_piece** ( **Board** \*brd, const **Piece** \*pc)

### 4.13.1 Detailed Description

**Board** (p. 7).

Author

S4MasterRace

Version

2.0

### 4.13.2 Function Documentation

#### 4.13.2.1 board\_break\_lines()

```
void board_break_lines (
    Board * brd,
    const int * hist )
```

#### 4.13.2.2 board\_copy()

```
Board* board_copy (
    Board * brd )
```

#### 4.13.2.3 board\_create()

```
Board* board_create (
    int width,
    int height )
```

#### 4.13.2.4 board\_free()

```
void board_free (
    Board * brd )
```

#### 4.13.2.5 board\_get\_completed\_lines()

```
size_t board_get_completed_lines (
    const Board * brd,
    int * hist )
```

#### 4.13.2.6 board\_init()

```
void board_init (
    Board * brd )
```



## 4.13.2.7 board\_merge\_piece()

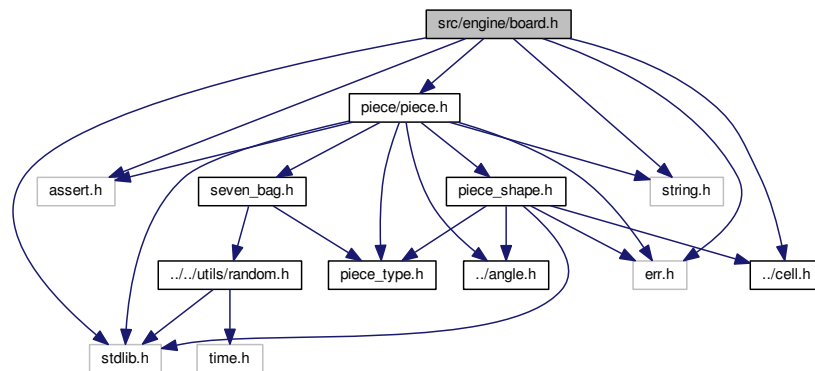
```
int board_merge_piece (
    Board * brd,
    const Piece * pc )
```

## 4.14 src/engine/board.h File Reference

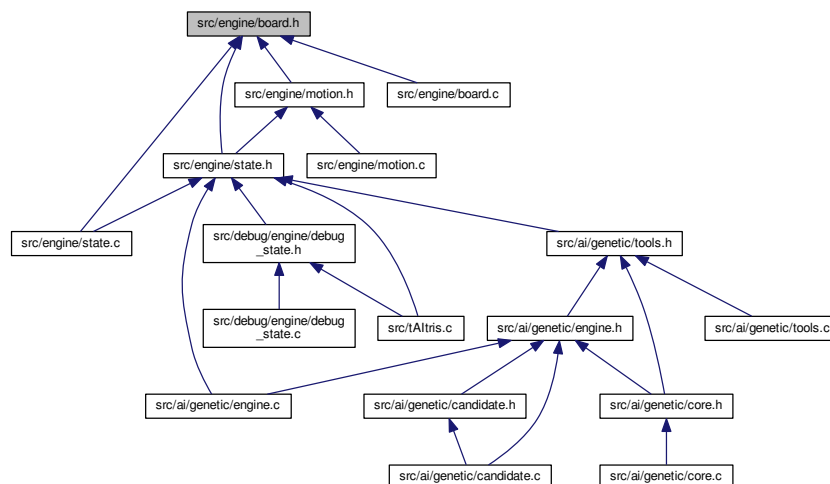
**Board** (p. 7).

```
#include <stdlib.h>
#include <assert.h>
#include <string.h>
#include <err.h>
#include "piece/piece.h"
#include "cell.h"
```

Include dependency graph for board.h:



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



## Data Structures

- struct **Board**

## Macros

- `#define BOARD_WIDTH 10`
- `#define BOARD_HEIGHT 20`
- `#define BOARD_HIDDEN 2`
- `#define board_reverse_y(_brd_, _y_) ((_brd_)->height - 1 - (_y_))`

## Functions

- **Board** \* **board\_create** (int width, int height)
- void **board\_init** ( **Board** \*brd)
- void **board\_free** ( **Board** \*brd)
- **Board** \* **board\_copy** ( **Board** \*brd)
- size\_t **board\_get\_completed\_lines** (const **Board** \*brd, int \*hist)
- void **board\_break\_lines** ( **Board** \*brd, const int \*hist)
- int **board\_merge\_piece** ( **Board** \*brd, const **Piece** \*pc)

### 4.14.1 Detailed Description

**Board** (p. 7).

#### Author

S4MasterRace

#### Version

2.0

### 4.14.2 Macro Definition Documentation

#### 4.14.2.1 BOARD\_HEIGHT

```
#define BOARD_HEIGHT 20
```

#### 4.14.2.2 BOARD\_HIDDEN

```
#define BOARD_HIDDEN 2
```

#### 4.14.2.3 board\_reverse\_y

```
#define board_reverse_y(  
    _brd_,  
    _y_ ) ((_brd_)->height - 1 - (_y_))
```

#### 4.14.2.4 BOARD\_WIDTH

```
#define BOARD_WIDTH 10
```

### 4.14.3 Function Documentation

#### 4.14.3.1 board\_break\_lines()

```
void board_break_lines (  
    Board * brd,  
    const int * hist )
```

#### 4.14.3.2 board\_copy()

```
Board* board_copy (  
    Board * brd )
```

#### 4.14.3.3 board\_create()

```
Board* board_create (  
    int width,  
    int height )
```

#### 4.14.3.4 board\_free()

```
void board_free (  
    Board * brd )
```

#### 4.14.3.5 board\_get\_completed\_lines()

```
size_t board_get_completed_lines (
    const Board * brd,
    int * hist )
```

#### 4.14.3.6 board\_init()

```
void board_init (
    Board * brd )
```

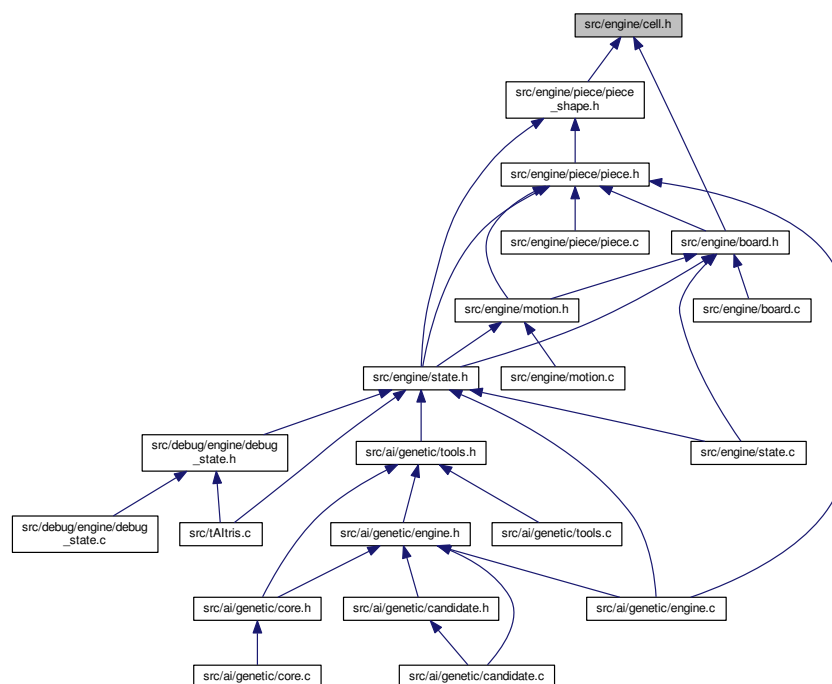
#### 4.14.3.7 board\_merge\_piece()

```
int board_merge_piece (
    Board * brd,
    const Piece * pc )
```

### 4.15 src/engine/cell.h File Reference

Cell.

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



## Macros

- `#define CELL_ESIZE 8`

## Enumerations

- `enum Cell {  
CELL_EMPTY, CELL_CYAN, CELL_YELLOW, CELL_PURPLE,  
CELL_GREEN, CELL_RED, CELL_BLUE, CELL_ORANGE }`

### 4.15.1 Detailed Description

Cell.

Author

S4MasterRace

Version

2.0

### 4.15.2 Macro Definition Documentation

#### 4.15.2.1 CELL\_ESIZE

```
#define CELL_ESIZE 8
```

### 4.15.3 Enumeration Type Documentation

#### 4.15.3.1 Cell

```
enum Cell
```

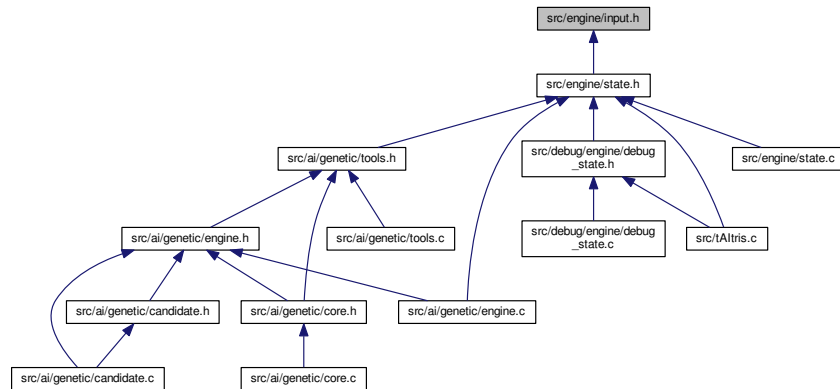
Enumerator

CELL_EMPTY	
CELL_CYAN	
CELL_YELLOW	
CELL_PURPLE	
CELL_GREEN	
CELL_RED	
CELL_BLUE	
CELL_ORANGE	

## 4.16 src/engine/input.h File Reference

Input.

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



### Macros

- `#define INPUT_ESIZE 6`

### Enumerations

- `enum Input {  
INPUT_MOVE_LEFT, INPUT_MOVE_RIGHT, INPUT_ROTATE_RIGHT, INPUT_ROTATE_LEFT,  
INPUT_SOFT_DROP, INPUT_HARD_DROP }`

#### 4.16.1 Detailed Description

Input.

Author

S4MasterRace

Version

2.0

#### 4.16.2 Macro Definition Documentation

## 4.16.2.1 INPUT\_ESIZE

```
#define INPUT_ESIZE 6
```

## 4.16.3 Enumeration Type Documentation

## 4.16.3.1 Input

```
enum Input
```

Enumerator

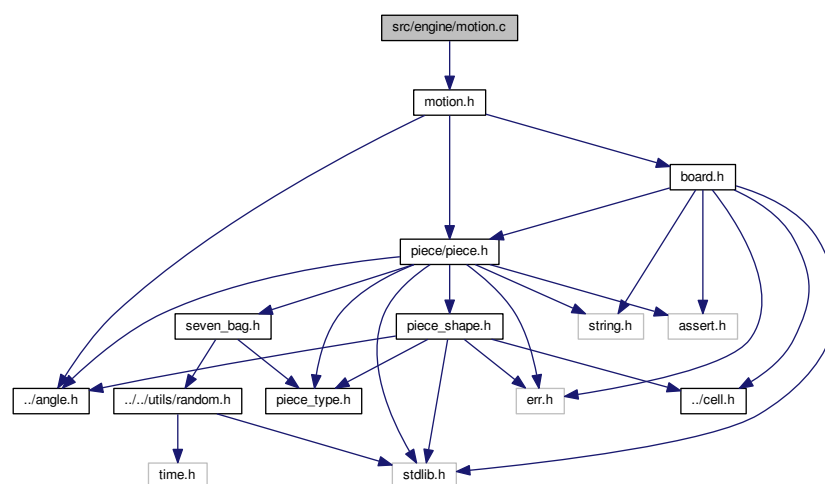
INPUT_MOVE_LEFT	
INPUT_MOVE_RIGHT	
INPUT_ROTATE_RIGHT	
INPUT_ROTATE_LEFT	
INPUT_SOFT_DROP	
INPUT_HARD_DROP	

## 4.17 src/engine/motion.c File Reference

Motion.

```
#include "motion.h"
```

Include dependency graph for motion.c:



## Functions

- int **motion\_is\_valid** (const **Piece** \*pc, const **Board** \*brd)
- int **motion\_try\_move** ( **Piece** \*pc, const **Board** \*brd, int dx, int dy)
- int **motion\_try\_down** ( **Piece** \*pc, const **Board** \*brd)
- int **motion\_try\_rotate** ( **Piece** \*pc, const **Board** \*brd, **Rotation** r)
- int **motion\_can\_move** (const **Piece** \*pc, const **Board** \*brd, int dx, int dy)
- int **motion\_can\_rotate** (const **Piece** \*pc, const **Board** \*brd, **Rotation** r)

### 4.17.1 Detailed Description

Motion.

Author

S4MasterRace

Version

2.0

### 4.17.2 Function Documentation

#### 4.17.2.1 motion\_can\_move()

```
int motion_can_move (
    const Piece * pc,
    const Board * brd,
    int dx,
    int dy )
```

#### 4.17.2.2 motion\_can\_rotate()

```
int motion_can_rotate (
    const Piece * pc,
    const Board * brd,
    Rotation r )
```

#### 4.17.2.3 motion\_is\_valid()

```
int motion_is_valid (
    const Piece * pc,
    const Board * brd )
```



## 4.17.2.4 motion\_try\_down()

```
int motion_try_down (
    Piece * pc,
    const Board * brd )
```

## 4.17.2.5 motion\_try\_move()

```
int motion_try_move (
    Piece * pc,
    const Board * brd,
    int dx,
    int dy )
```

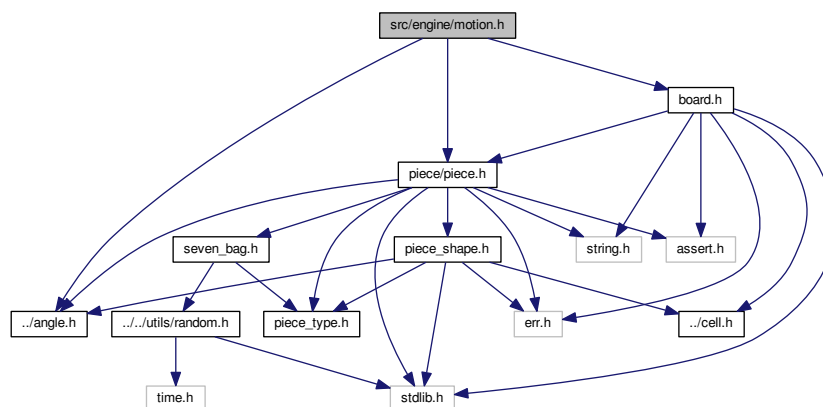
## 4.17.2.6 motion\_try\_rotate()

```
int motion_try_rotate (
    Piece * pc,
    const Board * brd,
    Rotation r )
```

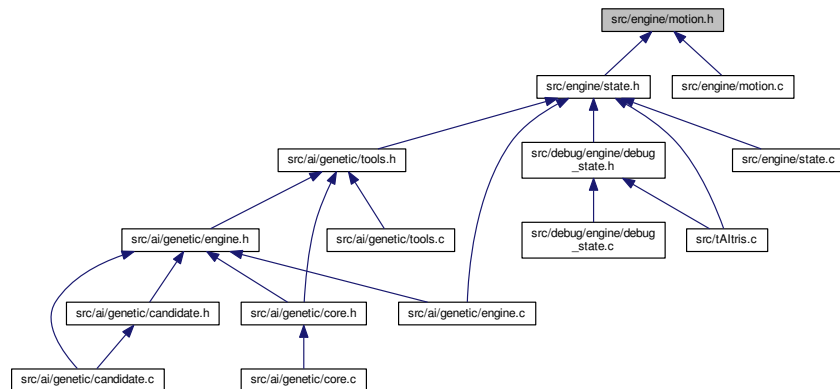
## 4.18 src/engine/motion.h File Reference

Motion.

```
#include "piece/piece.h"
#include "board.h"
#include "angle.h"
Include dependency graph for motion.h:
```



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



## Functions

- int **motion\_is\_valid** (const **Piece** \*pc, const **Board** \*brd)
- int **motion\_try\_move** ( **Piece** \*pc, const **Board** \*brd, int dx, int dy)
- int **motion\_try\_rotate** ( **Piece** \*pc, const **Board** \*brd, **Rotation** r)
- int **motion\_try\_down** ( **Piece** \*pc, const **Board** \*brd)
- int **motion\_can\_move** (const **Piece** \*pc, const **Board** \*brd, int dx, int dy)
- int **motion\_can\_rotate** (const **Piece** \*pc, const **Board** \*brd, **Rotation** r)

### 4.18.1 Detailed Description

Motion.

Author

S4MasterRace

Version

2.0

### 4.18.2 Function Documentation

#### 4.18.2.1 motion\_can\_move()

```

int motion_can_move (
    const Piece * pc,
    const Board * brd,
    int dx,
    int dy )
  
```

## 4.18.2.2 motion\_can\_rotate()

```
int motion_can_rotate (
    const Piece * pc,
    const Board * brd,
    Rotation r )
```

## 4.18.2.3 motion\_is\_valid()

```
int motion_is_valid (
    const Piece * pc,
    const Board * brd )
```

## 4.18.2.4 motion\_try\_down()

```
int motion_try_down (
    Piece * pc,
    const Board * brd )
```

## 4.18.2.5 motion\_try\_move()

```
int motion_try_move (
    Piece * pc,
    const Board * brd,
    int dx,
    int dy )
```

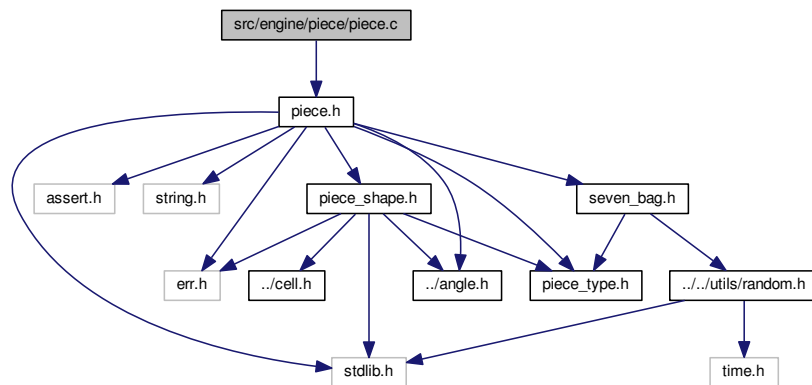
## 4.18.2.6 motion\_try\_rotate()

```
int motion_try_rotate (
    Piece * pc,
    const Board * brd,
    Rotation r )
```

## 4.19 src/engine/piece/piece.c File Reference

**Piece** (p. 9).

```
#include "piece.h"
Include dependency graph for piece.c:
```



### Functions

- **Piece \* piece\_create** ( **PieceType** type, int x, int y, **Angle** angle)
- void **piece\_free** ( **Piece** \*pc)
- **Piece \* piece\_copy** (const **Piece** \*pc)
- **Piece \* piece\_random** (int x, int y, **Angle** angle)

### 4.19.1 Detailed Description

**Piece** (p. 9).

Author

S4MasterRace

Version

2.0

### 4.19.2 Function Documentation

## 4.19.2.1 piece\_copy()

```
Piece* piece_copy (
    const Piece * pc )
```

## 4.19.2.2 piece\_create()

```
Piece* piece_create (
    PieceType type,
    int x,
    int y,
    Angle angle )
```

## 4.19.2.3 piece\_free()

```
void piece_free (
    Piece * pc )
```

## 4.19.2.4 piece\_random()

```
Piece* piece_random (
    int x,
    int y,
    Angle angle )
```

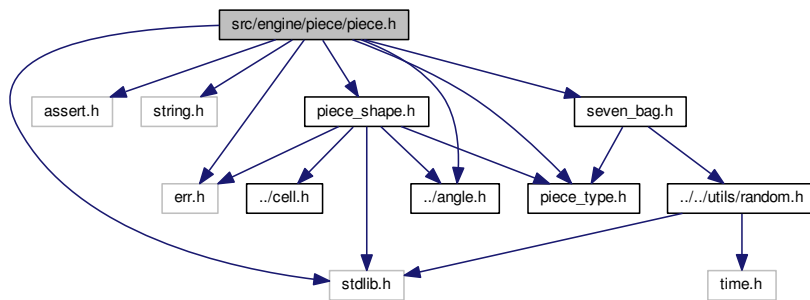
## 4.20 src/engine/piece/piece.h File Reference

**Piece** (p. 9).

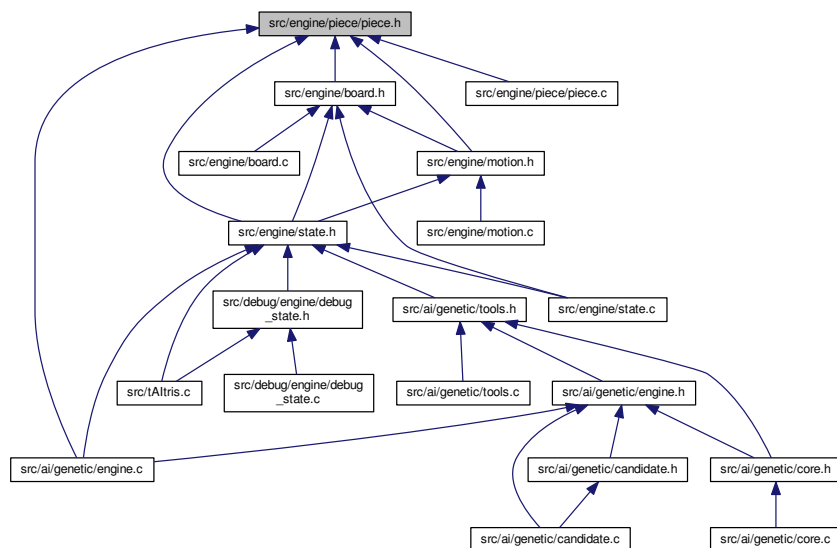
```
#include <stdlib.h>
#include <assert.h>
#include <string.h>
#include <err.h>
#include "piece_type.h"
#include "piece_shape.h"
#include "../angle.h"
```

```
#include "seven_bag.h"
```

Include dependency graph for piece.h:



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



## Data Structures

- struct **Piece**

## Functions

- **Piece** \* **piece\_create** ( **PieceType** type, int x, int y, **Angle** angle)
- void **piece\_free** ( **Piece** \*pc)
- **Piece** \* **piece\_copy** (const **Piece** \*pc)
- **Piece** \* **piece\_random** (int x, int y, **Angle** angle)

### 4.20.1 Detailed Description

**Piece** (p. 9).

Author

S4MasterRace

Version

2.0

### 4.20.2 Function Documentation

#### 4.20.2.1 piece\_copy()

```
Piece* piece_copy (
    const Piece * pc )
```

#### 4.20.2.2 piece\_create()

```
Piece* piece_create (
    PieceType type,
    int x,
    int y,
    Angle angle )
```

#### 4.20.2.3 piece\_free()

```
void piece_free (
    Piece * pc )
```

#### 4.20.2.4 piece\_random()

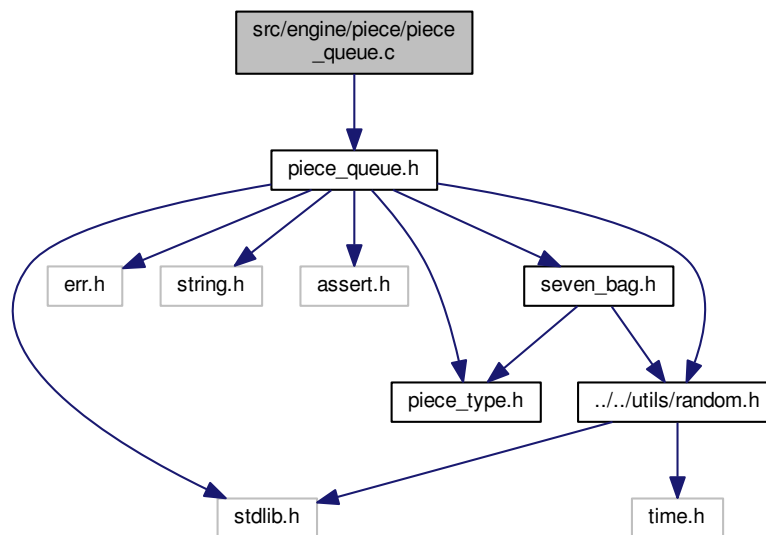
```
Piece* piece_random (
    int x,
    int y,
    Angle angle )
```

## 4.21 src/engine/piece/piece\_queue.c File Reference

**Piece** (p. 9) queue.

```
#include "piece_queue.h"
```

Include dependency graph for piece\_queue.c:



### Functions

- **PieceQueue \* piece\_queue\_create** (unsigned int seed)
- void **piece\_queue\_free** ( PieceQueue \*q)
- void **piece\_queue\_fill\_data** ( PieceType \*data, size\_t length)
- void **piece\_queue\_extend** ( PieceQueue \*q)
- **PieceType piece\_queue\_get** ( PieceQueue \*q, size\_t index)

### 4.21.1 Detailed Description

**Piece** (p. 9) queue.

Author

S4MasterRace

Version

2.0



## 4.21.2 Function Documentation

### 4.21.2.1 piece\_queue\_create()

```
PieceQueue* piece_queue_create (
    unsigned int seed )
```

### 4.21.2.2 piece\_queue\_extend()

```
void piece_queue_extend (
    PieceQueue * q )
```

### 4.21.2.3 piece\_queue\_fill\_data()

```
void piece_queue_fill_data (
    PieceType * data,
    size_t length )
```

### 4.21.2.4 piece\_queue\_free()

```
void piece_queue_free (
    PieceQueue * q )
```

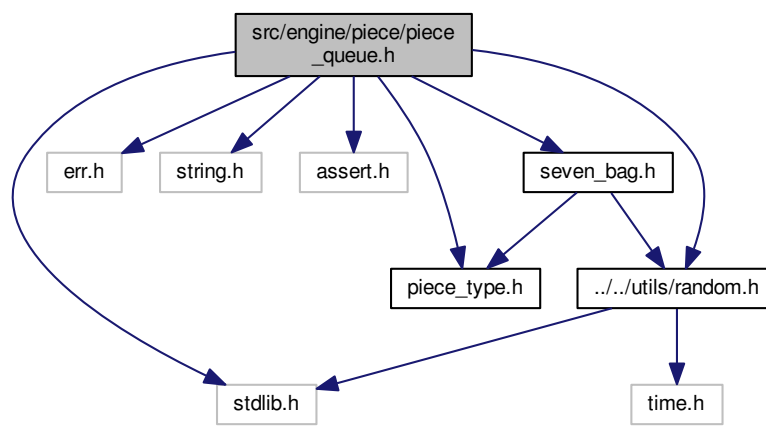
### 4.21.2.5 piece\_queue\_get()

```
PieceType piece_queue_get (
    PieceQueue * q,
    size_t index )
```

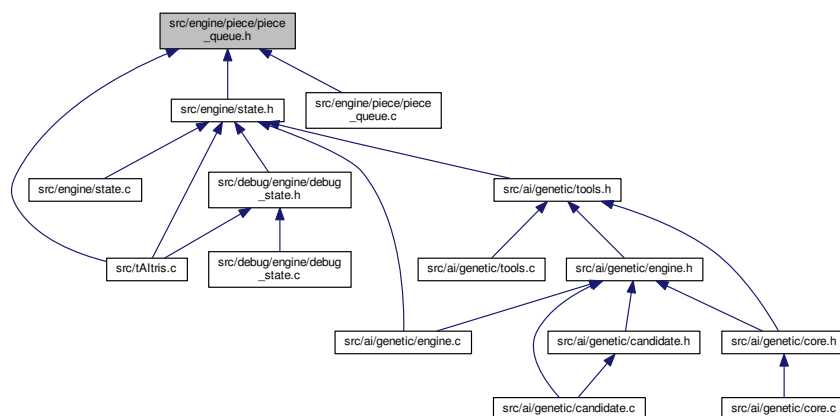
## 4.22 src/engine/piece/piece\_queue.h File Reference

**Piece** (p. 9) queue.

```
#include <stdlib.h>
#include <err.h>
#include <string.h>
#include <assert.h>
#include "piece_type.h"
#include "seven_bag.h"
#include "../../utils/random.h"
Include dependency graph for piece_queue.h:
```



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



### Data Structures

- struct **PieceQueue**

## Macros

- `#define PIECE_QUEUE_LENGTH 100`

## Functions

- **PieceQueue** \* **piece\_queue\_create** (unsigned int seed)
- void **piece\_queue\_free** ( **PieceQueue** \*q)
- void **piece\_queue\_fill\_data** ( **PieceType** \*data, size\_t length)
- void **piece\_queue\_extend** ( **PieceQueue** \*q)
- **PieceType** **piece\_queue\_get** ( **PieceQueue** \*q, size\_t index)

### 4.22.1 Detailed Description

**Piece** (p. 9) queue.

#### Author

S4MasterRace

#### Version

2.0

### 4.22.2 Macro Definition Documentation

#### 4.22.2.1 **PIECE\_QUEUE\_LENGTH**

```
#define PIECE_QUEUE_LENGTH 100
```

### 4.22.3 Function Documentation

#### 4.22.3.1 **piece\_queue\_create()**

```
PieceQueue* piece_queue_create (  
    unsigned int seed )
```

#### 4.22.3.2 piece\_queue\_extend()

```
void piece_queue_extend (  
    PieceQueue * q )
```

#### 4.22.3.3 piece\_queue\_fill\_data()

```
void piece_queue_fill_data (  
    PieceType * data,  
    size_t length )
```

#### 4.22.3.4 piece\_queue\_free()

```
void piece_queue_free (  
    PieceQueue * q )
```

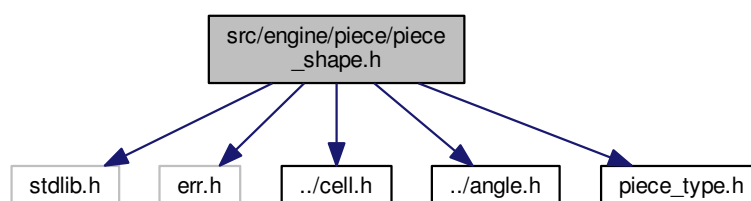
#### 4.22.3.5 piece\_queue\_get()

```
PieceType piece_queue_get (  
    PieceQueue * q,  
    size_t index )
```

### 4.23 src/engine/piece/piece\_shape.h File Reference

**Piece** (p. 9) shape.

```
#include <stdlib.h>  
#include <err.h>  
#include "../cell.h"  
#include "../angle.h"  
#include "piece_type.h"  
Include dependency graph for piece_shape.h:
```





#### 4.23.2.1 PIECE\_SHAPE\_HEIGHT

```
#define PIECE_SHAPE_HEIGHT 4
```

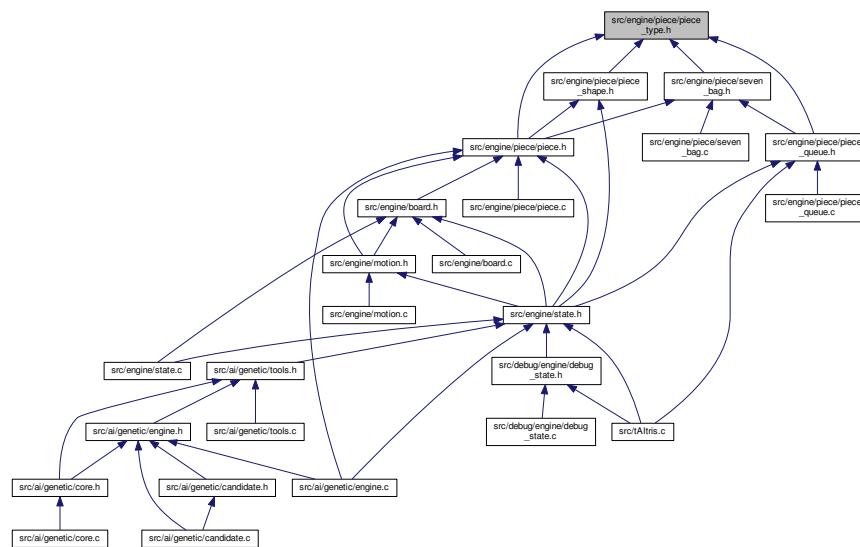
#### 4.23.2.2 PIECE\_SHAPE\_WIDTH

```
#define PIECE_SHAPE_WIDTH 4
```

### 4.24 src/engine/piece/piece\_type.h File Reference

**Piece** (p. 9) type.

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



### Macros

- `#define PIECE_TYPE_ESIZE 7`

### Enumerations

- `enum PieceType {  
 PIECE_TYPE_I, PIECE_TYPE_O, PIECE_TYPE_T, PIECE_TYPE_L,  
 PIECE_TYPE_J, PIECE_TYPE_Z, PIECE_TYPE_S }`

### 4.24.1 Detailed Description

**Piece** (p. 9) type.

Author

S4MasterRace

Version

2.0

### 4.24.2 Macro Definition Documentation

#### 4.24.2.1 PIECE\_TYPE\_ESIZE

```
#define PIECE_TYPE_ESIZE 7
```

### 4.24.3 Enumeration Type Documentation

#### 4.24.3.1 PieceType

enum **PieceType**

Enumerator

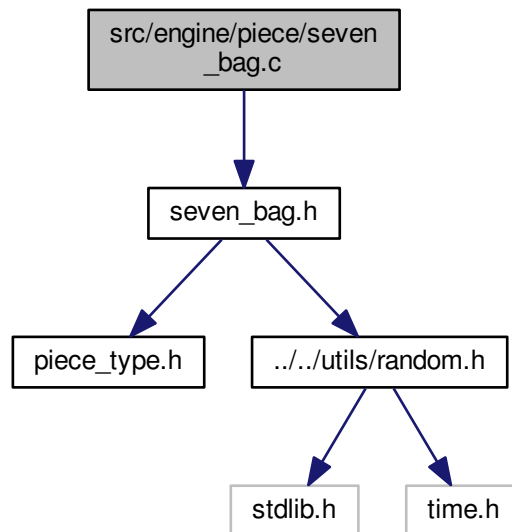
PIECE_TYPE_I	
PIECE_TYPE_O	
PIECE_TYPE_T	
PIECE_TYPE_L	
PIECE_TYPE_J	
PIECE_TYPE_Z	
PIECE_TYPE_S	

## 4.25 src/engine/piece/seven\_bag.c File Reference

7-Bag generator

```
#include "seven_bag.h"
```

Include dependency graph for seven\_bag.c:



### Functions

- void **seven\_bag\_init** ( **PieceType** \*bag)
- void **seven\_bag\_swap** ( **PieceType** \*a, **PieceType** \*b)
- void **seven\_bag\_shuffle** ( **PieceType** \*bag)
- **PieceType** **seven\_bag\_draw** ()

### 4.25.1 Detailed Description

7-Bag generator

Author

S4MasterRace

Version

2.0



## 4.25.2 Function Documentation

### 4.25.2.1 seven\_bag\_draw()

```
PieceType seven_bag_draw ( )
```

### 4.25.2.2 seven\_bag\_init()

```
void seven_bag_init (
    PieceType * bag )
```

### 4.25.2.3 seven\_bag\_shuffle()

```
void seven_bag_shuffle (
    PieceType * bag )
```

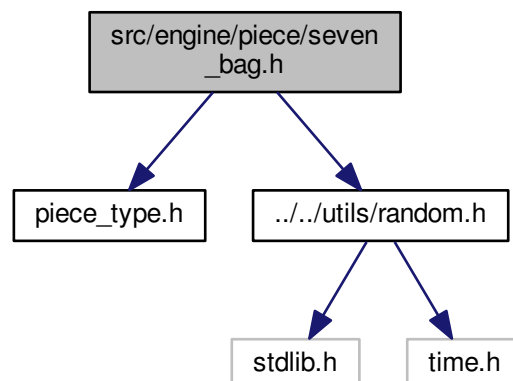
### 4.25.2.4 seven\_bag\_swap()

```
void seven_bag_swap (
    PieceType * a,
    PieceType * b )
```

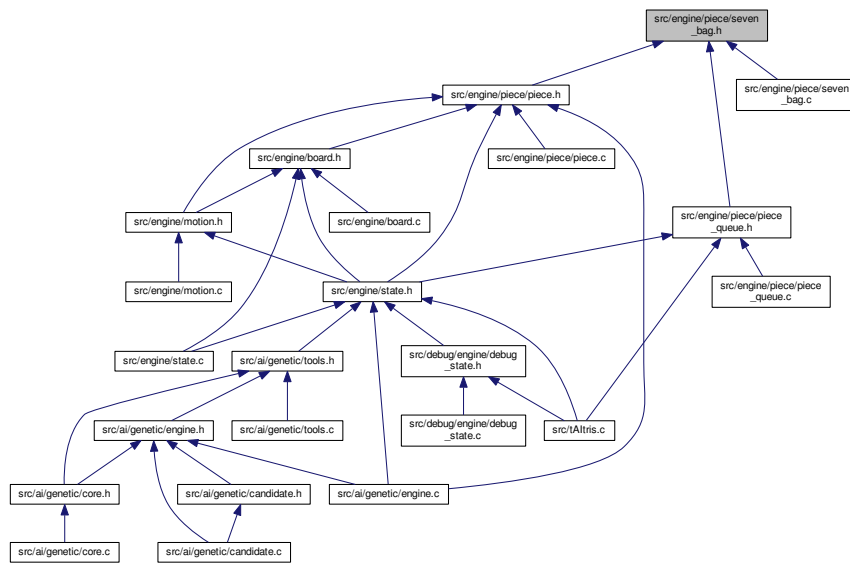
## 4.26 src/engine/piece/seven\_bag.h File Reference

7-Bag generator

```
#include "piece_type.h"
#include "../utils/random.h"
Include dependency graph for seven_bag.h:
```



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



## Functions

- void **seven\_bag\_init** ( **PieceType** \*bag)
- void **seven\_bag\_swap** ( **PieceType** \*a, **PieceType** \*b)
- void **seven\_bag\_shuffle** ( **PieceType** \*bag)
- **PieceType** **seven\_bag\_draw** ( )

### 4.26.1 Detailed Description

7-Bag generator

Author

S4MasterRace

Version

2.0

### 4.26.2 Function Documentation

#### 4.26.2.1 seven\_bag\_draw()

**PieceType** **seven\_bag\_draw** ( )

## 4.26.2.2 seven\_bag\_init()

```
void seven_bag_init (
    PieceType * bag )
```

## 4.26.2.3 seven\_bag\_shuffle()

```
void seven_bag_shuffle (
    PieceType * bag )
```

## 4.26.2.4 seven\_bag\_swap()

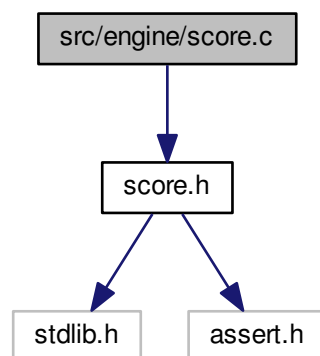
```
void seven_bag_swap (
    PieceType * a,
    PieceType * b )
```

## 4.27 src/engine/score.c File Reference

Scoring system.

```
#include "score.h"
```

Include dependency graph for score.c:



## Functions

- unsigned int **score\_compute\_break** (const int hist[], size\_t len, unsigned int level)

### 4.27.1 Detailed Description

Scoring system.

Author

S4MasterRace

Version

2.0

### 4.27.2 Function Documentation

#### 4.27.2.1 `score_compute_break()`

```
unsigned int score_compute_break (  
    const int hist[],  
    size_t len,  
    unsigned int level )
```

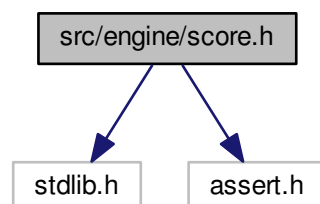
## 4.28 `src/engine/score.h` File Reference

Scoring system.

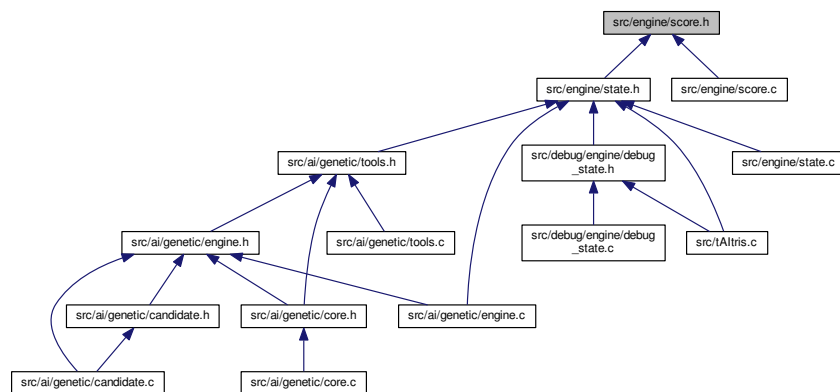
```
#include <stdlib.h>
```

```
#include <assert.h>
```

Include dependency graph for `score.h`:



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



## Macros

- `#define SCORE_SINGLE 100`
- `#define SCORE_DOUBLE 300`
- `#define SCORE_TRIPLE 500`
- `#define SCORE_TETRIS 800`
- `#define SCORE_SDROP 1`
- `#define SCORE_HDROP 2`
- `#define SCORE_LVL_PER_LINE 10`

## Functions

- unsigned int **score\_compute\_break** (const int hist[], size\_t len, unsigned int level)

### 4.28.1 Detailed Description

Scoring system.

#### Author

S4MasterRace

#### Version

2.0

### 4.28.2 Macro Definition Documentation

#### 4.28.2.1 SCORE\_DOUBLE

```
#define SCORE_DOUBLE 300
```

#### 4.28.2.2 SCORE\_HDROP

```
#define SCORE_HDROP 2
```

#### 4.28.2.3 SCORE\_LVL\_PER\_LINE

```
#define SCORE_LVL_PER_LINE 10
```

#### 4.28.2.4 SCORE\_SDROP

```
#define SCORE_SDROP 1
```

#### 4.28.2.5 SCORE\_SINGLE

```
#define SCORE_SINGLE 100
```

#### 4.28.2.6 SCORE\_TETRIS

```
#define SCORE_TETRIS 800
```

#### 4.28.2.7 SCORE\_TRIPLE

```
#define SCORE_TRIPLE 500
```

### 4.28.3 Function Documentation

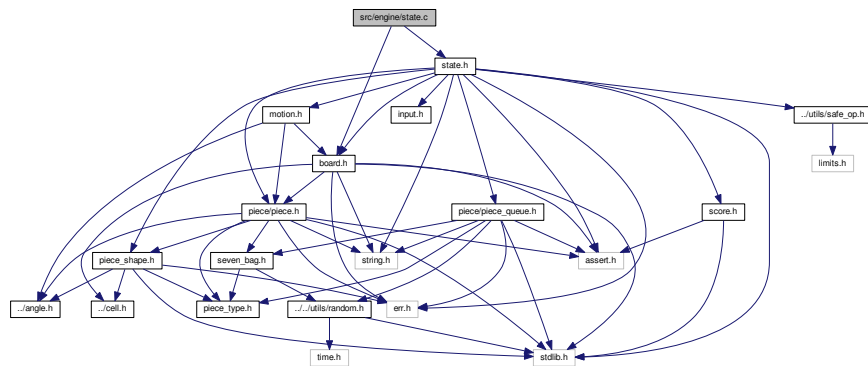
## 4.28.3.1 score\_compute\_break()

```
unsigned int score_compute_break (
    const int hist[],
    size_t len,
    unsigned int level )
```

## 4.29 src/engine/state.c File Reference

**State** (p. 12).

```
#include "state.h"
#include "board.h"
Include dependency graph for state.c:
```



## Functions

- **State \* state\_create** ()
- void **state\_init** ( State \*state, PieceQueue \*q)
- void **state\_free** ( State \*state)
- **State \* state\_copy** (const State \*state)
- **Piece \* state\_create\_piece** ( State \*state)
- void **state\_next\_piece** ( State \*state)
- int **state\_step** ( State \*state)
- int **state\_apply\_input** ( State \*state, Input input)
- int **state\_apply\_inputs** ( State \*state, Input input[], size\_t len)
- int **state\_can\_apply\_input** ( State \*state, Input input)
- int **state\_can\_apply\_inputs** ( State \*state, Input input[], size\_t len)

## 4.29.1 Detailed Description

**State** (p. 12).

**Author**

S4MasterRace

**Version**

2.0

## 4.29.2 Function Documentation

### 4.29.2.1 state\_apply\_input()

```
int state_apply_input (
    State * state,
    Input input )
```

### 4.29.2.2 state\_apply\_inputs()

```
int state_apply_inputs (
    State * state,
    Input input[],
    size_t len )
```

### 4.29.2.3 state\_can\_apply\_input()

```
int state_can_apply_input (
    State * state,
    Input input )
```

### 4.29.2.4 state\_can\_apply\_inputs()

```
int state_can_apply_inputs (
    State * state,
    Input input[],
    size_t len )
```

### 4.29.2.5 state\_copy()

```
State* state_copy (
    const State * state )
```



## 4.29.2.6 state\_create()

```
State* state_create ( )
```

## 4.29.2.7 state\_create\_piece()

```
Piece* state_create_piece (
    State * state )
```

## 4.29.2.8 state\_free()

```
void state_free (
    State * state )
```

## 4.29.2.9 state\_init()

```
void state_init (
    State * state,
    PieceQueue * q )
```

## 4.29.2.10 state\_next\_piece()

```
void state_next_piece (
    State * state )
```

## 4.29.2.11 state\_step()

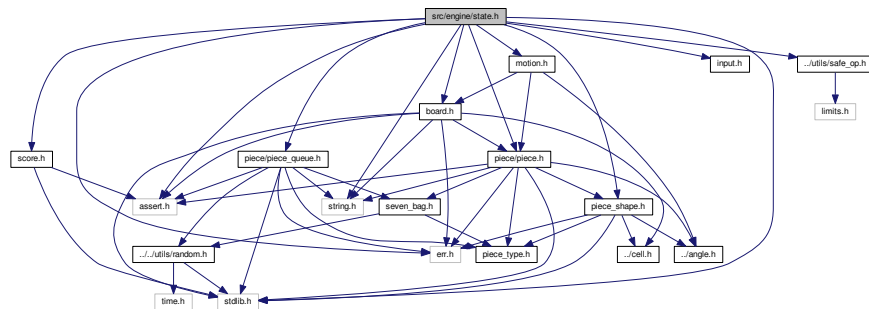
```
int state_step (
    State * state )
```

## 4.30 src/engine/state.h File Reference

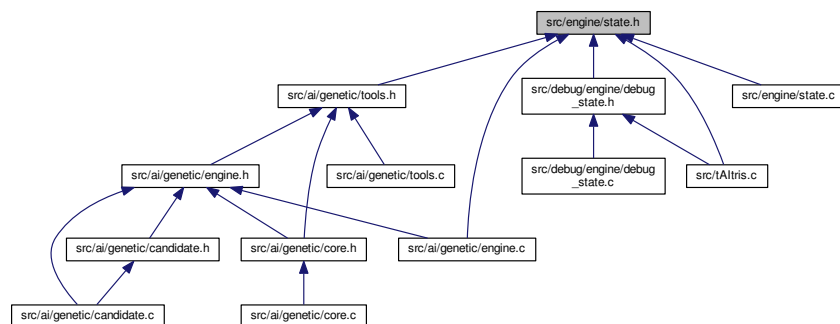
**State** (p. 12).

```
#include <stdlib.h>
#include <err.h>
#include <string.h>
#include <assert.h>
#include "board.h"
#include "piece/piece.h"
#include "piece/piece_shape.h"
#include "piece/piece_queue.h"
#include "motion.h"
#include "input.h"
#include "score.h"
#include "../utils/safe_op.h"
```

Include dependency graph for state.h:



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



## Data Structures

- struct **State**

## Functions

- **State** \* **state\_create** ()
- void **state\_init** ( **State** \*state, **PieceQueue** \*q)
- void **state\_free** ( **State** \*state)
- **State** \* **state\_copy** (const **State** \*state)
- **Piece** \* **state\_create\_piece** ( **State** \*state)
- void **state\_next\_piece** ( **State** \*state)
- int **state\_step** ( **State** \*state)
- int **state\_apply\_input** ( **State** \*state, **Input** input)
- int **state\_apply\_inputs** ( **State** \*state, **Input** input[], size\_t len)
- int **state\_can\_apply\_input** ( **State** \*state, **Input** input)
- int **state\_can\_apply\_inputs** ( **State** \*state, **Input** input[], size\_t len)

### 4.30.1 Detailed Description

**State** (p. 12).

Author

S4MasterRace

Version

2.0

### 4.30.2 Function Documentation

#### 4.30.2.1 state\_apply\_input()

```
int state_apply_input (
    State * state,
    Input input )
```

#### 4.30.2.2 state\_apply\_inputs()

```
int state_apply_inputs (
    State * state,
    Input input[],
    size_t len )
```

#### 4.30.2.3 state\_can\_apply\_input()

```
int state_can_apply_input (
    State * state,
    Input input )
```

#### 4.30.2.4 state\_can\_apply\_inputs()

```
int state_can_apply_inputs (
    State * state,
    Input input[],
    size_t len )
```

#### 4.30.2.5 state\_copy()

```
State* state_copy (
    const State * state )
```

#### 4.30.2.6 state\_create()

```
State* state_create ( )
```

#### 4.30.2.7 state\_create\_piece()

```
Piece* state_create_piece (
    State * state )
```

#### 4.30.2.8 state\_free()

```
void state_free (
    State * state )
```

#### 4.30.2.9 state\_init()

```
void state_init (
    State * state,
    PieceQueue * q )
```

#### 4.30.2.10 state\_next\_piece()

```
void state_next_piece (
    State * state )
```

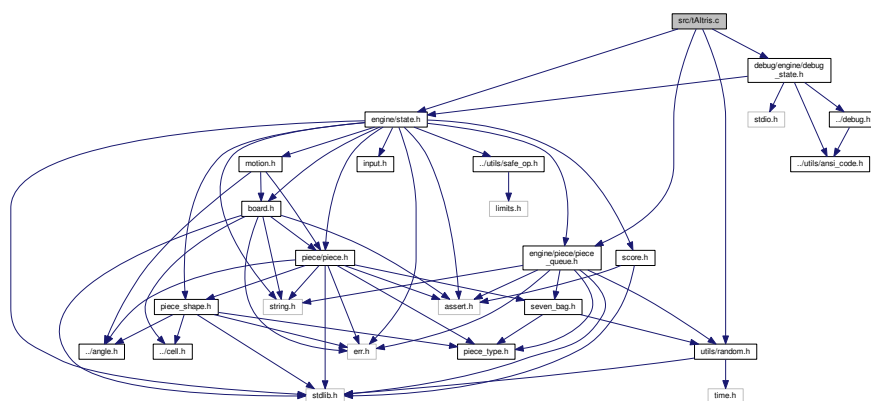
#### 4.30.2.11 state\_step()

```
int state_step (
    State * state )
```

#### 4.31 src/tAltris.c File Reference

Main file.

```
#include "utils/random.h"
#include "engine/piece/piece_queue.h"
#include "engine/state.h"
#include "debug/engine/debug_state.h"
Include dependency graph for tAltris.c:
```



## Functions

- **int main ()**

### 4.31.1 Detailed Description

Main file.

Author

S4MasterRace

Version

2.0

### 4.31.2 Function Documentation

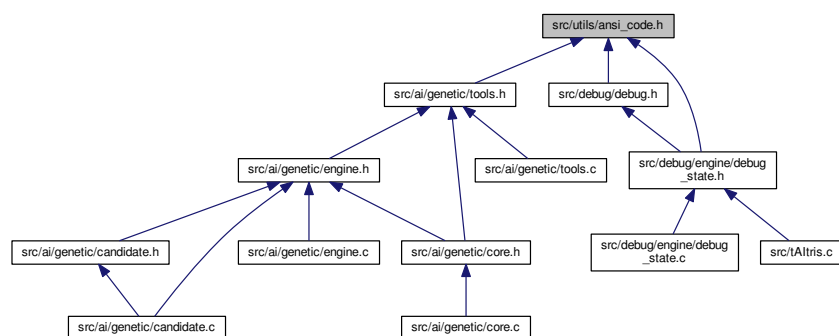
#### 4.31.2.1 main()

```
int main ( )
```

## 4.32 src/utils/ansi\_code.h File Reference

ANSI escape code.

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



## Macros

- `#define ANSI_ESC "\x1b"`
- `#define ANSI_SGR(_code_) ANSI_ESC "[" #_code_ "m"`
- `#define ANSI_RESET ANSI_SGR(0)`
- `#define ANSI_BOLD ANSI_SGR(1)`
- `#define ANSI_FAINT ANSI_SGR(2)`
- `#define ANSI_ITALIC ANSI_SGR(3)`
- `#define ANSI_UNDERLINE ANSI_SGR(4)`
- `#define ANSI_SBLINK ANSI_SGR(5)`
- `#define ANSI_RBLINK ANSI_SGR(6)`
- `#define ANSI_CROSSEDOUT ANSI_SGR(9)`
- `#define ANSI_FRAMED ANSI_SGR(51)`
- `#define ANSI_ENCIRCLED ANSI_SGR(52)`
- `#define ANSI_OVERLINED ANSI_SGR(53)`
- `#define ANSI_FG_DEFAULT ANSI_SGR(39)`
- `#define ANSI_FG_BLACK ANSI_SGR(30)`
- `#define ANSI_FG_RED ANSI_SGR(31)`
- `#define ANSI_FG_GREEN ANSI_SGR(32)`
- `#define ANSI_FG_YELLOW ANSI_SGR(33)`
- `#define ANSI_FG_BLUE ANSI_SGR(34)`
- `#define ANSI_FG_MAGENTA ANSI_SGR(35)`
- `#define ANSI_FG_CYAN ANSI_SGR(36)`
- `#define ANSI_FG_WHITE ANSI_SGR(37)`
- `#define ANSI_FG_BBLACK ANSI_SGR(90)`
- `#define ANSI_FG_BRED ANSI_SGR(91)`
- `#define ANSI_FG_BGREEN ANSI_SGR(92)`
- `#define ANSI_FG_BYELLOW ANSI_SGR(93)`
- `#define ANSI_FG_BBLUE ANSI_SGR(94)`
- `#define ANSI_FG_BMAGENTA ANSI_SGR(95)`
- `#define ANSI_FG_BCYAN ANSI_SGR(96)`
- `#define ANSI_FG_BWHITE ANSI_SGR(97)`
- `#define ANSI_BG_DEFAULT ANSI_SGR(49)`
- `#define ANSI_BG_BLACK ANSI_SGR(40)`
- `#define ANSI_BG_RED ANSI_SGR(41)`
- `#define ANSI_BG_GREEN ANSI_SGR(42)`
- `#define ANSI_BG_YELLOW ANSI_SGR(43)`
- `#define ANSI_BG_BLUE ANSI_SGR(44)`
- `#define ANSI_BG_MAGENTA ANSI_SGR(45)`
- `#define ANSI_BG_CYAN ANSI_SGR(46)`
- `#define ANSI_BG_WHITE ANSI_SGR(47)`
- `#define ANSI_BG_BBLACK ANSI_SGR(100)`
- `#define ANSI_BG_BRED ANSI_SGR(101)`
- `#define ANSI_BG_BGREEN ANSI_SGR(102)`
- `#define ANSI_BG_BYELLOW ANSI_SGR(103)`
- `#define ANSI_BG_BBLUE ANSI_SGR(104)`
- `#define ANSI_BG_BMAGENTA ANSI_SGR(105)`
- `#define ANSI_BG_BCYAN ANSI_SGR(106)`
- `#define ANSI_BG_BWHITE ANSI_SGR(107)`

### 4.32.1 Detailed Description

ANSI escape code.

Author

S4MasterRace

Version

2.0

### 4.32.2 Macro Definition Documentation

#### 4.32.2.1 ANSI\_BG\_BBLACK

```
#define ANSI_BG_BBLACK ANSI_SGR(100)
```

#### 4.32.2.2 ANSI\_BG\_BBLUE

```
#define ANSI_BG_BBLUE ANSI_SGR(104)
```

#### 4.32.2.3 ANSI\_BG\_BCYAN

```
#define ANSI_BG_BCYAN ANSI_SGR(106)
```

#### 4.32.2.4 ANSI\_BG\_BGREEN

```
#define ANSI_BG_BGREEN ANSI_SGR(102)
```

#### 4.32.2.5 ANSI\_BG\_BLACK

```
#define ANSI_BG_BLACK ANSI_SGR(40)
```



#### 4.32.2.6 ANSI\_BG\_BLUE

```
#define ANSI_BG_BLUE    ANSI_SGR(44)
```

#### 4.32.2.7 ANSI\_BG\_BMAGENTA

```
#define ANSI_BG_BMAGENTA ANSI_SGR(105)
```

#### 4.32.2.8 ANSI\_BG\_BRED

```
#define ANSI_BG_BRED    ANSI_SGR(101)
```

#### 4.32.2.9 ANSI\_BG\_BWHITE

```
#define ANSI_BG_BWHITE  ANSI_SGR(107)
```

#### 4.32.2.10 ANSI\_BG\_BYELLOW

```
#define ANSI_BG_BYELLOW ANSI_SGR(103)
```

#### 4.32.2.11 ANSI\_BG\_CYAN

```
#define ANSI_BG_CYAN    ANSI_SGR(46)
```

#### 4.32.2.12 ANSI\_BG\_DEFAULT

```
#define ANSI_BG_DEFAULT ANSI_SGR(49)
```

#### 4.32.2.13 ANSI\_BG\_GREEN

```
#define ANSI_BG_GREEN    ANSI_SGR(42)
```

#### 4.32.2.14 ANSI\_BG\_MAGENTA

```
#define ANSI_BG_MAGENTA  ANSI_SGR(45)
```

#### 4.32.2.15 ANSI\_BG\_RED

```
#define ANSI_BG_RED  ANSI_SGR(41)
```

#### 4.32.2.16 ANSI\_BG\_WHITE

```
#define ANSI_BG_WHITE  ANSI_SGR(47)
```

#### 4.32.2.17 ANSI\_BG\_YELLOW

```
#define ANSI_BG_YELLOW  ANSI_SGR(43)
```

#### 4.32.2.18 ANSI\_BOLD

```
#define ANSI_BOLD  ANSI_SGR(1)
```

#### 4.32.2.19 ANSI\_CROSSEDOUT

```
#define ANSI_CROSSEDOUT  ANSI_SGR(9)
```

#### 4.32.2.20 ANSI\_ENCIRCLED

```
#define ANSI_ENCIRCLED  ANSI_SGR(52)
```

#### 4.32.2.21 ANSI\_ESC

```
#define ANSI_ESC  "\x1b"
```

#### 4.32.2.22 ANSI\_FAINT

```
#define ANSI_FAINT ANSI_SGR(2)
```

#### 4.32.2.23 ANSI\_FG\_BBLACK

```
#define ANSI_FG_BBLACK ANSI_SGR(90)
```

#### 4.32.2.24 ANSI\_FG\_BBLUE

```
#define ANSI_FG_BBLUE ANSI_SGR(94)
```

#### 4.32.2.25 ANSI\_FG\_BCYAN

```
#define ANSI_FG_BCYAN ANSI_SGR(96)
```

#### 4.32.2.26 ANSI\_FG\_BGREEN

```
#define ANSI_FG_BGREEN ANSI_SGR(92)
```

#### 4.32.2.27 ANSI\_FG\_BLACK

```
#define ANSI_FG_BLACK ANSI_SGR(30)
```

#### 4.32.2.28 ANSI\_FG\_BLUE

```
#define ANSI_FG_BLUE ANSI_SGR(34)
```

#### 4.32.2.29 ANSI\_FG\_BMAGENTA

```
#define ANSI_FG_BMAGENTA ANSI_SGR(95)
```

#### 4.32.2.30 ANSI\_FG\_BRED

```
#define ANSI_FG_BRED    ANSI_SGR(91)
```

#### 4.32.2.31 ANSI\_FG\_BWHITE

```
#define ANSI_FG_BWHITE  ANSI_SGR(97)
```

#### 4.32.2.32 ANSI\_FG\_BYELLOW

```
#define ANSI_FG_BYELLOW ANSI_SGR(93)
```

#### 4.32.2.33 ANSI\_FG\_CYAN

```
#define ANSI_FG_CYAN    ANSI_SGR(36)
```

#### 4.32.2.34 ANSI\_FG\_DEFAULT

```
#define ANSI_FG_DEFAULT ANSI_SGR(39)
```

#### 4.32.2.35 ANSI\_FG\_GREEN

```
#define ANSI_FG_GREEN    ANSI_SGR(32)
```

#### 4.32.2.36 ANSI\_FG\_MAGENTA

```
#define ANSI_FG_MAGENTA  ANSI_SGR(35)
```

#### 4.32.2.37 ANSI\_FG\_RED

```
#define ANSI_FG_RED      ANSI_SGR(31)
```

#### 4.32.2.38 ANSI\_FG\_WHITE

```
#define ANSI_FG_WHITE  ANSI_SGR(37)
```

#### 4.32.2.39 ANSI\_FG\_YELLOW

```
#define ANSI_FG_YELLOW  ANSI_SGR(33)
```

#### 4.32.2.40 ANSI\_FRAMED

```
#define ANSI_FRAMED  ANSI_SGR(51)
```

#### 4.32.2.41 ANSI\_ITALIC

```
#define ANSI_ITALIC  ANSI_SGR(3)
```

#### 4.32.2.42 ANSI\_OVERLINED

```
#define ANSI_OVERLINED  ANSI_SGR(53)
```

#### 4.32.2.43 ANSI\_RBLINK

```
#define ANSI_RBLINK  ANSI_SGR(6)
```

#### 4.32.2.44 ANSI\_RESET

```
#define ANSI_RESET  ANSI_SGR(0)
```

#### 4.32.2.45 ANSI\_SBLINK

```
#define ANSI_SBLINK  ANSI_SGR(5)
```

#### 4.32.2.46 ANSI\_SGR

```
#define ANSI_SGR(  
    _code_ )  ANSI_ESC "[" #_code_ "m"
```

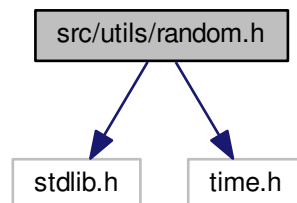
#### 4.32.2.47 ANSI\_UNDERLINE

```
#define ANSI_UNDERLINE  ANSI_SGR(4)
```

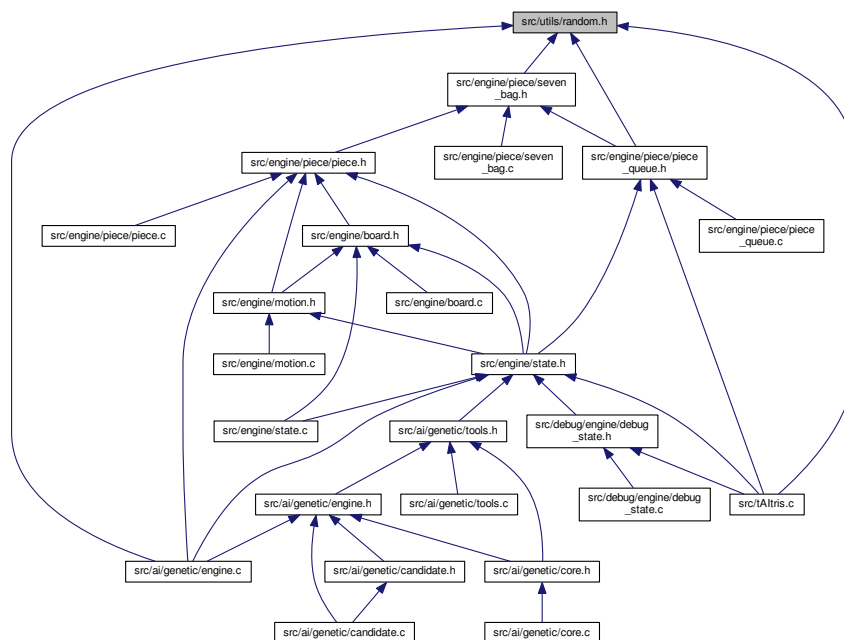
### 4.33 src/utls/random.h File Reference

Random number generation.

```
#include <stdlib.h>  
#include <time.h>  
Include dependency graph for random.h:
```



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



#### 4.33.1 Detailed Description

Random number generation.

### Author

## S4MasterRace

## Version

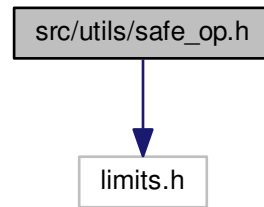
2.0

#### 4.34 src/utls/safe\_op.h File Reference

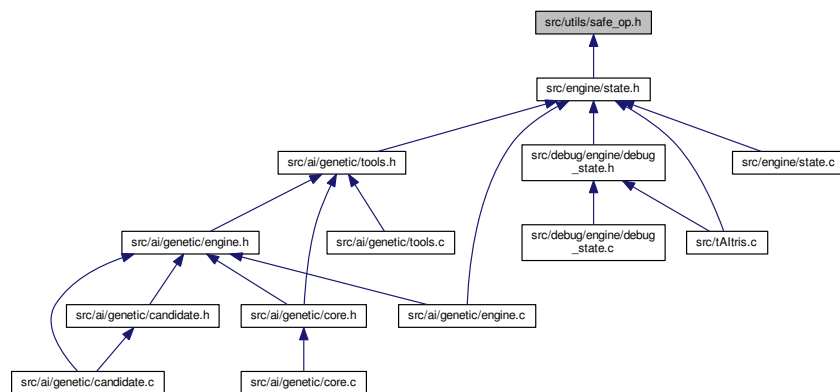
Safe operations.

```
#include <limits.h>
```

Include dependency graph for safe\_op.h:



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



## Macros

- `#define SAFE_OP_SUCCESS 0`
- `#define SAFE_OP_OVERFLOW 1`
- `#define SAFE_OP_UNDERFLOW (-1)`

### 4.34.1 Detailed Description

Safe operations.

#### Author

S4MasterRace

#### Version

2.0



## 4.34.2 Macro Definition Documentation

### 4.34.2.1 SAFE\_OP\_OVERFLOW

```
#define SAFE_OP_OVERFLOW 1
```

### 4.34.2.2 SAFE\_OP\_SUCCESS

```
#define SAFE_OP_SUCCESS 0
```

### 4.34.2.3 SAFE\_OP\_UNDERFLOW

```
#define SAFE_OP_UNDERFLOW (-1)
```



# Index

`_genetic_best`  
engine.c, 22

ABS

tools.h, 29

ANGLE\_ESIZE

angle.h, 38

ANSI\_BG\_BBLACK

ansi\_code.h, 80

ANSI\_BG\_BBLUE

ansi\_code.h, 80

ANSI\_BG\_BCYAN

ansi\_code.h, 80

ANSI\_BG\_BGREEN

ansi\_code.h, 80

ANSI\_BG\_BLACK

ansi\_code.h, 80

ANSI\_BG\_BLUE

ansi\_code.h, 80

ANSI\_BG\_BMAGENTA

ansi\_code.h, 81

ANSI\_BG\_BRED

ansi\_code.h, 81

ANSI\_BG\_BWHITE

ansi\_code.h, 81

ANSI\_BG\_BYELLOW

ansi\_code.h, 81

ANSI\_BG\_CYAN

ansi\_code.h, 81

ANSI\_BG\_DEFAULT

ansi\_code.h, 81

ANSI\_BG\_GREEN

ansi\_code.h, 81

ANSI\_BG\_MAGENTA

ansi\_code.h, 81

ANSI\_BG\_RED

ansi\_code.h, 82

ANSI\_BG\_WHITE

ansi\_code.h, 82

ANSI\_BG\_YELLOW

ansi\_code.h, 82

ANSI\_BOLD

ansi\_code.h, 82

ANSI\_CROSSEDOUT

ansi\_code.h, 82

ANSI\_ENCIRCLED

ansi\_code.h, 82

ANSI\_ESC

ansi\_code.h, 82

ANSI\_FAINT

ansi\_code.h, 82

ANSI\_FG\_BBLACK

ansi\_code.h, 83

ANSI\_FG\_BBLUE

ansi\_code.h, 83

ANSI\_FG\_BCYAN

ansi\_code.h, 83

ANSI\_FG\_BGREEN

ansi\_code.h, 83

ANSI\_FG\_BLACK

ansi\_code.h, 83

ANSI\_FG\_BLUE

ansi\_code.h, 83

ANSI\_FG\_BMAGENTA

ansi\_code.h, 83

ANSI\_FG\_BRED

ansi\_code.h, 83

ANSI\_FG\_BWHITE

ansi\_code.h, 84

ANSI\_FG\_BYELLOW

ansi\_code.h, 84

ANSI\_FG\_CYAN

ansi\_code.h, 84

ANSI\_FG\_DEFAULT

ansi\_code.h, 84

ANSI\_FG\_GREEN

ansi\_code.h, 84

ANSI\_FG\_MAGENTA

ansi\_code.h, 84

ANSI\_FG\_RED

ansi\_code.h, 84

ANSI\_FG\_WHITE

ansi\_code.h, 84

ANSI\_FG\_YELLOW

ansi\_code.h, 85

ANSI\_FRAMED

ansi\_code.h, 85

ANSI\_ITALIC

ansi\_code.h, 85

ANSI\_OVERLINED

ansi\_code.h, 85

ANSI\_RBLINK

ansi\_code.h, 85

ANSI\_RESET

ansi\_code.h, 85

ANSI\_SBLINK

ansi\_code.h, 85

ANSI\_SGR

ansi\_code.h, 85

- ANSI\_UNDERLINE
  - ansi\_code.h, 86
- agg\_height
  - AiCoefs, 6
- aggregate\_height
  - tools.c, 26
  - tools.h, 29
- AiBest, 5
  - piece, 5
  - score, 6
- AiCoefs, 6
  - agg\_height, 6
  - bumpiness, 6
  - clears, 6
  - holes, 7
- Angle
  - angle.h, 38
- angle
  - Piece, 9
- angle.h
  - ANGLE\_ESIZE, 38
  - Angle, 38
  - Rotation, 38
- ansi\_code.h
  - ANSI\_BG\_BBLACK, 80
  - ANSI\_BG\_BBLUE, 80
  - ANSI\_BG\_BCYAN, 80
  - ANSI\_BG\_BGREEN, 80
  - ANSI\_BG\_BLACK, 80
  - ANSI\_BG\_BLUE, 80
  - ANSI\_BG\_BMAGENTA, 81
  - ANSI\_BG\_BRED, 81
  - ANSI\_BG\_BWHITE, 81
  - ANSI\_BG\_BYELLOW, 81
  - ANSI\_BG\_CYAN, 81
  - ANSI\_BG\_DEFAULT, 81
  - ANSI\_BG\_GREEN, 81
  - ANSI\_BG\_MAGENTA, 81
  - ANSI\_BG\_RED, 82
  - ANSI\_BG\_WHITE, 82
  - ANSI\_BG\_YELLOW, 82
  - ANSI\_BOLD, 82
  - ANSI\_CROSSEDOUT, 82
  - ANSI\_ENCIRCLED, 82
  - ANSI\_ESC, 82
  - ANSI\_FAINT, 82
  - ANSI\_FG\_BBLACK, 83
  - ANSI\_FG\_BBLUE, 83
  - ANSI\_FG\_BCYAN, 83
  - ANSI\_FG\_BGREEN, 83
  - ANSI\_FG\_BLACK, 83
  - ANSI\_FG\_BLUE, 83
  - ANSI\_FG\_BMAGENTA, 83
  - ANSI\_FG\_BRED, 83
  - ANSI\_FG\_BWHITE, 84
  - ANSI\_FG\_BYELLOW, 84
  - ANSI\_FG\_CYAN, 84
  - ANSI\_FG\_DEFAULT, 84
  - ANSI\_FG\_GREEN, 84
  - ANSI\_FG\_MAGENTA, 84
  - ANSI\_FG\_RED, 84
  - ANSI\_FG\_WHITE, 84
  - ANSI\_FG\_YELLOW, 85
  - ANSI\_FRAMED, 85
  - ANSI\_ITALIC, 85
  - ANSI\_OVERLINED, 85
  - ANSI\_RBLINK, 85
  - ANSI\_RESET, 85
  - ANSI\_SBLINK, 85
  - ANSI\_SGR, 85
  - ANSI\_UNDERLINE, 86
- BOARD\_HEIGHT
  - board.h, 42
- BOARD\_HIDDEN
  - board.h, 42
- BOARD\_WIDTH
  - board.h, 43
- Board, 7
  - cells, 7
  - height, 7
  - width, 7
- board
  - State, 12
- board.c
  - board\_break\_lines, 39
  - board\_copy, 40
  - board\_create, 40
  - board\_free, 40
  - board\_get\_completed\_lines, 40
  - board\_init, 40
  - board\_merge\_piece, 40
- board.h
  - BOARD\_HEIGHT, 42
  - BOARD\_HIDDEN, 42
  - BOARD\_WIDTH, 43
  - board\_break\_lines, 43
  - board\_copy, 43
  - board\_create, 43
  - board\_free, 43
  - board\_get\_completed\_lines, 43
  - board\_init, 44
  - board\_merge\_piece, 44
  - board\_reverse\_y, 42
- board\_break\_lines
  - board.c, 39
  - board.h, 43
- board\_copy
  - board.c, 40
  - board.h, 43
- board\_create
  - board.c, 40
  - board.h, 43
- board\_free
  - board.c, 40
  - board.h, 43
- board\_get\_completed\_lines

- board.c, 40
- board.h, 43
- board\_height
  - tools.c, 27
  - tools.h, 29
- board\_heights
  - tools.c, 27
  - tools.h, 30
- board\_init
  - board.c, 40
  - board.h, 44
- board\_merge\_piece
  - board.c, 40
  - board.h, 44
- board\_reverse\_y
  - board.h, 42
- broken\_lines
  - State, 12
- bumpiness
  - AiCoefs, 6
  - tools.c, 27
  - tools.h, 30
- CELL\_ESIZE
  - cell.h, 45
- Candidate, 8
  - coefs, 8
  - fitness, 8
- candidate.c
  - genetic\_candidate\_create, 16
  - genetic\_candidate\_create\_random, 16
  - genetic\_candidate\_crossover, 16
  - genetic\_candidate\_free, 16
  - genetic\_candidate\_mutate, 16
  - genetic\_candidate\_normalize, 16
- candidate.h
  - genetic\_candidate\_create, 18
  - genetic\_candidate\_crossover, 18
  - genetic\_candidate\_free, 18
  - genetic\_candidate\_mutate, 18
  - genetic\_candidate\_normalize, 19
- Cell
  - cell.h, 45
- cell.h
  - CELL\_ESIZE, 45
  - Cell, 45
- cells
  - Board, 7
- clears
  - AiCoefs, 6
  - tools.c, 27
  - tools.h, 30
- coalescent\_clears
  - tools.h, 30
- coefs
  - Candidate, 8
- core.c
  - genetic\_show\_stats, 20
- core.h
  - genetic\_show\_stats, 21
- current\_piece
  - State, 13
- DEBUG\_STATE\_COLOR
  - debug\_state.h, 35
- DEBUG\_STATE\_NAME
  - debug\_state.h, 35
- DEBUG\_STATE\_TAG
  - debug\_state.h, 35
- DEBUG\_TAG
  - debug.h, 32
- data
  - PieceQueue, 10
- debug.h
  - DEBUG\_TAG, 32
- debug\_state.c
  - debug\_state\_print, 33
  - debug\_state\_print\_cell, 33
  - debug\_state\_print\_infos, 33
  - debug\_state\_print\_line\_number, 33
  - debug\_state\_print\_next\_piece, 34
- debug\_state.h
  - DEBUG\_STATE\_COLOR, 35
  - DEBUG\_STATE\_NAME, 35
  - DEBUG\_STATE\_TAG, 35
  - debug\_state\_print, 36
  - debug\_state\_print\_cell, 36
  - debug\_state\_print\_infos, 36
  - debug\_state\_print\_line\_number, 36
  - debug\_state\_print\_next\_piece, 36
- debug\_state\_print
  - debug\_state.c, 33
  - debug\_state.h, 36
- debug\_state\_print\_cell
  - debug\_state.c, 33
  - debug\_state.h, 36
- debug\_state\_print\_infos
  - debug\_state.c, 33
  - debug\_state.h, 36
- debug\_state\_print\_line\_number
  - debug\_state.c, 33
  - debug\_state.h, 36
- debug\_state\_print\_next\_piece
  - debug\_state.c, 34
  - debug\_state.h, 36
- engine.c
  - \_genetic\_best, 22
  - genetic\_aibest\_create, 22
  - genetic\_aibest\_free, 22
  - genetic\_aicoefs\_free, 22
  - genetic\_aicoefs\_random, 23
  - genetic\_best, 23
  - genetic\_coefs\_get, 23
  - genetic\_get\_rank, 23
- engine.h
  - genetic\_aibest\_create, 24
  - genetic\_aibest\_free, 25

- genetic\_aicoefs\_free, 25
  - genetic\_aicoefs\_random, 25
  - genetic\_coefs\_get, 25
  - genetic\_get\_rank, 25
- fill
  - PieceShape, 11
- fitness
  - Candidate, 8
- genetic\_aibest\_create
  - engine.c, 22
  - engine.h, 24
- genetic\_aibest\_free
  - engine.c, 22
  - engine.h, 25
- genetic\_aicoefs\_free
  - engine.c, 22
  - engine.h, 25
- genetic\_aicoefs\_random
  - engine.c, 23
  - engine.h, 25
- genetic\_best
  - engine.c, 23
- genetic\_candidate\_create
  - candidate.c, 16
  - candidate.h, 18
- genetic\_candidate\_create\_random
  - candidate.c, 16
- genetic\_candidate\_crossover
  - candidate.c, 16
  - candidate.h, 18
- genetic\_candidate\_free
  - candidate.c, 16
  - candidate.h, 18
- genetic\_candidate\_mutate
  - candidate.c, 16
  - candidate.h, 18
- genetic\_candidate\_normalize
  - candidate.c, 16
  - candidate.h, 19
- genetic\_coefs\_get
  - engine.c, 23
  - engine.h, 25
- genetic\_get\_rank
  - engine.c, 23
  - engine.h, 25
- genetic\_show\_stats
  - core.c, 20
  - core.h, 21
- height
  - Board, 7
- hole
  - tools.c, 27
  - tools.h, 30
- holes
  - AiCoefs, 7
  - tools.c, 27
- tools.h, 30
- INPUT\_ESIZE
  - input.h, 46
- Input
  - input.h, 47
- input.h
  - INPUT\_ESIZE, 46
  - Input, 47
- input\_counts
  - State, 13
- length
  - PieceQueue, 10
- level
  - State, 13
- main
  - tAltris.c, 78
- motion.c
  - motion\_can\_move, 48
  - motion\_can\_rotate, 48
  - motion\_is\_valid, 48
  - motion\_try\_down, 48
  - motion\_try\_move, 49
  - motion\_try\_rotate, 49
- motion.h
  - motion\_can\_move, 50
  - motion\_can\_rotate, 50
  - motion\_is\_valid, 51
  - motion\_try\_down, 51
  - motion\_try\_move, 51
  - motion\_try\_rotate, 51
- motion\_can\_move
  - motion.c, 48
  - motion.h, 50
- motion\_can\_rotate
  - motion.c, 48
  - motion.h, 50
- motion\_is\_valid
  - motion.c, 48
  - motion.h, 51
- motion\_try\_down
  - motion.c, 48
  - motion.h, 51
- motion\_try\_move
  - motion.c, 49
  - motion.h, 51
- motion\_try\_rotate
  - motion.c, 49
  - motion.h, 51
- next\_piece
  - State, 13
- PIECE\_QUEUE\_LENGTH
  - piece\_queue.h, 59
- PIECE\_SHAPE\_HEIGHT
  - piece\_shape.h, 61

PIECE\_SHAPE\_WIDTH  
     piece\_shape.h, 62  
 PIECE\_TYPE\_ESIZE  
     piece\_type.h, 63  
 Piece, 9  
     angle, 9  
     shape, 9  
     type, 10  
     x, 10  
     y, 10  
 piece  
     AiBest, 5  
 piece.c  
     piece\_copy, 52  
     piece\_create, 53  
     piece\_free, 53  
     piece\_random, 53  
 piece.h  
     piece\_copy, 55  
     piece\_create, 55  
     piece\_free, 55  
     piece\_random, 55  
 piece\_copy  
     piece.c, 52  
     piece.h, 55  
 piece\_create  
     piece.c, 53  
     piece.h, 55  
 piece\_free  
     piece.c, 53  
     piece.h, 55  
 piece\_queue  
     State, 13  
 piece\_queue.c  
     piece\_queue\_create, 57  
     piece\_queue\_extend, 57  
     piece\_queue\_fill\_data, 57  
     piece\_queue\_free, 57  
     piece\_queue\_get, 57  
 piece\_queue.h  
     PIECE\_QUEUE\_LENGTH, 59  
     piece\_queue\_create, 59  
     piece\_queue\_extend, 59  
     piece\_queue\_fill\_data, 60  
     piece\_queue\_free, 60  
     piece\_queue\_get, 60  
 piece\_queue\_create  
     piece\_queue.c, 57  
     piece\_queue.h, 59  
 piece\_queue\_extend  
     piece\_queue.c, 57  
     piece\_queue.h, 59  
 piece\_queue\_fill\_data  
     piece\_queue.c, 57  
     piece\_queue.h, 60  
 piece\_queue\_free  
     piece\_queue.c, 57  
     piece\_queue.h, 60  
     piece\_queue\_get  
         piece\_queue.c, 57  
         piece\_queue.h, 60  
     piece\_random  
         piece.c, 53  
         piece.h, 55  
     piece\_shape.h  
         PIECE\_SHAPE\_HEIGHT, 61  
         PIECE\_SHAPE\_WIDTH, 62  
     piece\_type.h  
         PIECE\_TYPE\_ESIZE, 63  
         PieceType, 63  
     PieceQueue, 10  
         data, 10  
         length, 10  
         seed, 11  
     PieceShape, 11  
         fill, 11  
         shape, 11  
     PieceType  
         piece\_type.h, 63  
     Rotation  
         angle.h, 38  
     SAFE\_OP\_OVERFLOW  
         safe\_op.h, 89  
     SAFE\_OP\_SUCCESS  
         safe\_op.h, 89  
     SAFE\_OP\_UNDERFLOW  
         safe\_op.h, 89  
     SCORE\_DOUBLE  
         score.h, 69  
     SCORE\_HDROP  
         score.h, 70  
     SCORE\_LVL\_PER\_LINE  
         score.h, 70  
     SCORE\_SDROP  
         score.h, 70  
     SCORE\_SINGLE  
         score.h, 70  
     SCORE\_TETRIS  
         score.h, 70  
     SCORE\_TRIPLE  
         score.h, 70  
     safe\_op.h  
         SAFE\_OP\_OVERFLOW, 89  
         SAFE\_OP\_SUCCESS, 89  
         SAFE\_OP\_UNDERFLOW, 89  
     score  
         AiBest, 6  
         State, 13  
     score.c  
         score\_compute\_break, 68  
     score.h  
         SCORE\_DOUBLE, 69  
         SCORE\_HDROP, 70

- SCORE\_LVL\_PER\_LINE, 70
- SCORE\_SDROP, 70
- SCORE\_SINGLE, 70
- SCORE\_TETRIS, 70
- SCORE\_TRIPLE, 70
- score\_compute\_break, 70
- score\_compute\_break
  - score.c, 68
  - score.h, 70
- seed
  - PieceQueue, 11
- seven\_bag.c
  - seven\_bag\_draw, 65
  - seven\_bag\_init, 65
  - seven\_bag\_shuffle, 65
  - seven\_bag\_swap, 65
- seven\_bag.h
  - seven\_bag\_draw, 66
  - seven\_bag\_init, 66
  - seven\_bag\_shuffle, 67
  - seven\_bag\_swap, 67
- seven\_bag\_draw
  - seven\_bag.c, 65
  - seven\_bag.h, 66
- seven\_bag\_init
  - seven\_bag.c, 65
  - seven\_bag.h, 66
- seven\_bag\_shuffle
  - seven\_bag.c, 65
  - seven\_bag.h, 67
- seven\_bag\_swap
  - seven\_bag.c, 65
  - seven\_bag.h, 67
- shape
  - Piece, 9
  - PieceShape, 11
- show\_features
  - tools.c, 28
  - tools.h, 31
- src/ai/genetic/candidate.c, 15
- src/ai/genetic/candidate.h, 17
- src/ai/genetic/core.c, 19
- src/ai/genetic/core.h, 20
- src/ai/genetic/engine.c, 21
- src/ai/genetic/engine.h, 23
- src/ai/genetic/tools.c, 26
- src/ai/genetic/tools.h, 28
- src/debug/debug.h, 31
- src/debug/engine/debug\_state.c, 32
- src/debug/engine/debug\_state.h, 34
- src/engine/angle.h, 37
- src/engine/board.c, 38
- src/engine/board.h, 41
- src/engine/cell.h, 44
- src/engine/input.h, 46
- src/engine/motion.c, 47
- src/engine/motion.h, 49
- src/engine/piece/piece.c, 52
- src/engine/piece/piece.h, 53
- src/engine/piece/piece\_queue.c, 56
- src/engine/piece/piece\_queue.h, 58
- src/engine/piece/piece\_shape.h, 60
- src/engine/piece/piece\_type.h, 62
- src/engine/piece/seven\_bag.c, 64
- src/engine/piece/seven\_bag.h, 65
- src/engine/score.c, 67
- src/engine/score.h, 68
- src/engine/state.c, 71
- src/engine/state.h, 74
- src/tAltris.c, 77
- src/utils/ansi\_code.h, 78
- src/utils/random.h, 86
- src/utils/safe\_op.h, 87
- State, 12
  - board, 12
  - broken\_lines, 12
  - current\_piece, 13
  - input\_counts, 13
  - level, 13
  - next\_piece, 13
  - piece\_queue, 13
  - piece\_queue\_index, 13
  - score, 13
  - step, 13
- state.c
  - state\_apply\_input, 72
  - state\_apply\_inputs, 72
  - state\_can\_apply\_input, 72
  - state\_can\_apply\_inputs, 72
  - state\_copy, 72
  - state\_create, 72
  - state\_create\_piece, 73
  - state\_free, 73
  - state\_init, 73
  - state\_next\_piece, 73
  - state\_step, 73
- state.h
  - state\_apply\_input, 75
  - state\_apply\_inputs, 75
  - state\_can\_apply\_input, 75
  - state\_can\_apply\_inputs, 76
  - state\_copy, 76
  - state\_create, 76
  - state\_create\_piece, 76
  - state\_free, 76
  - state\_init, 76
  - state\_next\_piece, 77
  - state\_step, 77
- state\_apply\_input
  - state.c, 72
  - state.h, 75
- state\_apply\_inputs
  - state.c, 72
  - state.h, 75
- state\_can\_apply\_input
  - state.c, 72



- state.h, 75
- state\_can\_apply\_inputs
  - state.c, 72
  - state.h, 76
- state\_copy
  - state.c, 72
  - state.h, 76
- state\_create
  - state.c, 72
  - state.h, 76
- state\_create\_piece
  - state.c, 73
  - state.h, 76
- state\_free
  - state.c, 73
  - state.h, 76
- state\_init
  - state.c, 73
  - state.h, 76
- state\_next\_piece
  - state.c, 73
  - state.h, 77
- state\_step
  - state.c, 73
  - state.h, 77
- step
  - State, 13
- tAltris.c
  - main, 78
- tools.c
  - aggregate\_height, 26
  - board\_height, 27
  - board\_heights, 27
  - bumpiness, 27
  - clears, 27
  - hole, 27
  - holes, 27
  - show\_features, 28
- tools.h
  - ABS, 29
  - aggregate\_height, 29
  - board\_height, 29
  - board\_heights, 30
  - bumpiness, 30
  - clears, 30
  - coalescent\_clears, 30
  - hole, 30
  - holes, 30
  - show\_features, 31
- type
  - Piece, 10
- width
  - Board, 7
- x
  - Piece, 10
- y
  - Piece, 10