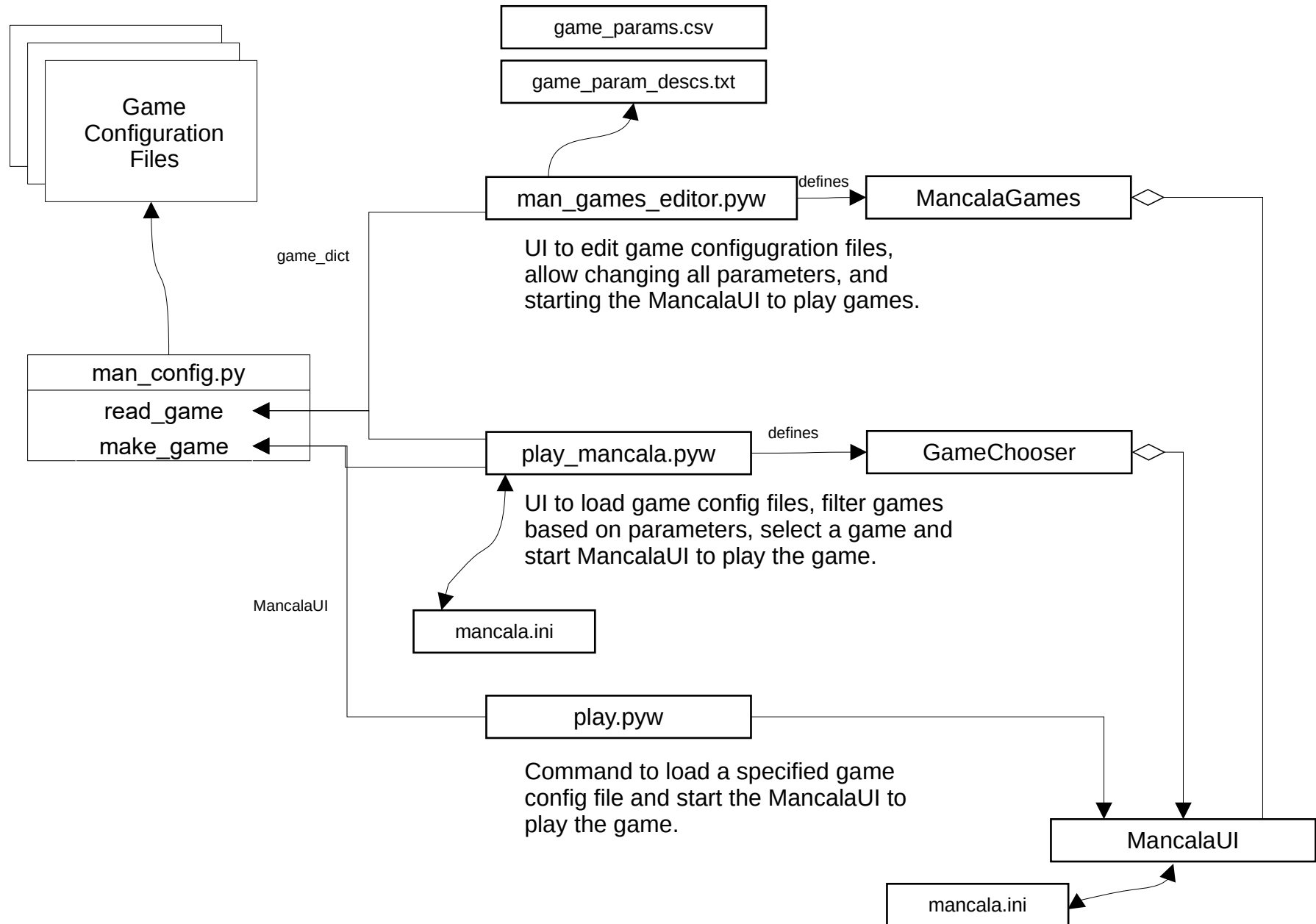
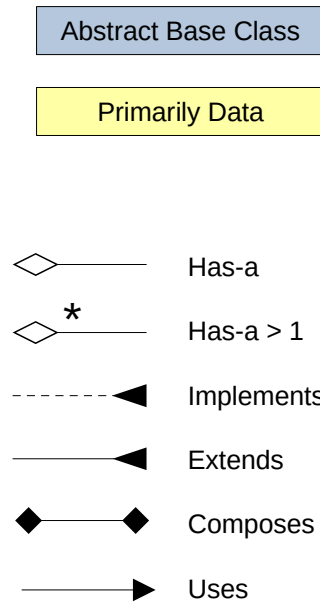


Mancala Games



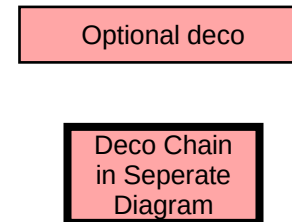
Notation Conventions

Class Diagram Conventions



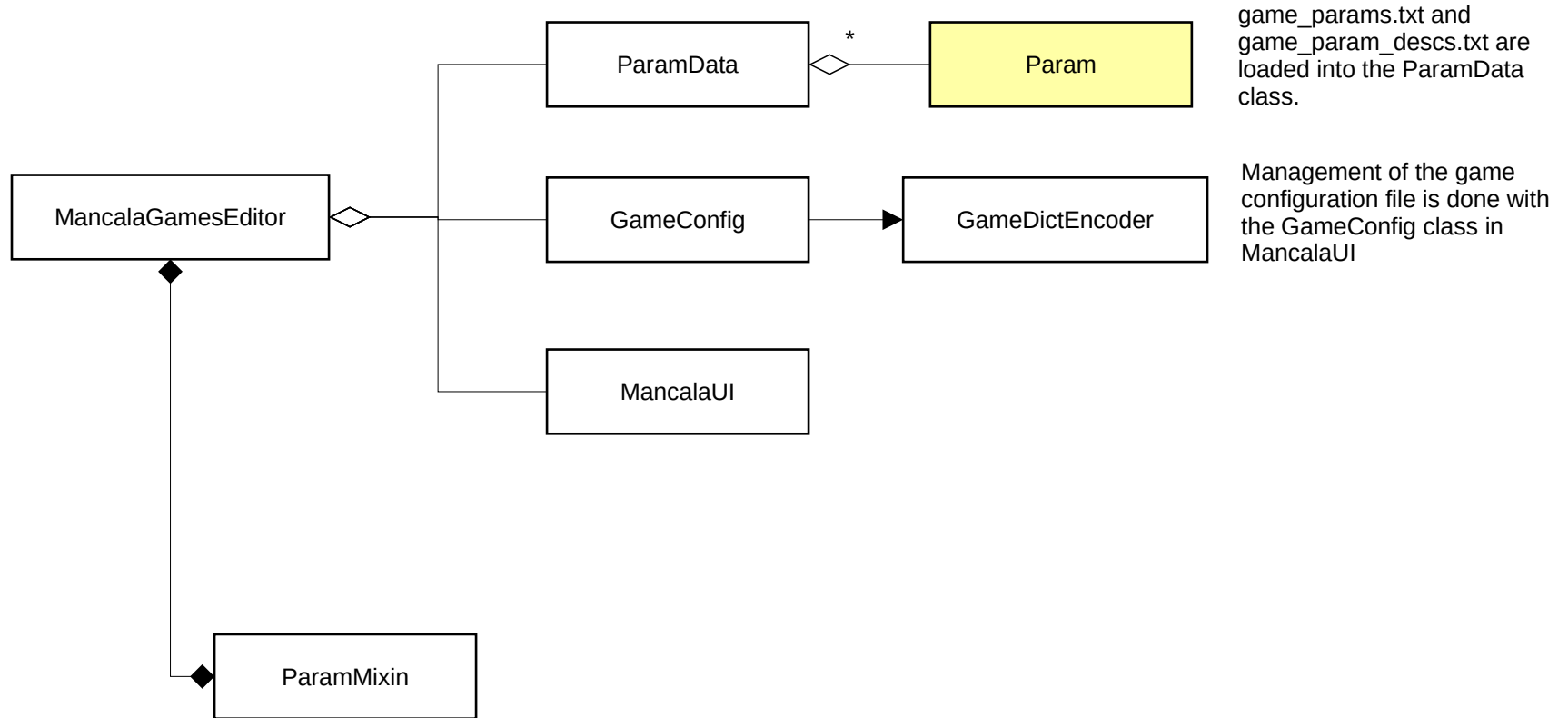
Deco Chain Conventions

- One path down the deco chain is used.
- Intersecting arrows are decision points.
- Shown in **call order** from start dot (constructed in reverse order).
- Calls down the deco chain maybe at any point in each deco's processing.
- Some deco's do not call down the deco chain even if there is a follow-on deco.
- All paths shown might not be possible (see ginfo_rules).



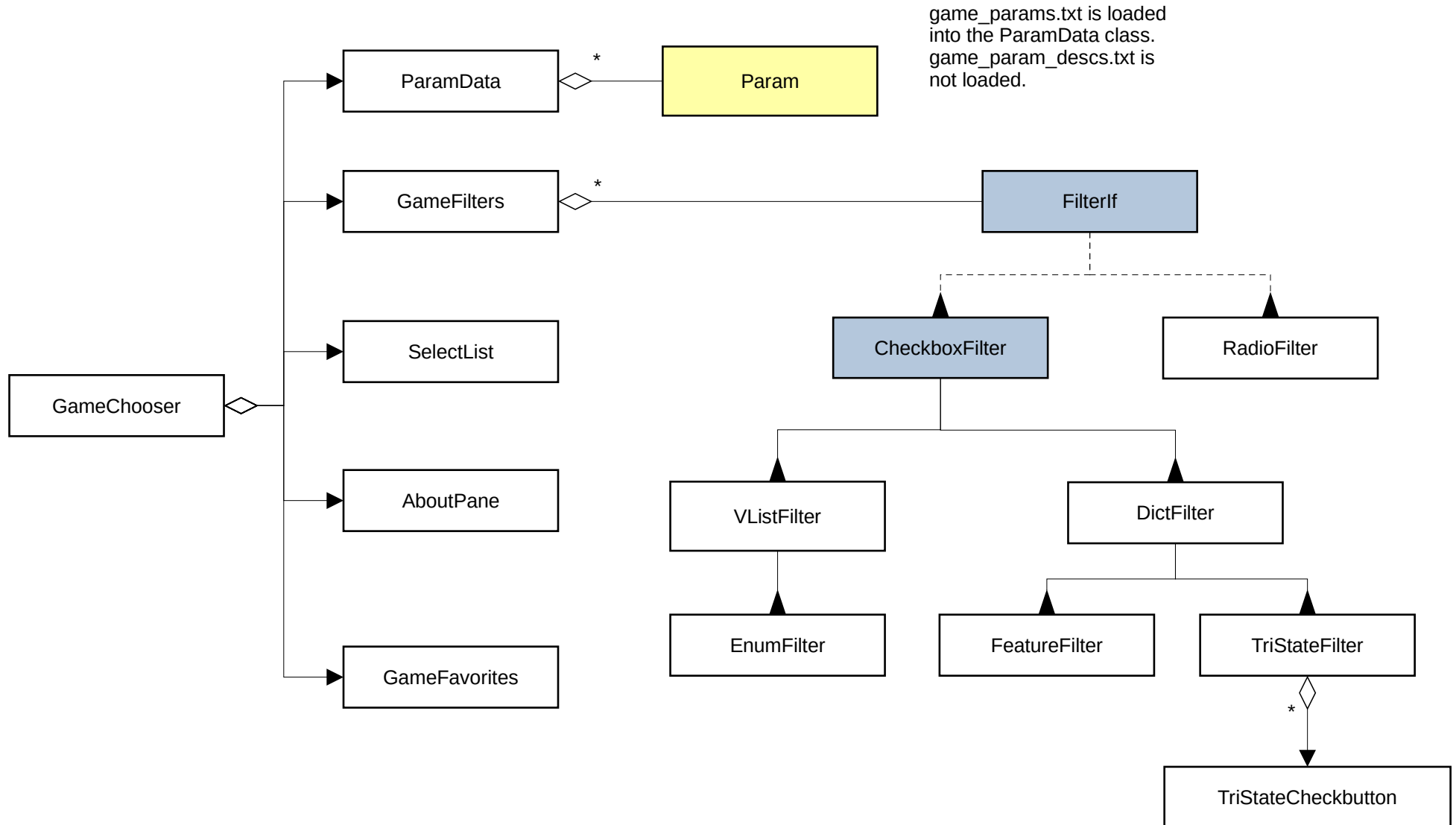
MancalaGamesEditor

man_games_editor.pyw



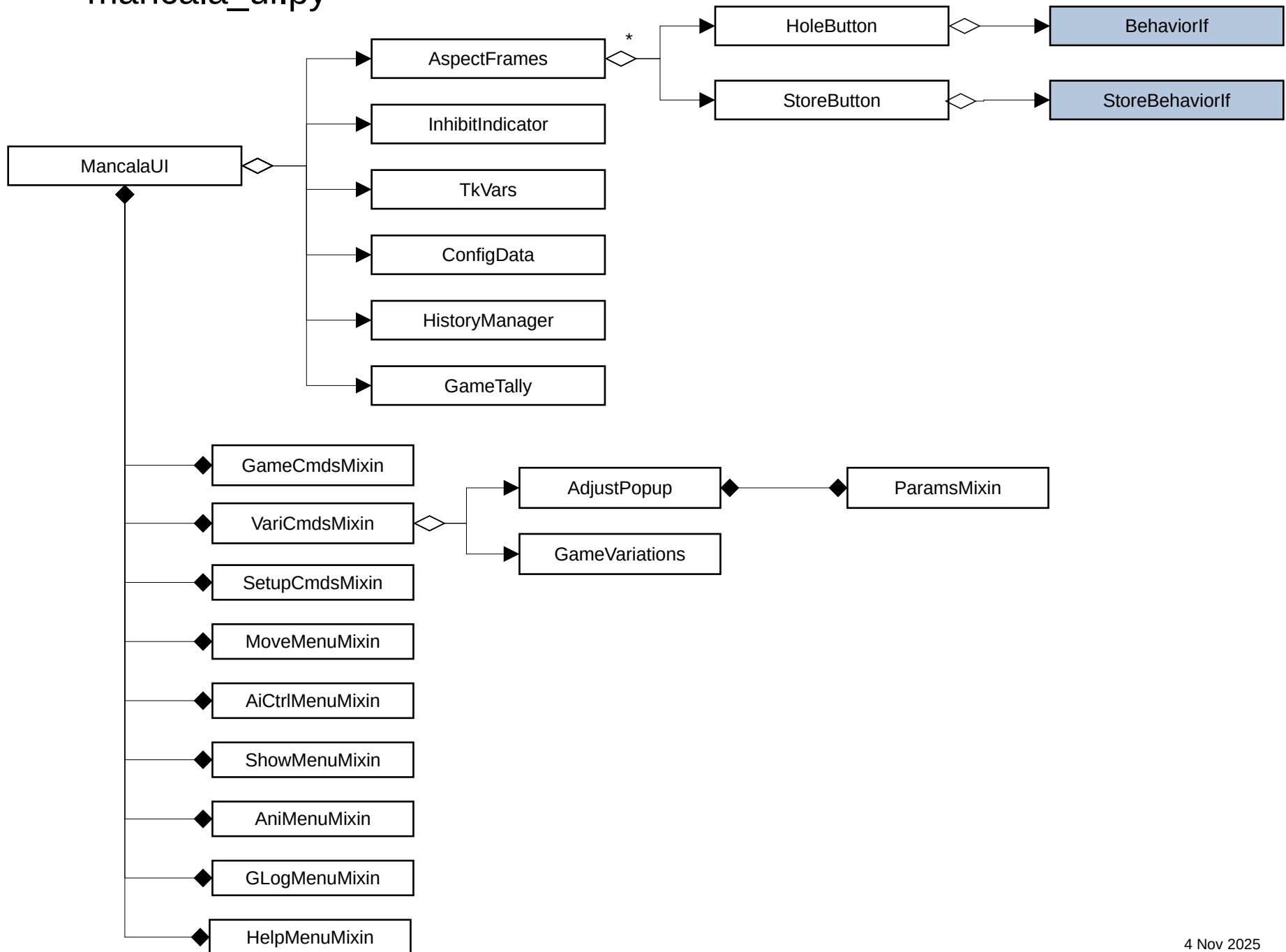
GameChooser

play_mancala.pyw

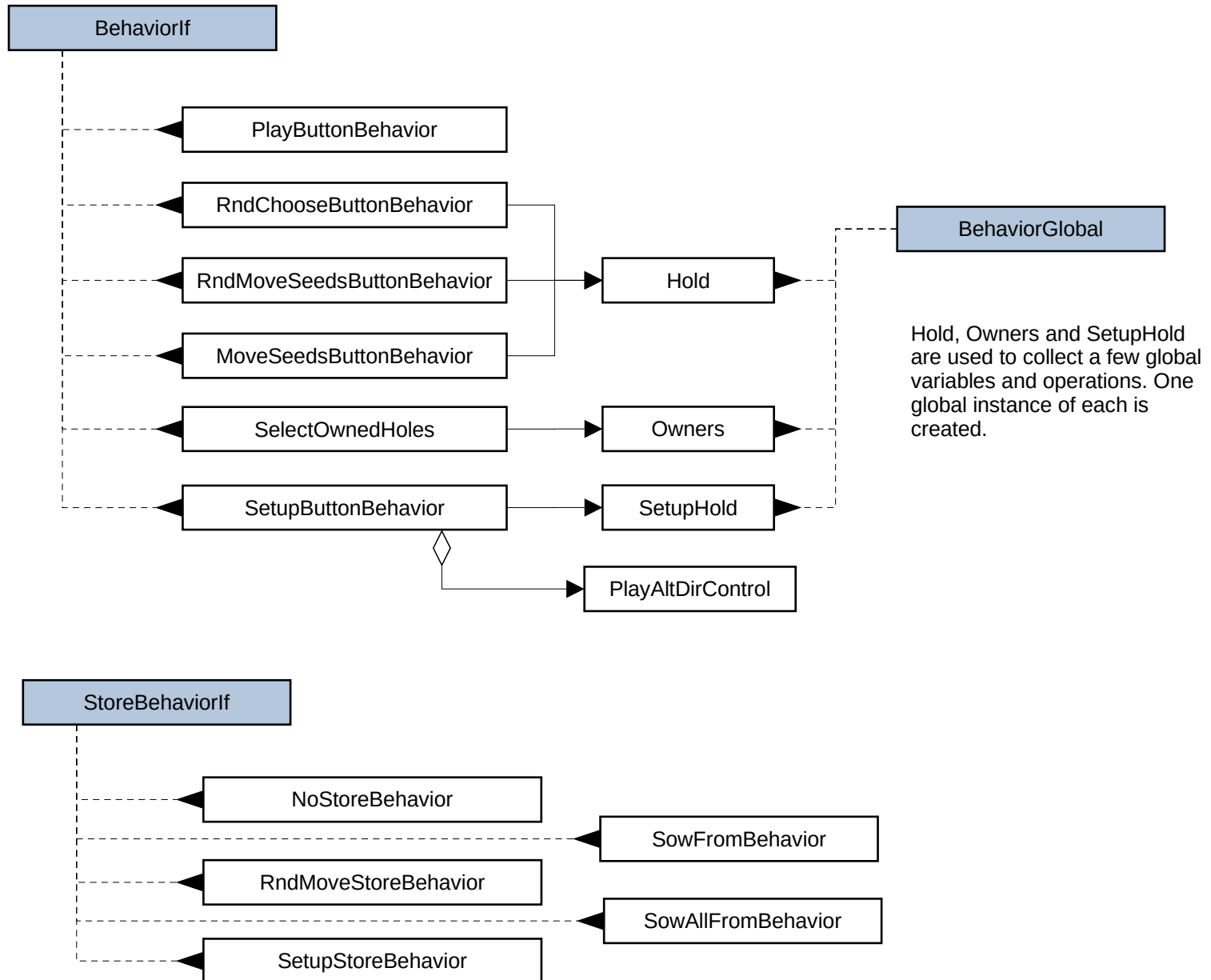


MancalaUI Classes

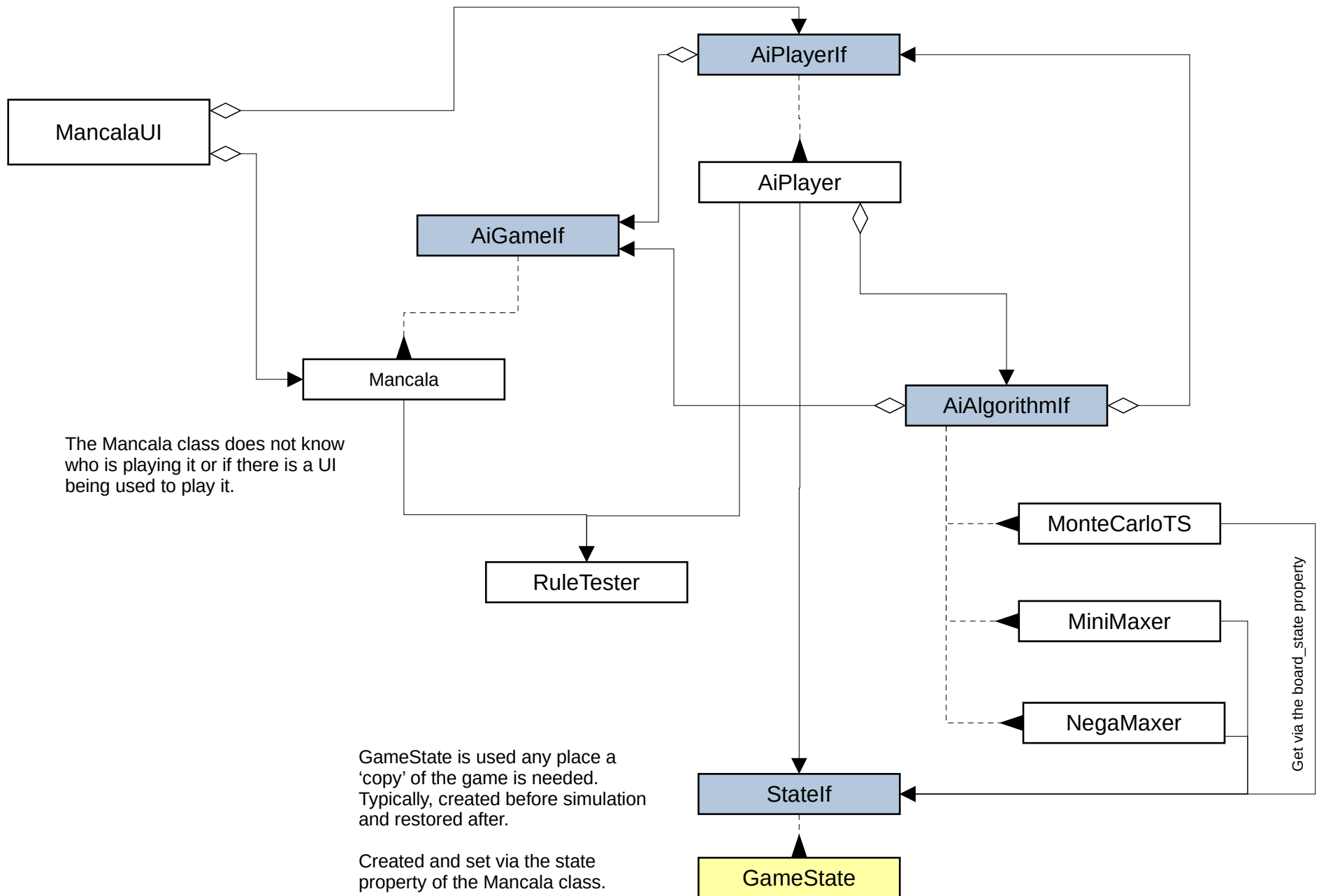
mancala_ui.py



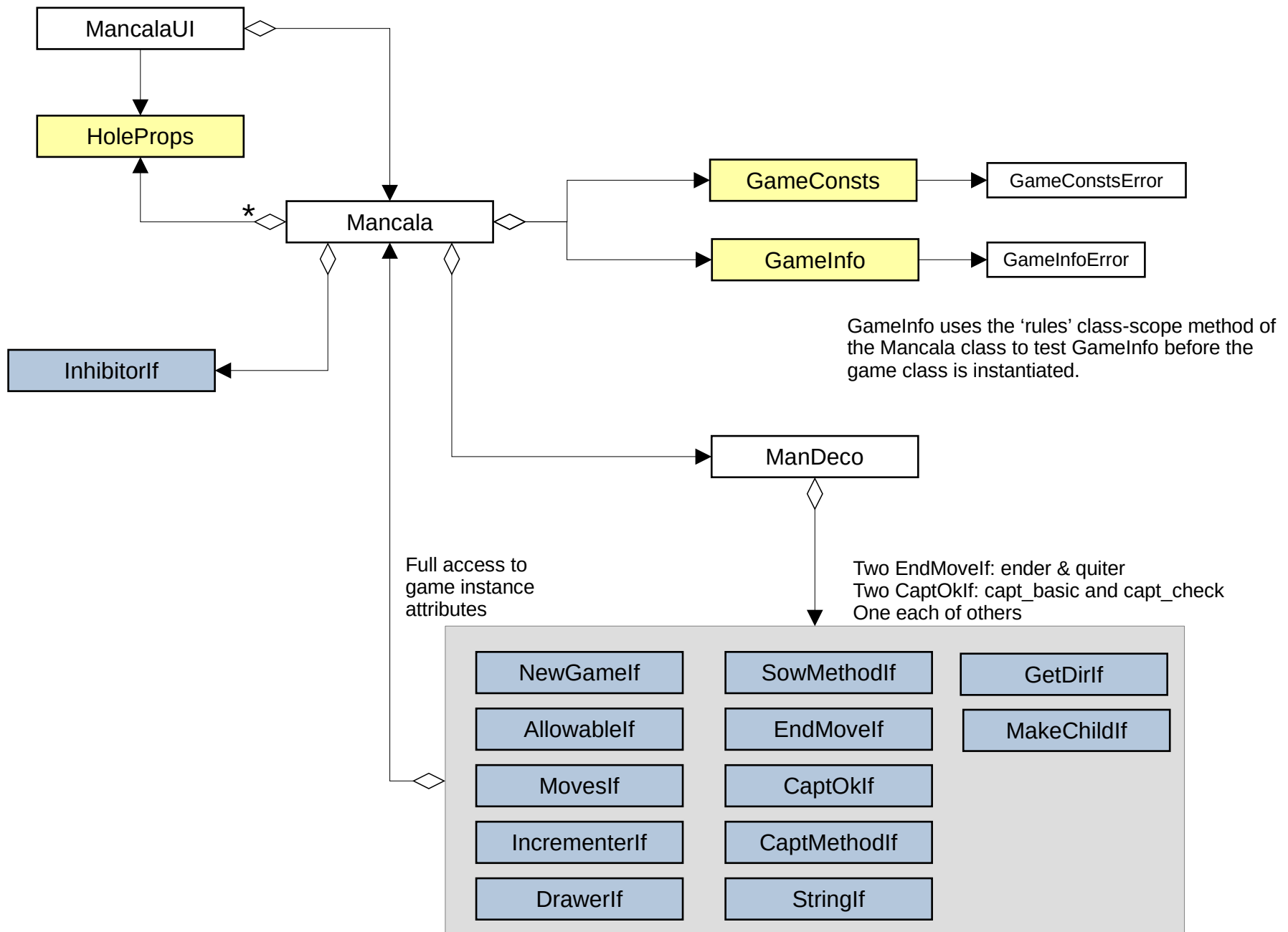
Behavior Classes for MancalaUI



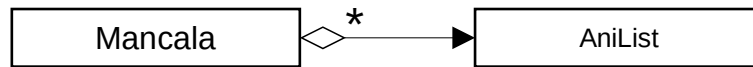
AIPlayer and AIAlgorithm Integration



Mancala Classes



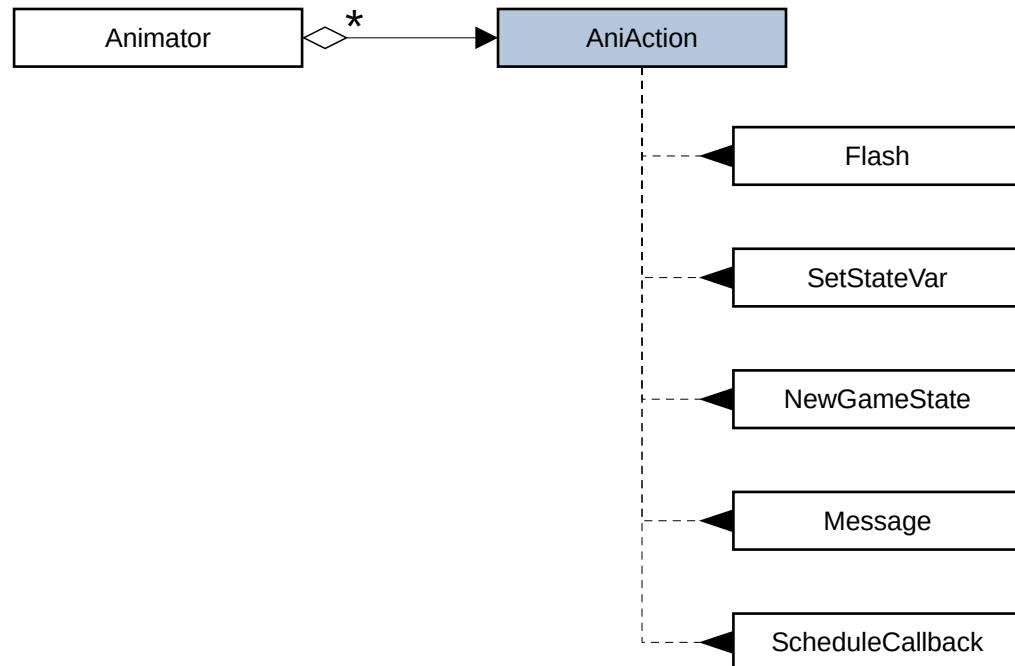
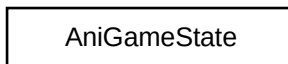
Animator Classes



Assignments to an AniList generate SetStateVar animations.

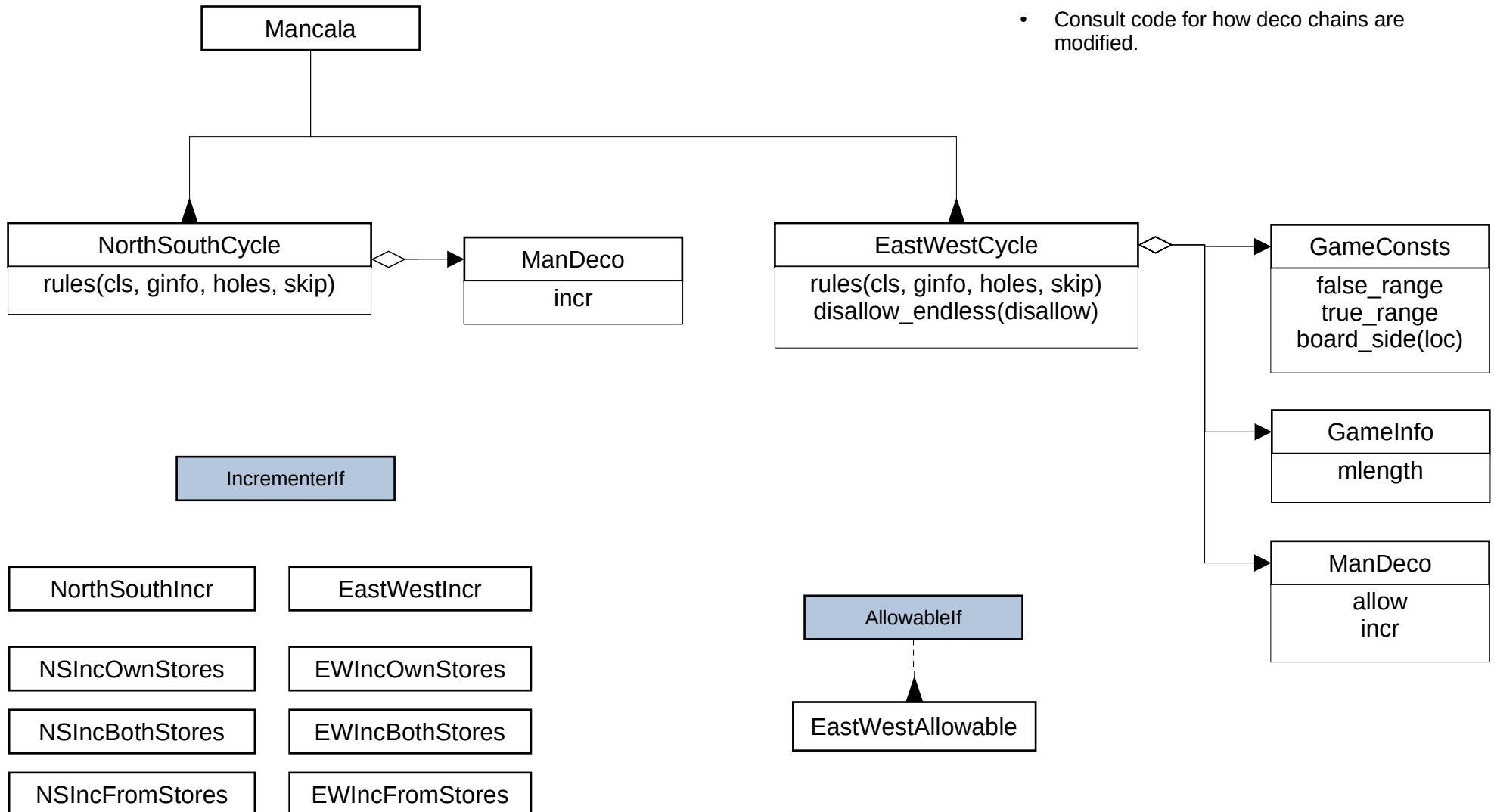
These animator hooks are used for 5 state variable and only when they are configured for use in a game.

These hooks are not included if animator.ENABLED is set False.

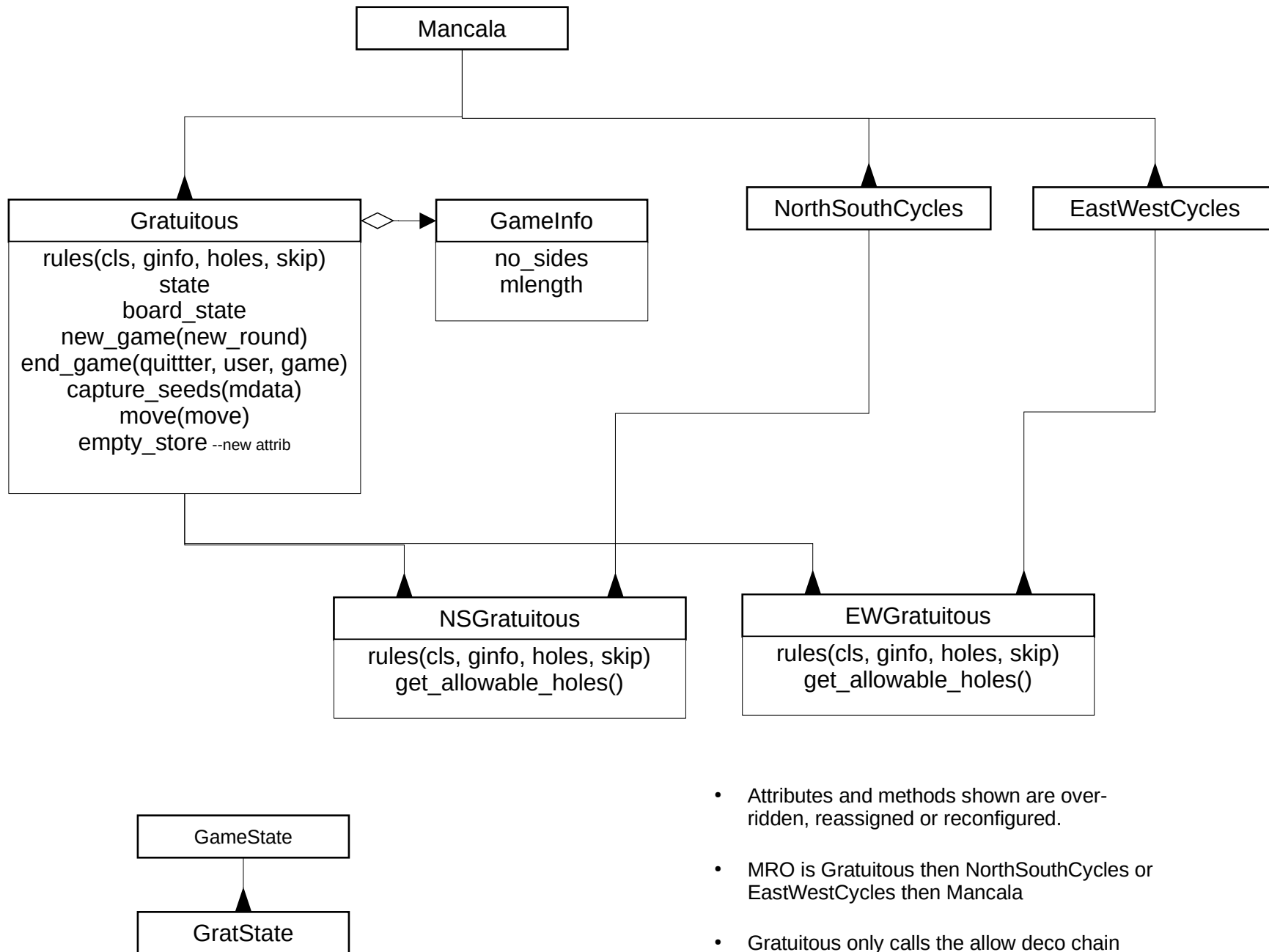


Two Cycle Game Classes

- Attributes and methods shown are overridden, reassigned or reconfigured.
- Consult code for how deco chains are modified.

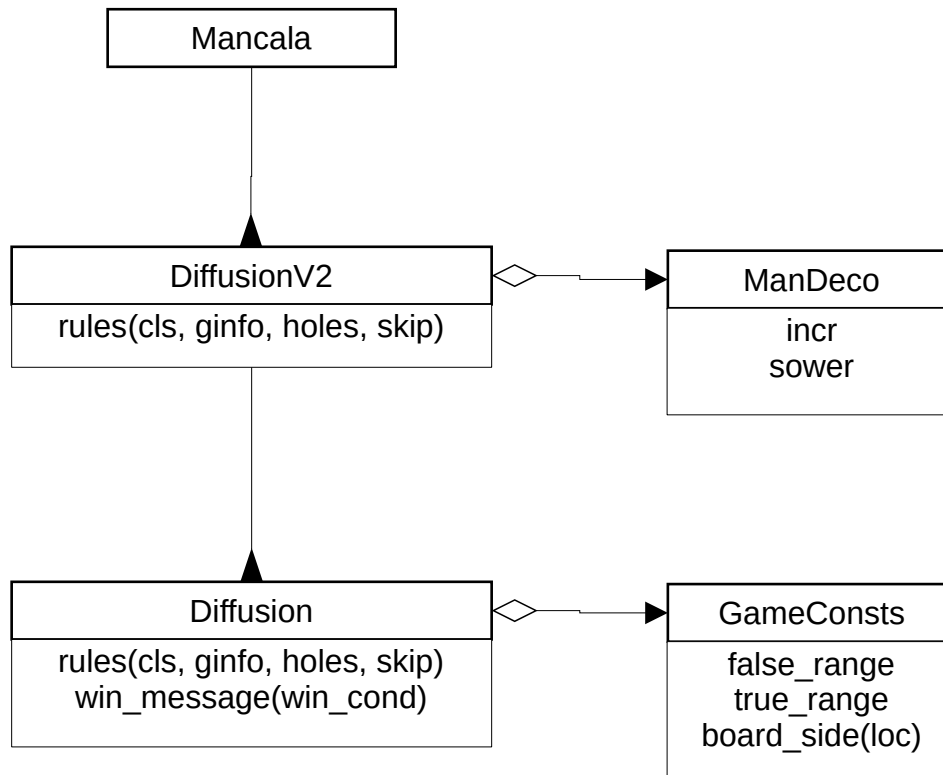


Gratuitous Game Classes

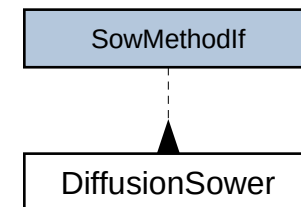


- Attributes and methods shown are overridden, reassigned or reconfigured.
- MRO is Gratuitous then NorthSouthCycles or EastWestCycles then Mancala
- Gratuitous only calls the allow deco chain when on the first part of turns, not on the place seeds opposite part.

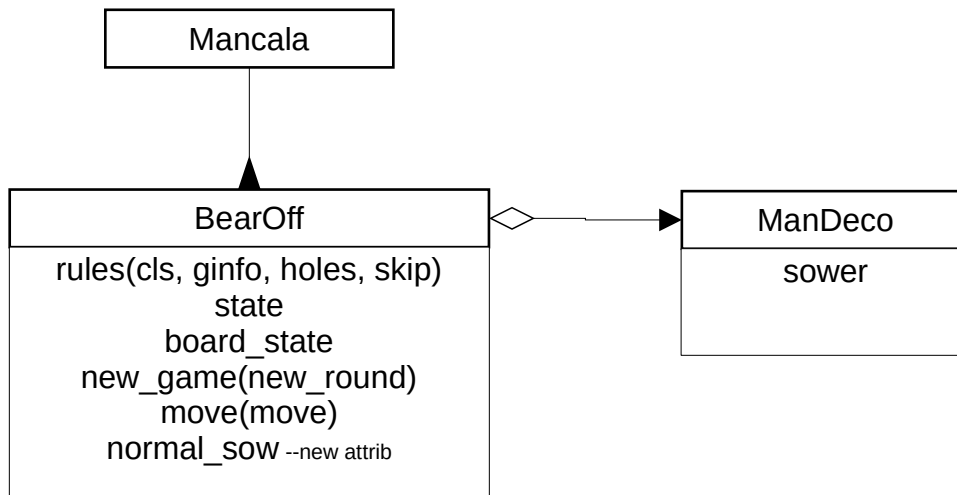
Diffusion and DiffusionV2 Game Classes



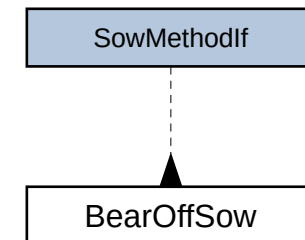
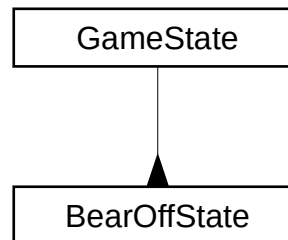
- Attributes and methods shown are overridden, reassigned or reconfigured.
- The incr deco chain is cleared because it should not be used: the sower is completely replaced and the capturer deco is CaptNone.
- Both game classes use the DiffusionSower.



Bear Off Game Class

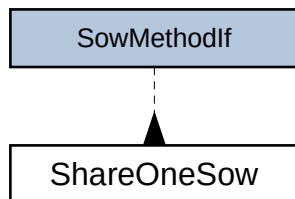
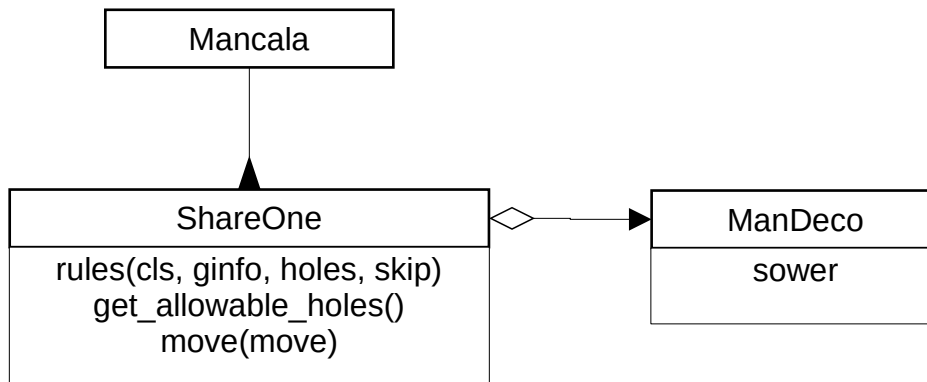


- Attributes and methods shown are overridden, reassigned or reconfigured.
- The BearOff sower is inserted in the deco chain before the single sower. The BearOffSower either does the bear off style sowing or calls down the deco chain to the original single sower.



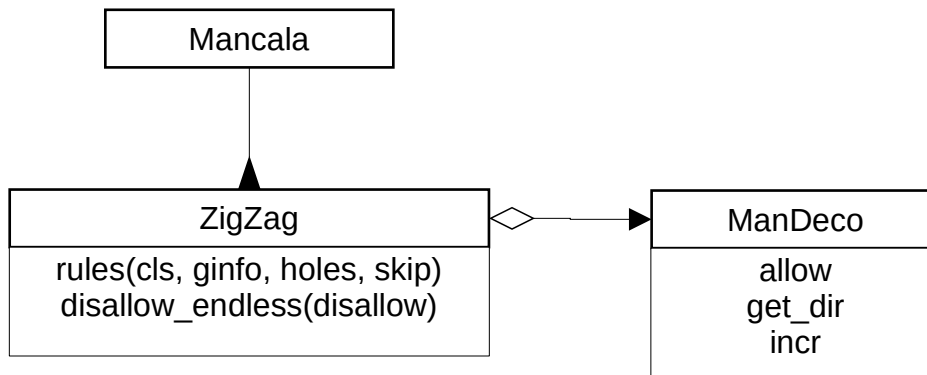
animation msg

ShareOne Game Class

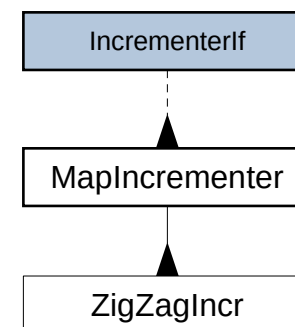
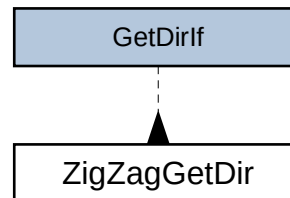
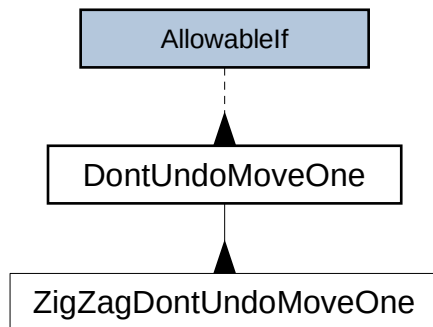


- Attributes and methods shown are over-ridden, reassigned or reconfigured.
- If the move will be a share one move, only holes that are not children with 2 or more seeds are allowable (the allow deco is not used); otherwise, the deco chain is used.
- If the next move is to share one seed and the animator is active, a message is popped up via the move method override.
- ShareOneSow wraps the existing deco chain and performs an alternate sow to share the one seed.

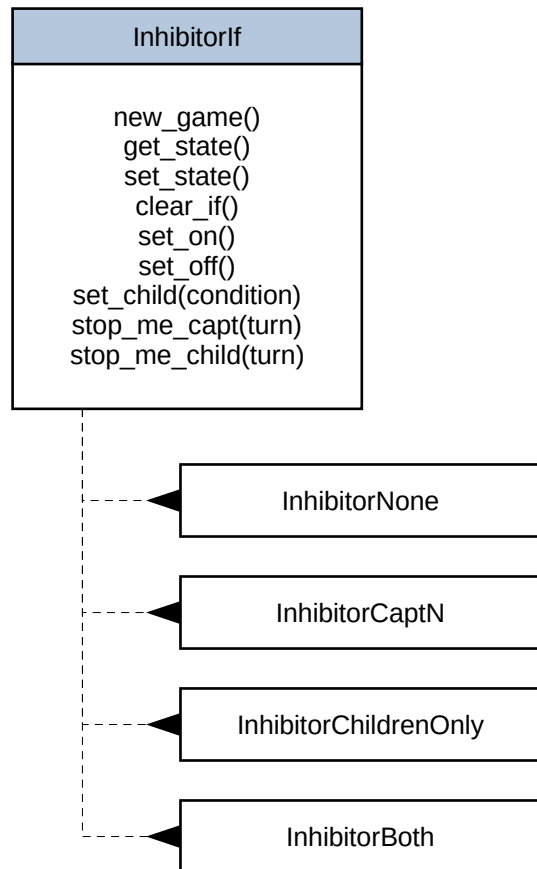
ZigZag Game Class



- Attributes and methods shown are over-ridden, reassigned or reconfigured.
- ZigZag Cycle:
 - The ZigZag cycle is similar to the normal cycle in that each hole is visited once before any hole is visited a second time.
 - The cycle is generated as though sowing from South's Leftmost hole (loc 0) through the board to North's Rightmost hole.
 - The sow direction describes which way through this cycle and the incremter should move.
- Consult code for how deco chains are modified.



Important Classes for Moves



The decorator chains and button behaviors use and control the inhibitor.

animation msgs

MoveTpl

Moves are one of (based on game parameters):

1. position
2. (position, direction)
3. (row, position, direction)
4. $-(\text{store_index} + 1)$, seeds

MoveTpl prints the moves nicely.

Row is in terms of the UI, that is Top/True is 0 and Bottom/False is 1. This is the “not” of the game.turn.

Moves are created when initializing the HoleButtons for the human players and via the get_moves deco chain for the AI player.

MoveData

MoveData is used to communicate information about each move between the deco chains and individual decorators.

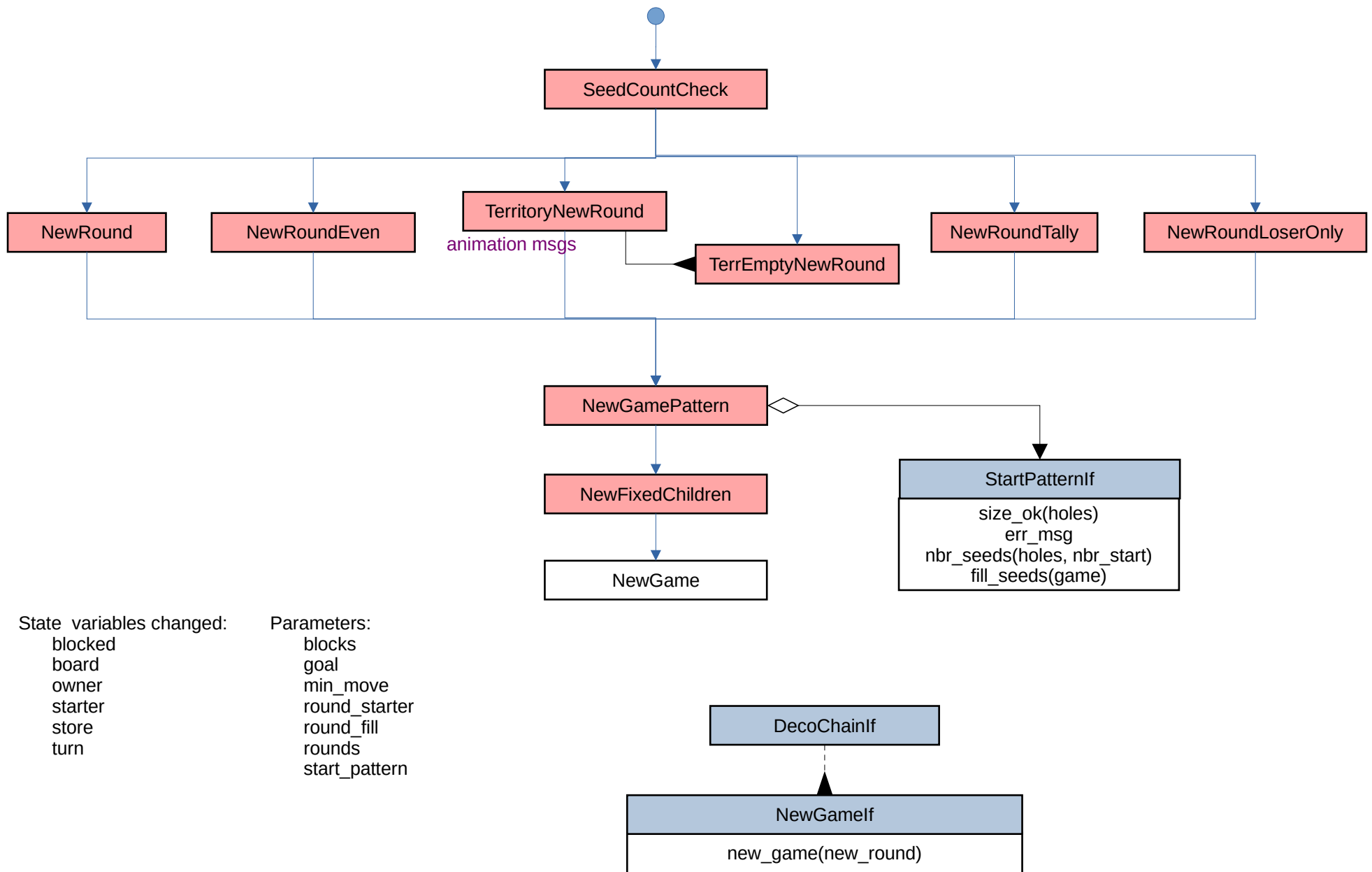
See class comment for where each field is set and/or updated.

The current move's mdata is stored in Mancala, but anything stored directly into that could mess up the Monte Carlo Tree Search (it's node dictionary uses a limited version of game state, which does not include Mancala.mdata).

Decorator Usage

Game Op/Step	Primary Decorator	Other Classes & Decorators Used	Description
New Game	new_game	StartPattern, inhibitor	Setups the game for initial play. Applies any prescribed moves.
Determine Drawable Holes	allow		Return a list of holes that are playable.
Collect Moves	get_moves		Return a list of possible moves.
Draw seeds to start a move	drawer		Parse the move, determine number of seeds to sow, possibly leave one seed
Determine sow direction	get_direction		Convert the move & location into an actual sowable direction: clockwise or counter-clockwise.
Sow	sower	MoveData, incr, make_child, inhibitor	Drop the seeds into the board holes.
Capture seeds	capturer & capt_ok	MoveData, incr, make_child, inhibitor	Perform any captures.
Evaluate end of game	ender	MoveData	At the end of each move determine if the game is over: game has been won, no more moves, game outcome can't change, etc.
Logging	get_string		Creates an ASCII string for the game.
Force end of game	quitter	MoveData	The game needs to end either because of endless sow or user selection. If not configured to do something else, unclaimed seeds are divvied between the players.

New Game Decorators and Chain



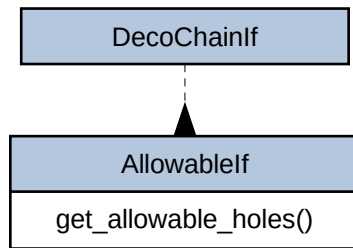
State variables changed:

blocked
board
owner
starter
store
turn

Parameters:

blocks
goal
min_move
round_starter
round_fill
rounds
start_pattern

Allowables Decorators and Chain



State variables read:

turn
board
store
blocked
owner
child
mcount

Parameters:

min_move
allow_rule
mlength
mustshare
grandslam
udir_holes

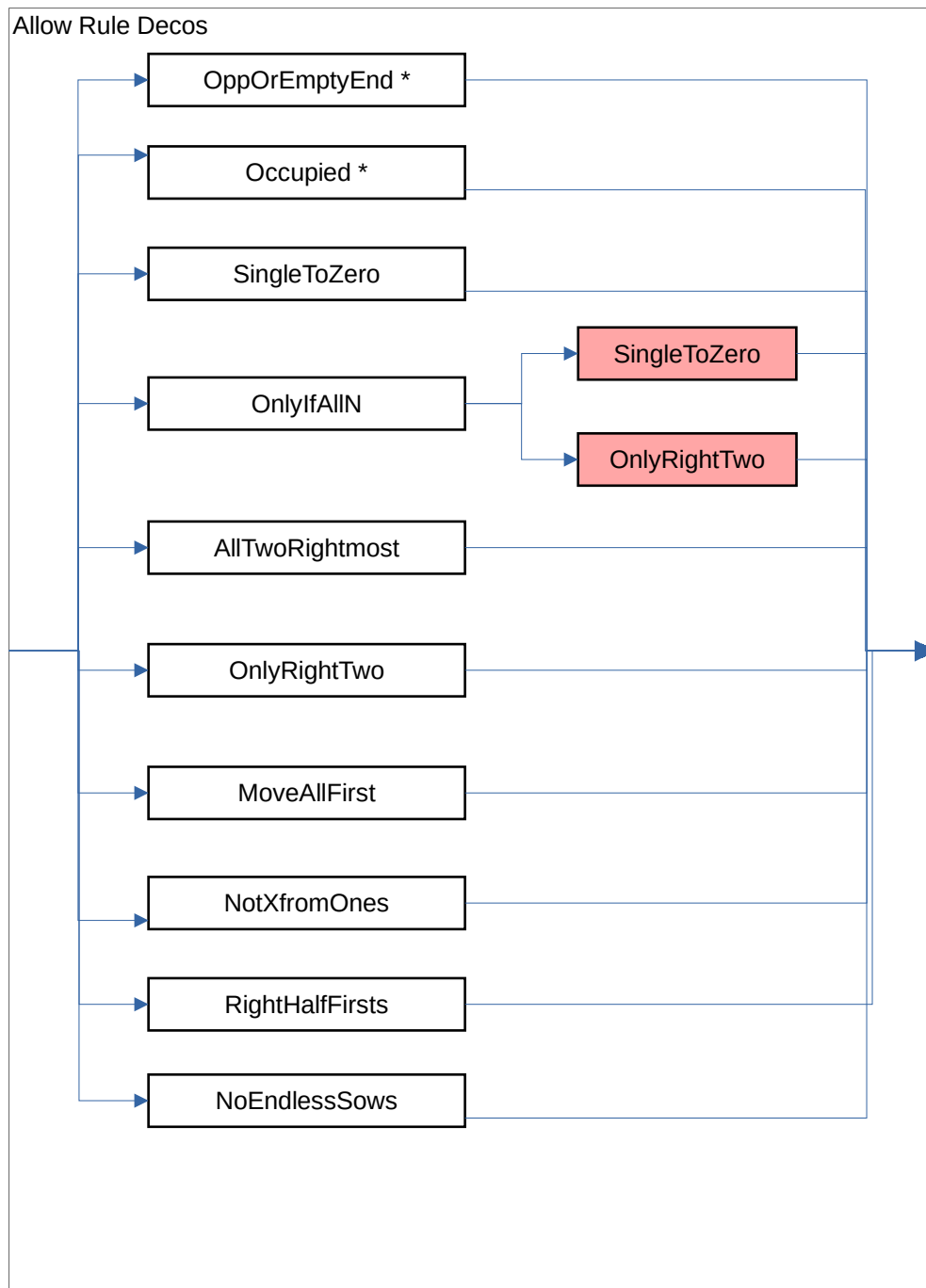


Notes:

* Simulates some portion of moves to determine allowables

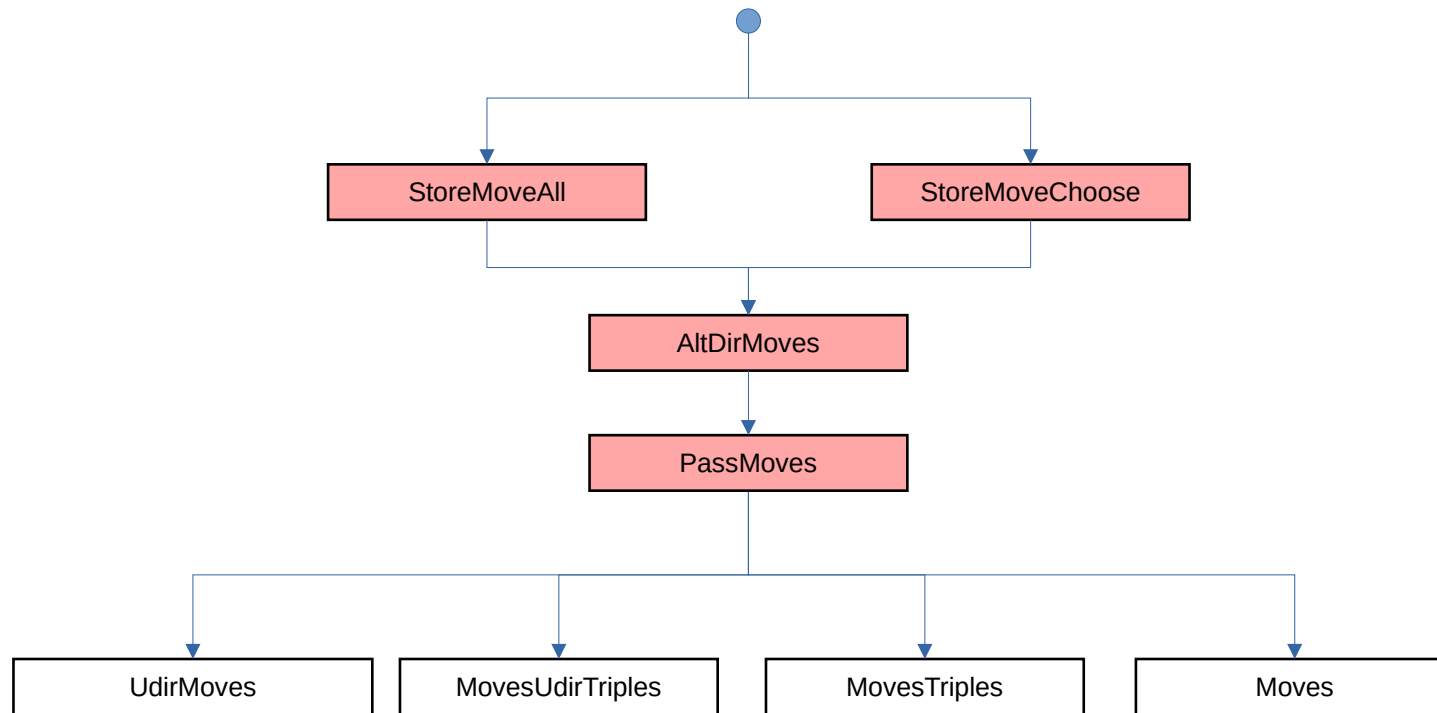
** MemoizeAllowable is used for deco's that simulate moves

Allow Rule Decos



Notes:
Some allow rule decos are shown more than once for clarity.
* Simulates some portion of moves to determine allowables

Get Moves Decorators and Chain

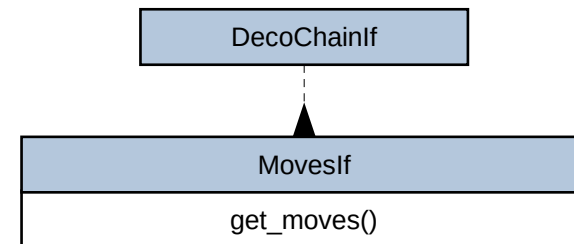


State variables read:

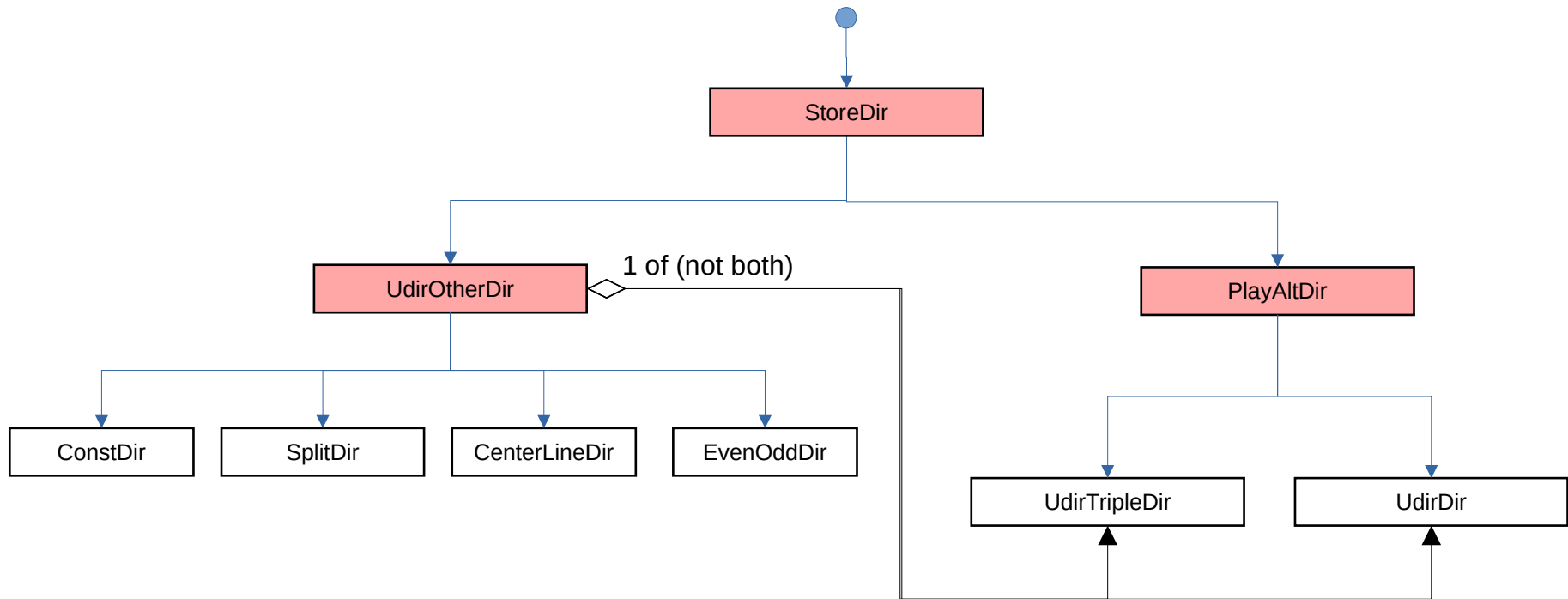
blocked
board
owner
starter
store
turn

Parameters:

mlength
mustpass
sow_direct
udir_holes
udirect

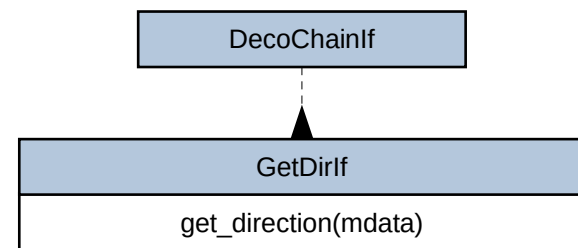


Get Direction Decorators and Chain

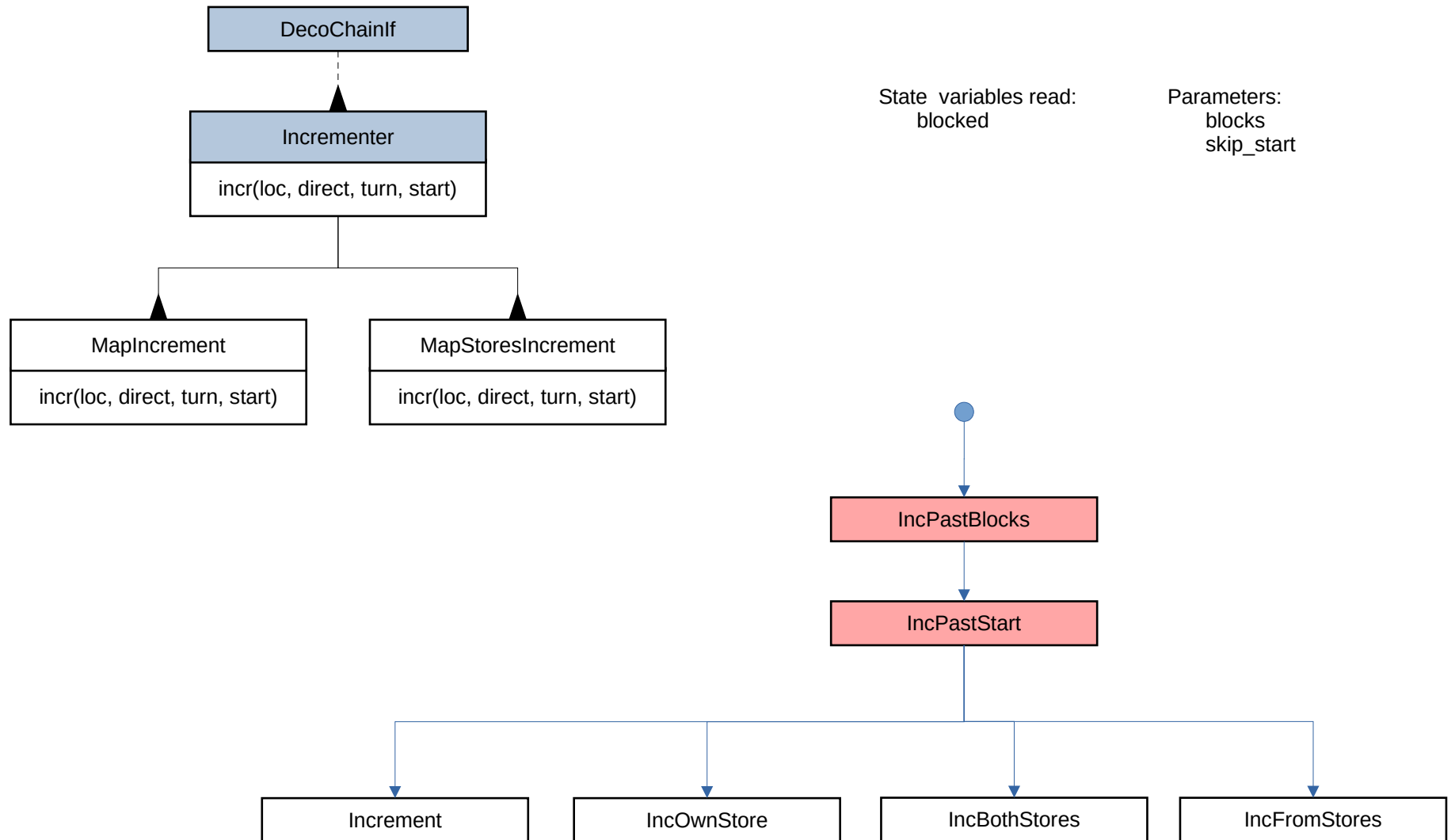


State variables read:
mcount
turn

Parameters:
no_sides
sow_direct
udir_holes
udirirect



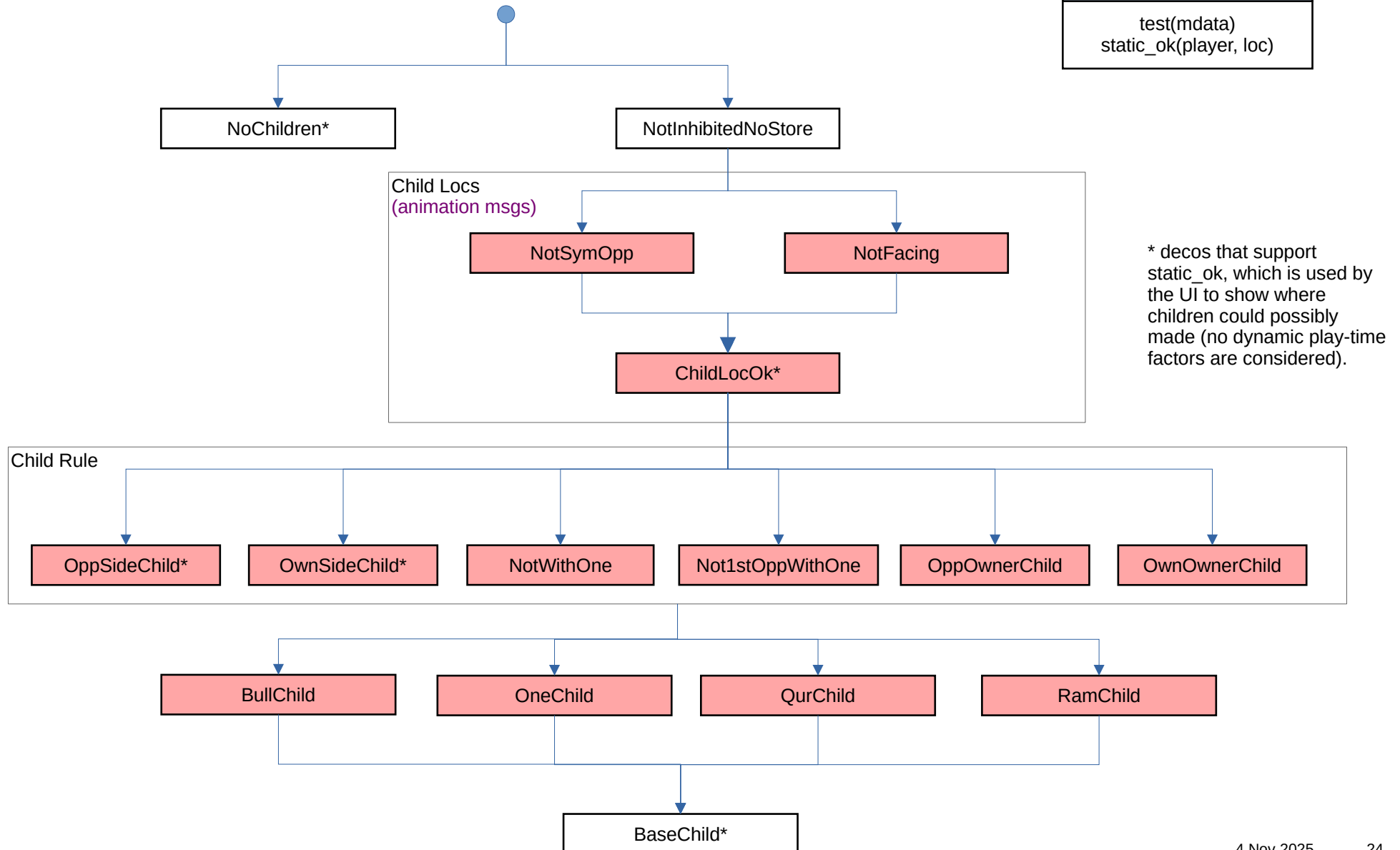
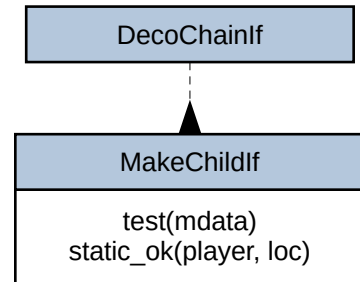
Incrementer Decorators and Chains



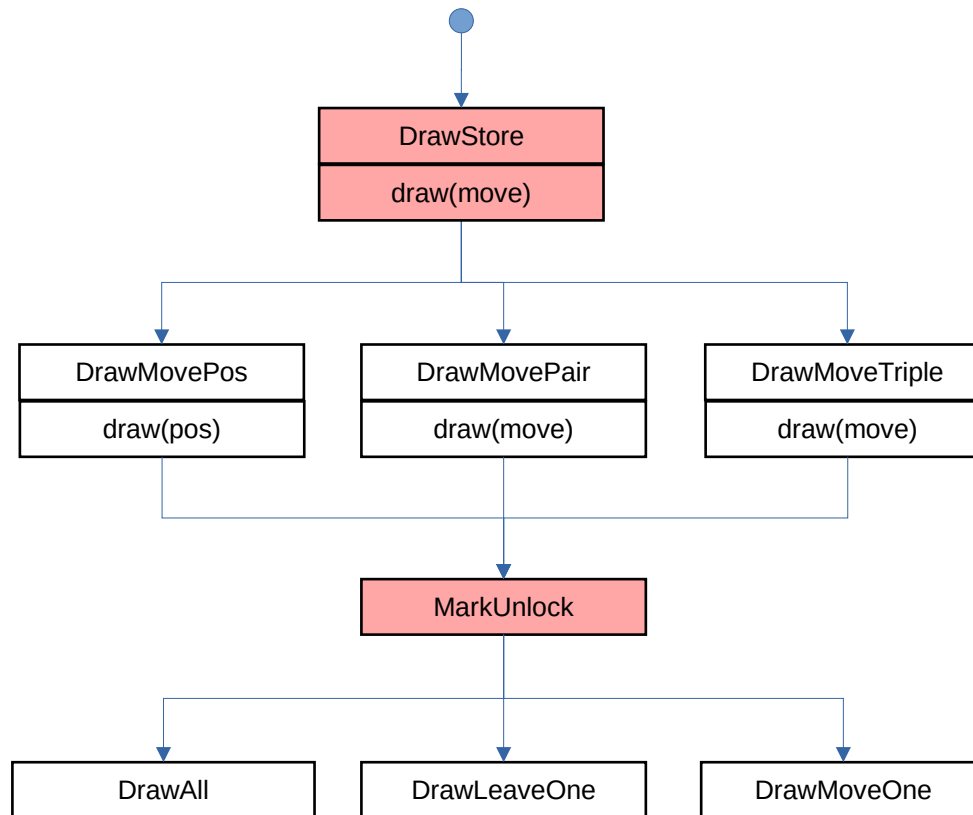
MakeChild Decorator and Chain

State variables read:
board
child
inhibitor
owner
turn

Parameters:
child_cvt
child_locs
child_rule
child_type



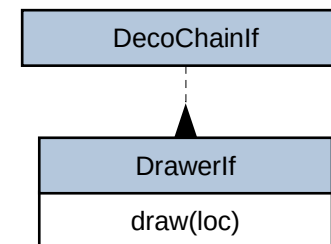
Draw Decorators and Chain



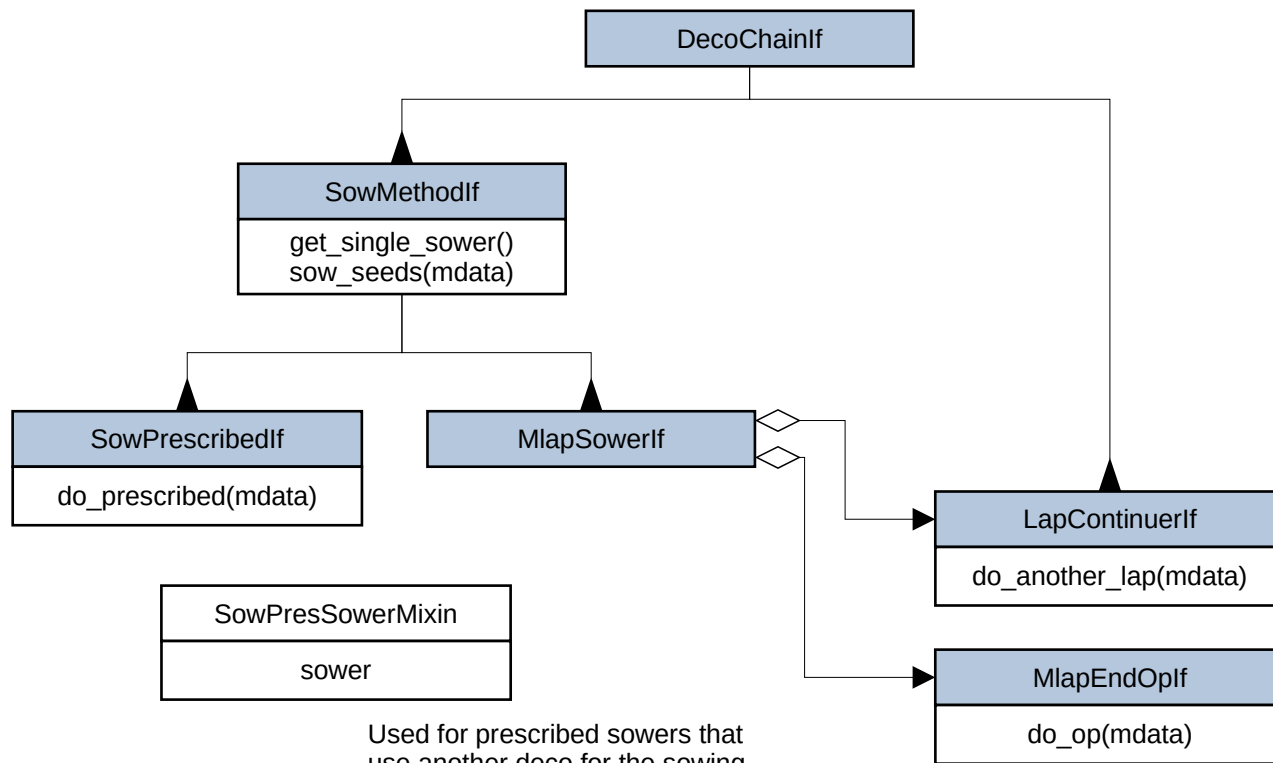
The drawer converts the move into board location.

State variables:
Read:
turn
Changed:
board
unlocked

Parameters:
allow_rule
mlength
move_one
moveunlock
sow_start



Sower Decorators

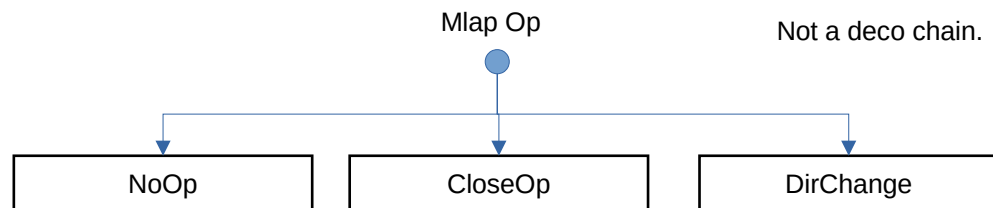


State variables:

Reads
inhibitor
turn
child
mcount
Changes
board
store
blocked

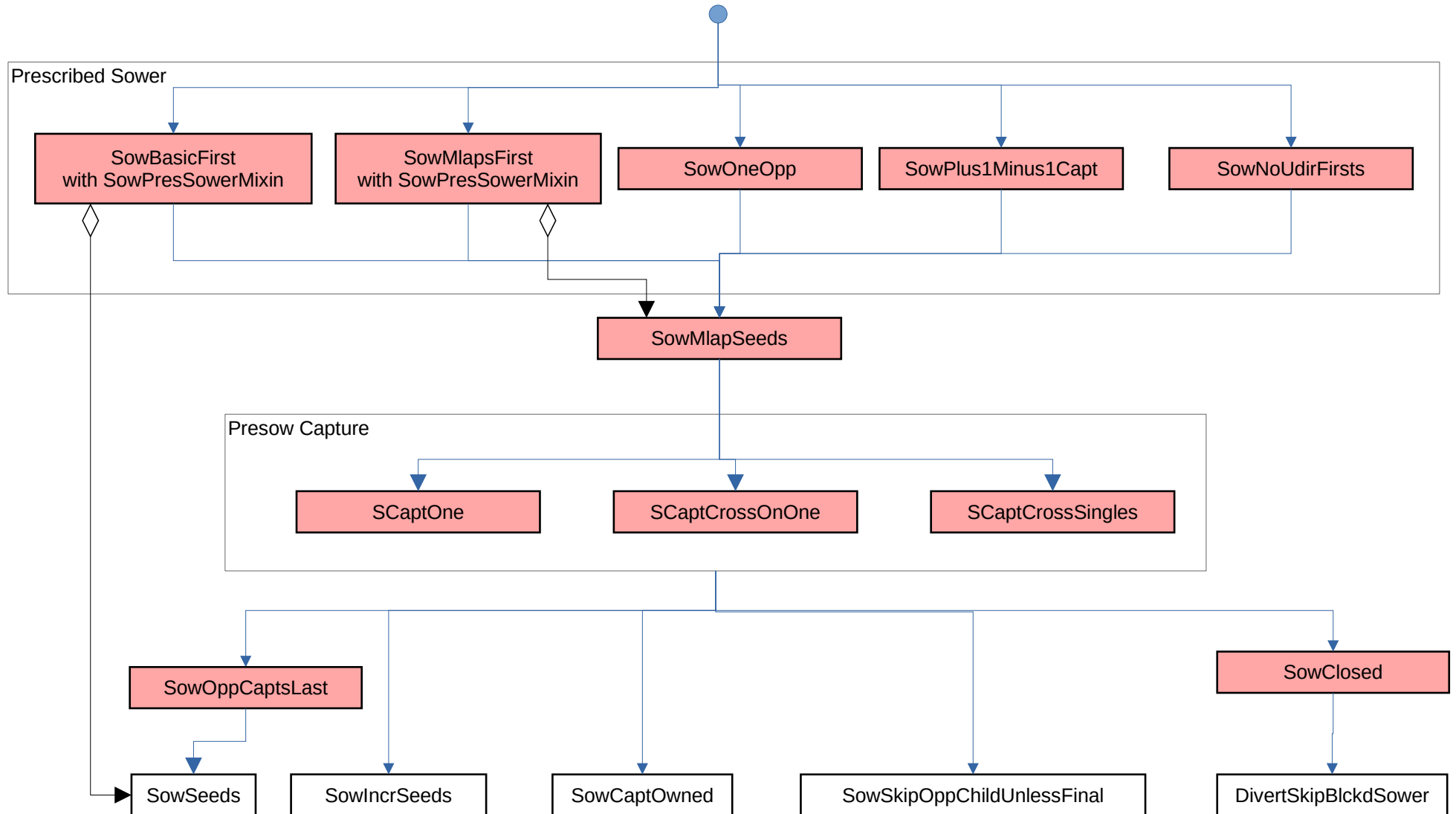
Parameters:

capt_max
capt_min
capt_on
child_type
crosscapt
evens
goal
gparam_one
mlaps
prescribed
presowcapt
sow_direct
sow_own_store
sow_param
sow_rule
visit_opp

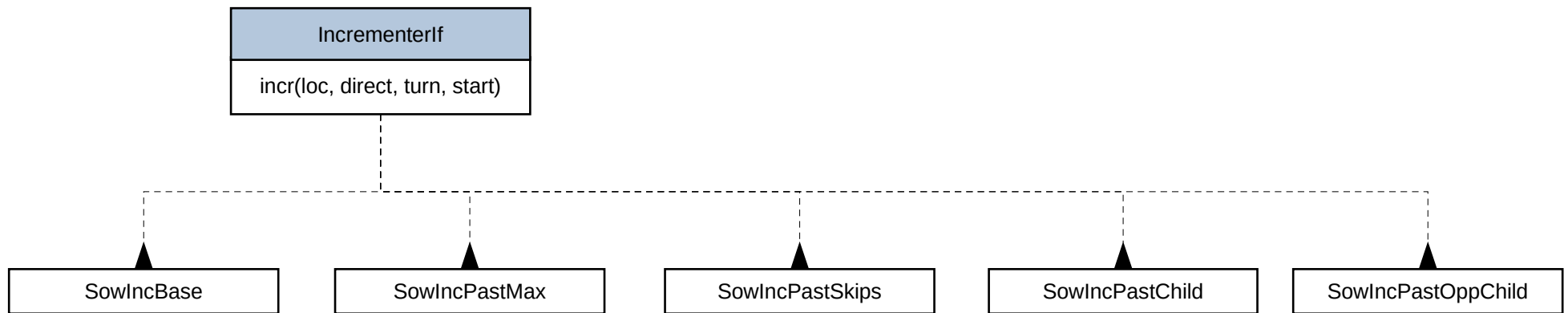


Sower Deco Chain

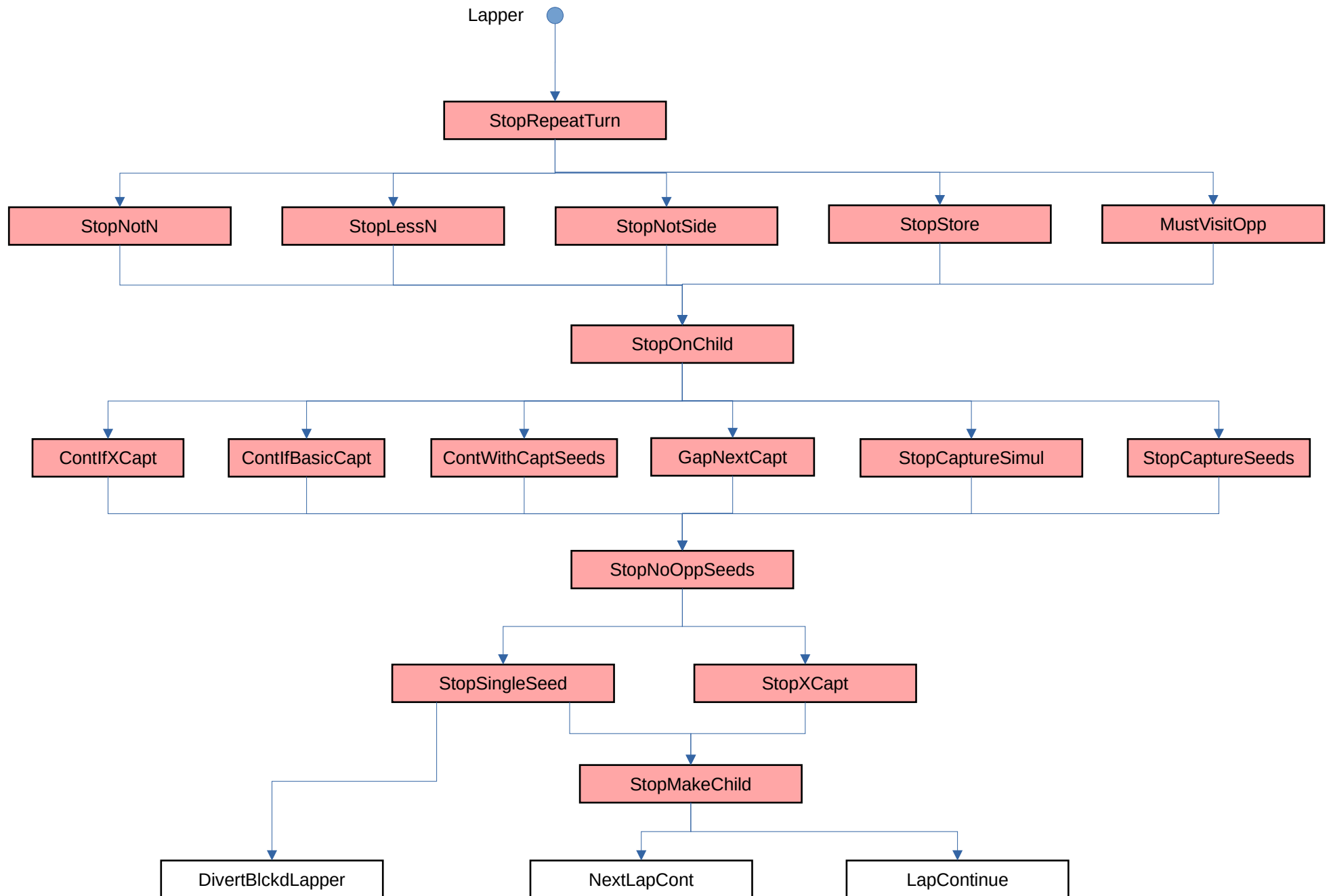
animation msgs



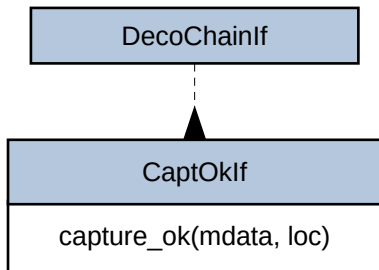
Incrementer Decos used with SowIncrSeeds



Lap Continuer Deco Chain and Mlap Operation



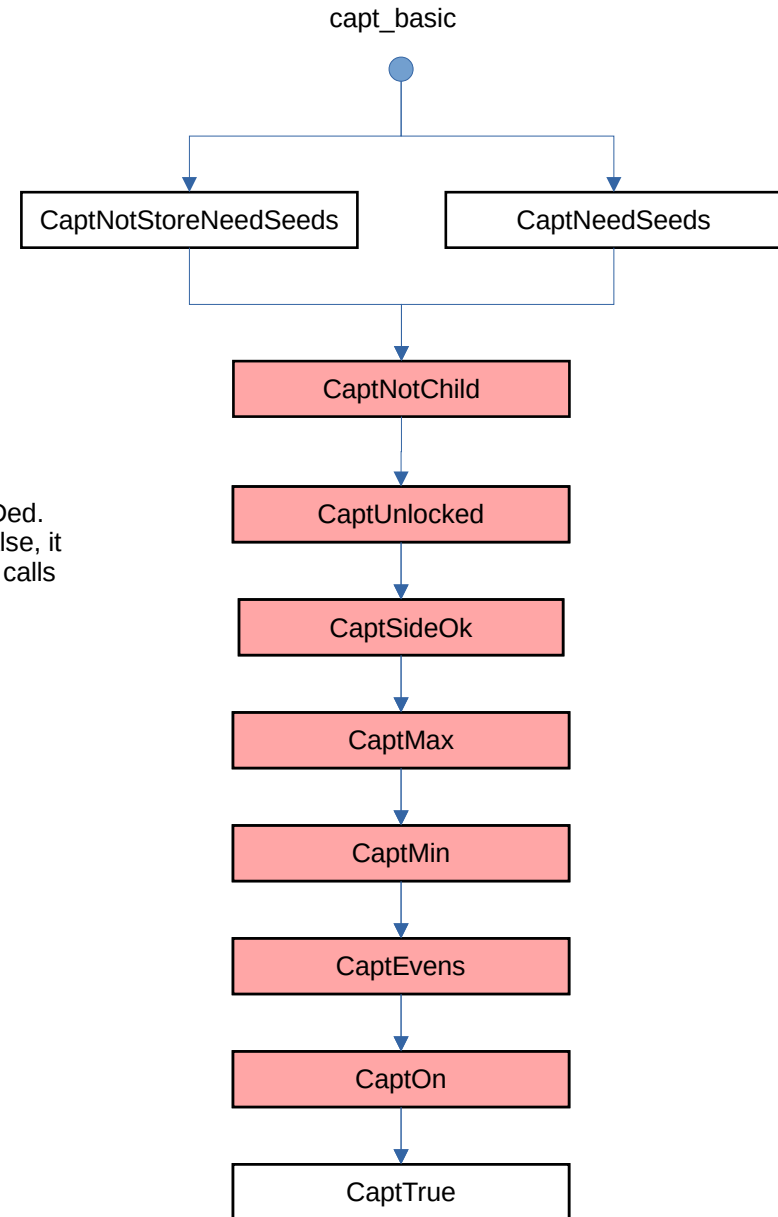
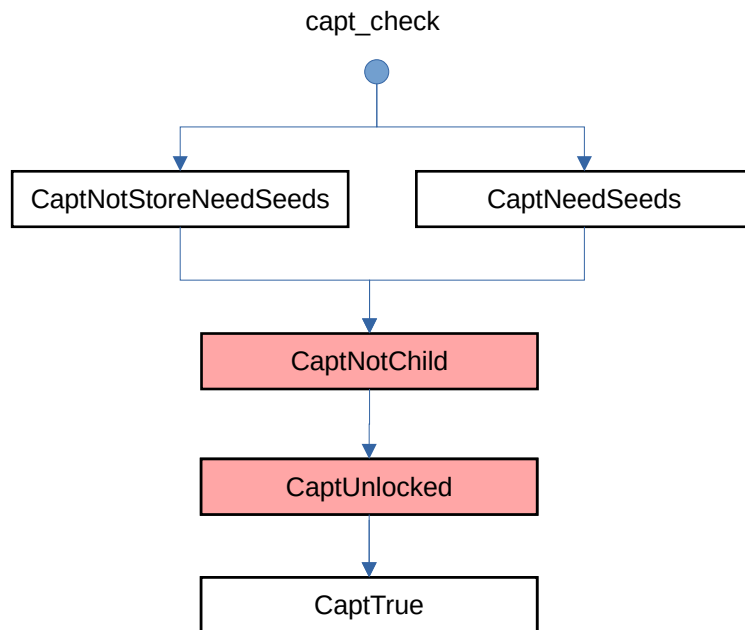
Capt Ok Decorators and Chains



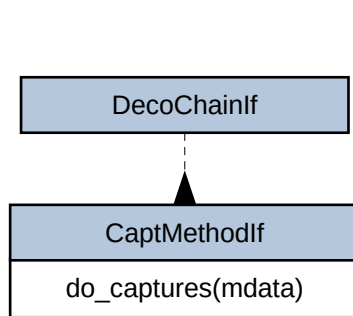
State variables read:
board
child
turn
unlocked

Parameters:
capt_max
capt_min
capt_on
capt_side
moveunlock

These are effectively ANDed.
If any deco condition is false, it
returns false, otherwise it calls
down the deco chain.



Capturer Decorators and Chain



State variables

Reads

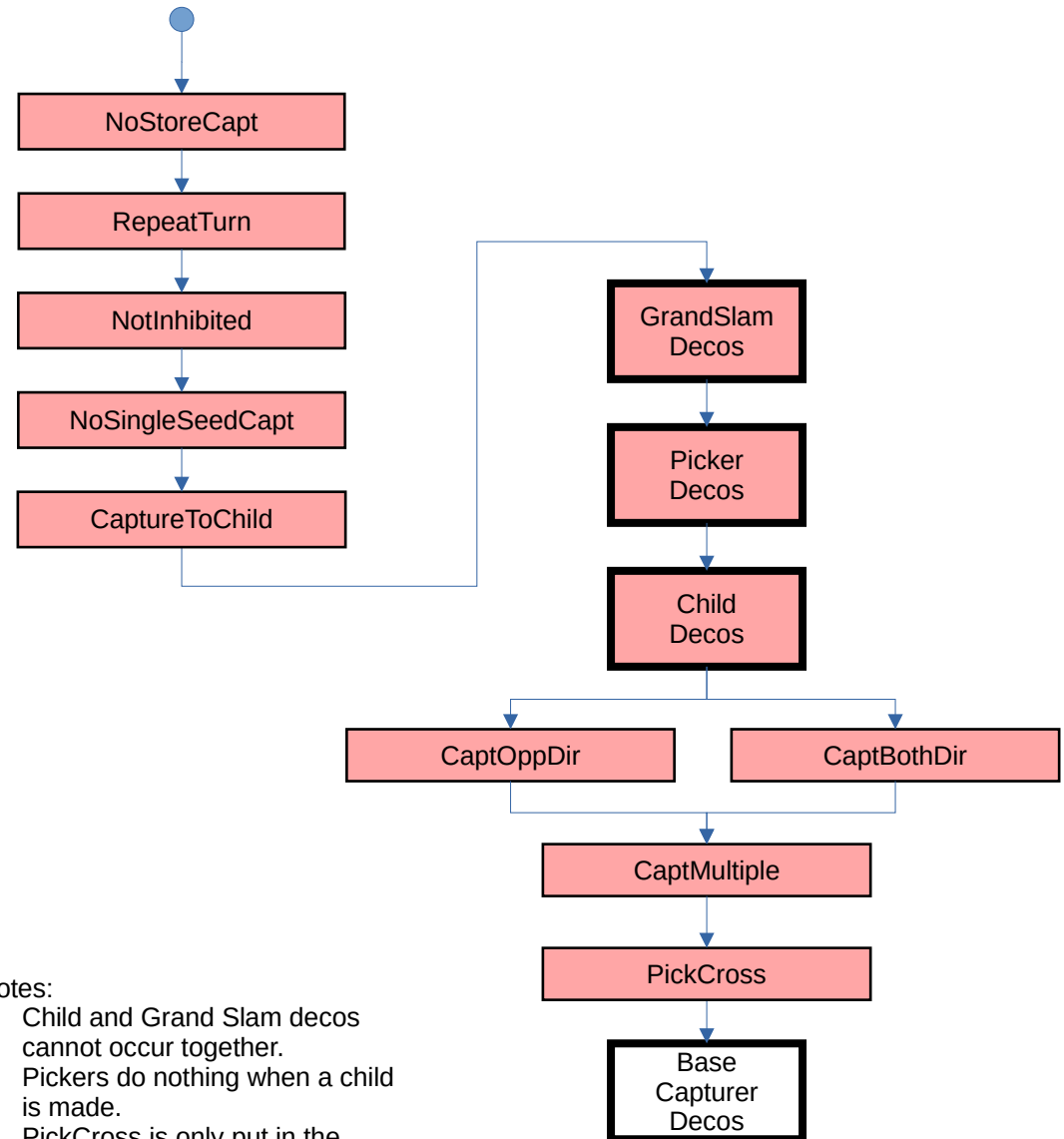
inhibitor
starter
turn

Changes

board
child
store

Parameters:

capsamedir
capt_max
capt_min
capt_on
capt_rturn
capt_side
capt_type
child_cvt
child_type
crosscapt
evens
grandslam
mlaps
multicapt
nocaptmoves
nosingcapt
pickextra
prescribed
round_fill
xc_sown
xcpickown

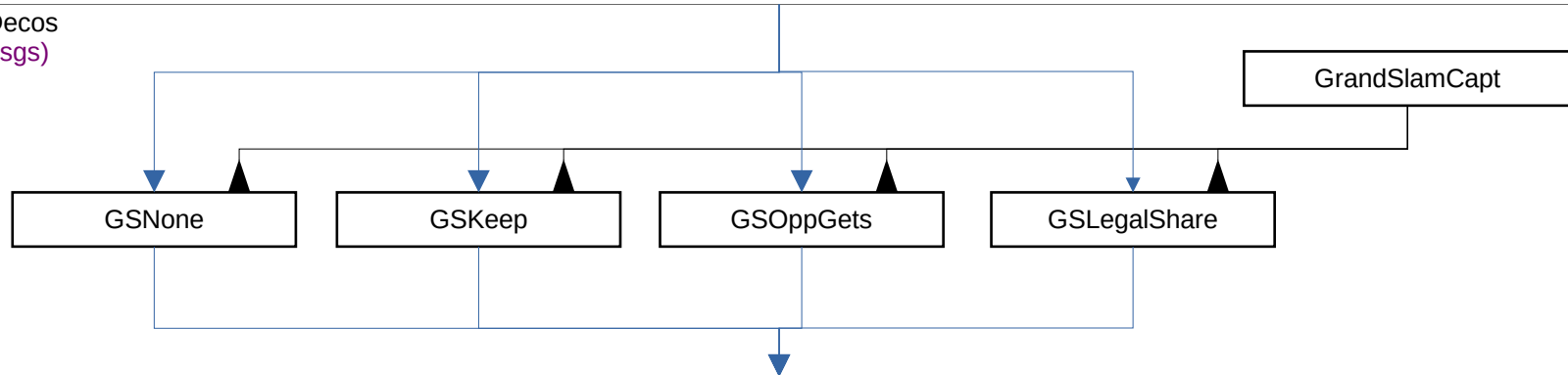


Notes:

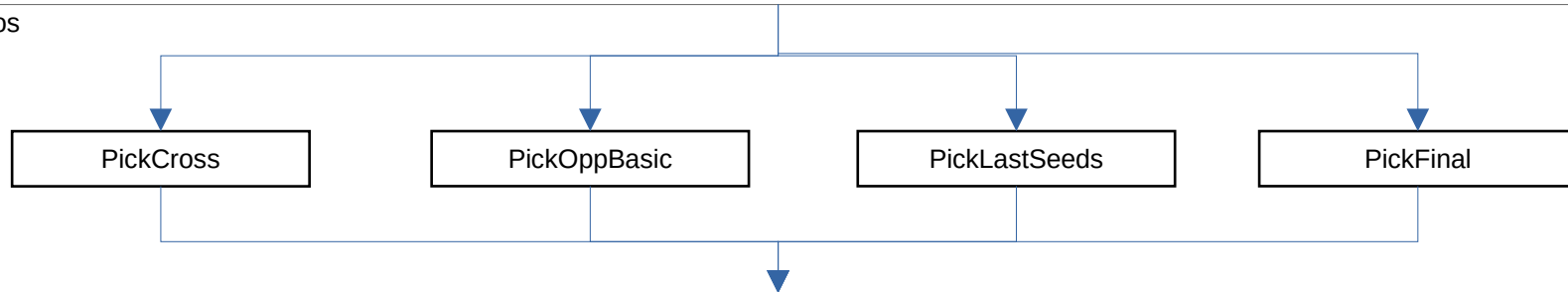
- Child and Grand Slam decos cannot occur together.
- Pickers do nothing when a child is made.
- PickCross is only put in the deco chain once, either in Picker Decos or after CaptMultiple.

Capturer Deco Chains (1 of 2)

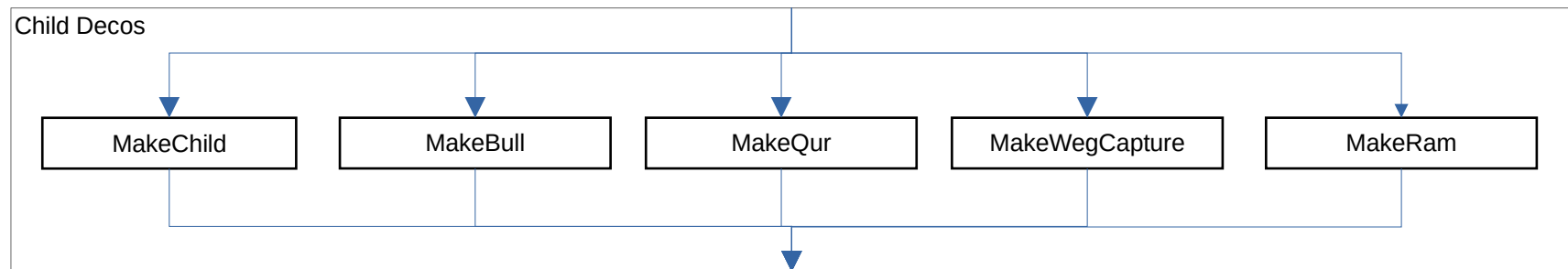
Grandslam Decos
(animation msgs)



Picker Decos

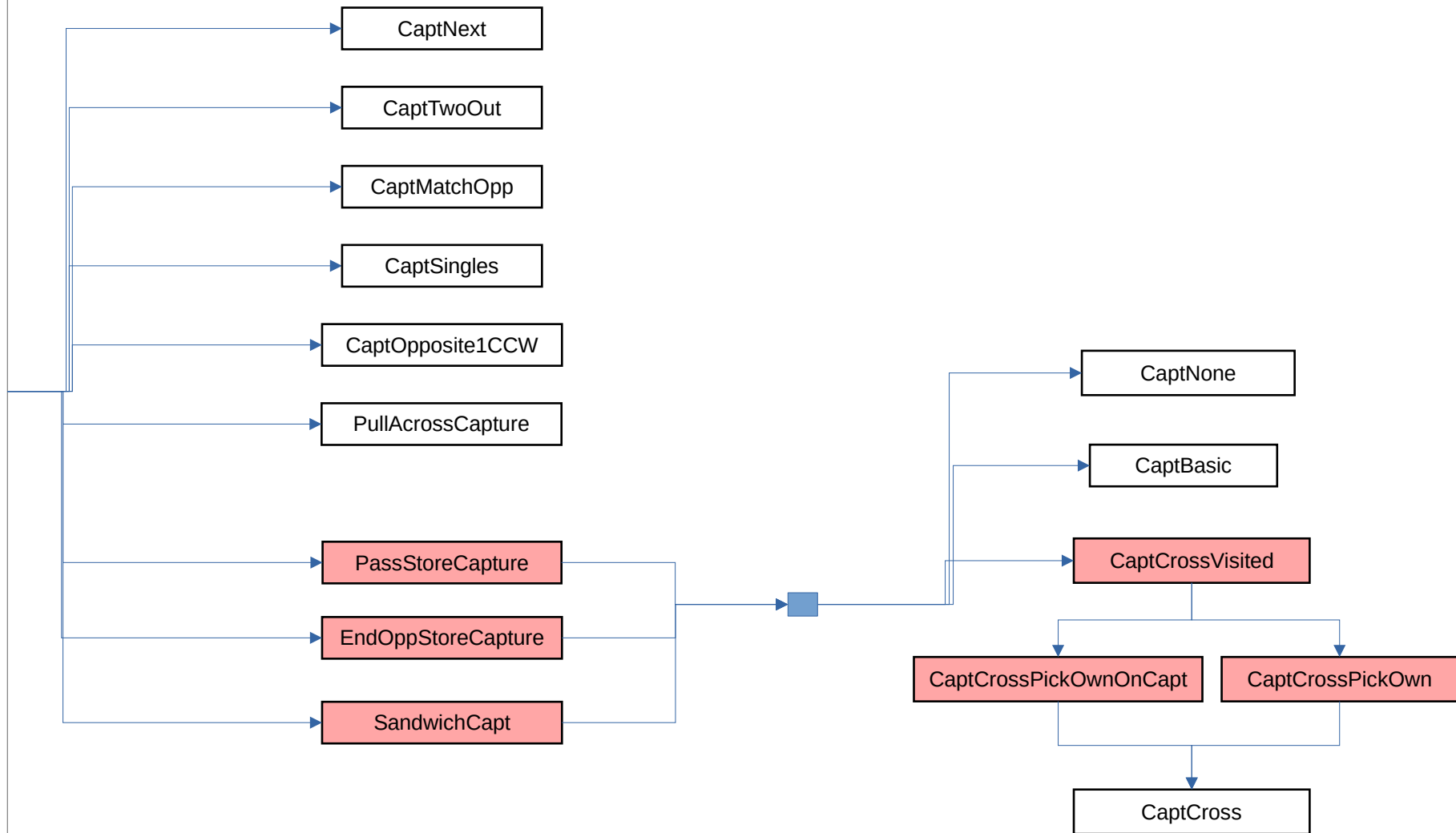


Child Decos



Capturer Deco Chains (2 of 2)

Base Capturer Decos



Ender & Quitter Decorators and Chains

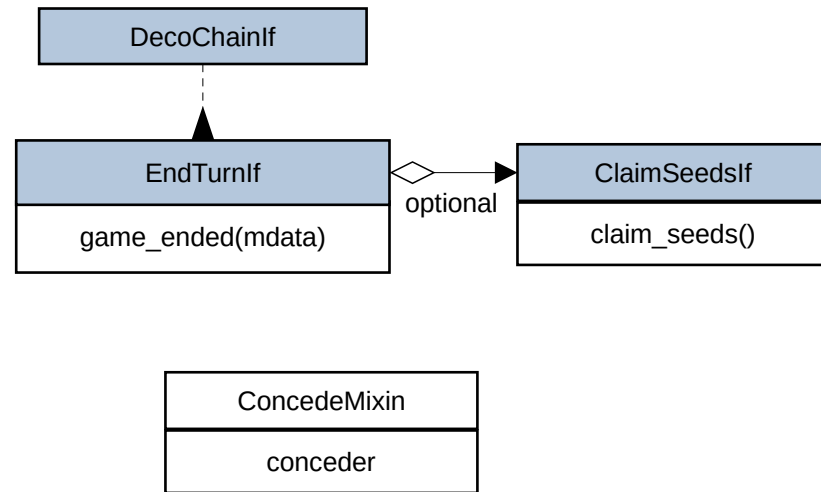
State variables:

Reads:
child
owner
turn

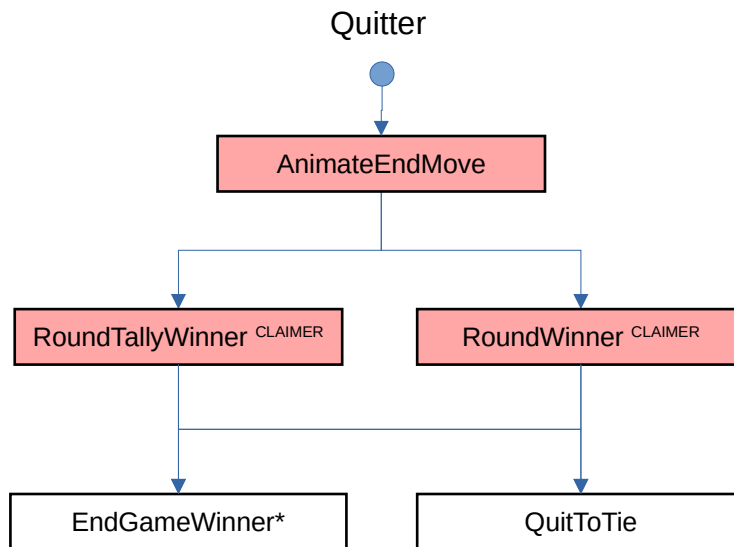
Changes:
board
store

Parameters:

capt_min
capt_next
capt_on
capttwoout
child_cvt
child_type
crosscapt
evens
goal
gparam_one
min_move
mlaps
mustpass
mustshare
no_sides
round_fill
rounds
sow_own_store
stores
unclaimed



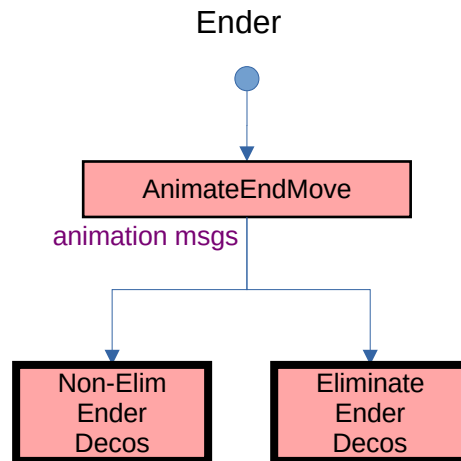
Used for enders that use a different criteria for ending when the user concedes a game.



Note:

* For EndGameWinner in the quitter: a claimer, taker or divvier is selected based on the quitter, child_type and store properties (see next page).

Ender Deco Chain



CLAIMER: counts owned seeds but does not move them:

- ClaimSeeds
- ChildClaimSeeds
- ClaimOwnSeeds
- ClaimBoardSeeds

TAKER: seeds not in children are claimed and moved to stores:

- TakeOwnSeeds
- TakeOnlyChildNStores
- TakeAllUnclaimed

DIVVY: unclaimed seeds are split between players:

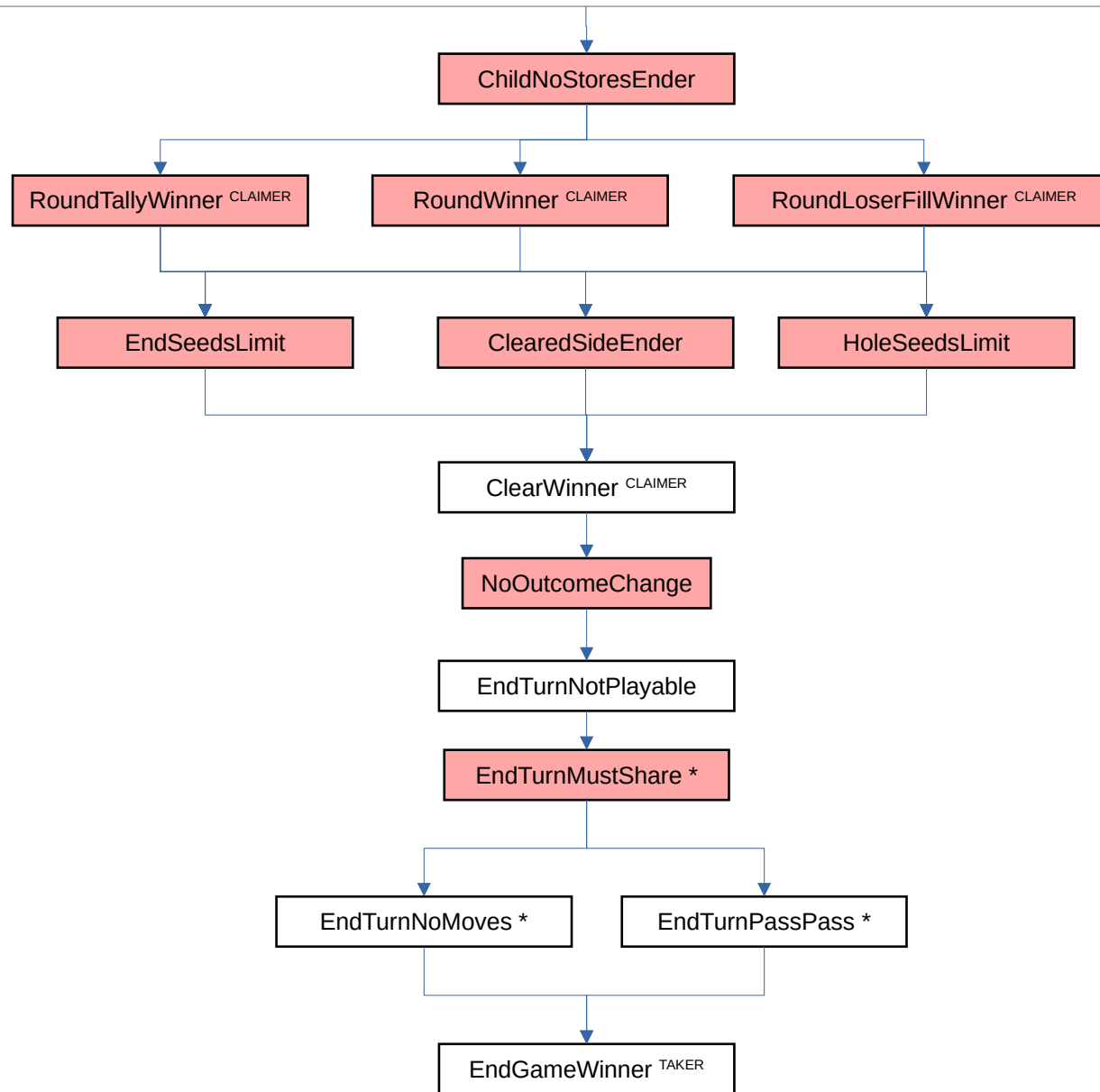
- DivvySeedsStores
- DivvySeedsChildOnly

Note:

* Uses get_allowable_holes

Non-Eliminate Ender Deco Chain

Non-Elim Ender Deco



Eliminate Ender Deco Chains

