Board Game Generation Language
A Brief Introduction

- Overview of BGGL
- BGGL Language Highlights
- Implementing Tic-Tac-Toe with BGGL
- Summary

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BGGL Overview: Goals

- Capture the essential components of a board game to assist game coders
- Specialize these components to provide the programmer with a rich code palette
- Eliminate tedious error-checking
- Create an environment for the invention of new board games

BGGL Overview: Strengths

- Versatile board game data types integrated with conventional programming language constructs
- Built-in language features tailored specifically for board games
- Flexible, robust rule specification syntax

BGGL Overview: Weaknesses

- Domain-specificity restricts applicability to other computational domains
- Extensive syntax steepens the learning curve for even the most basic functionality in BGGL
- No extensibility support

BGGL Highlights: Board

- Global variable with convenient manipulation functions

```
board = <[W, B, W]
         [B, W, B]
         [W, B, W]>;

          /* specifies
          the following
          board:
   0 1 2
 0 W B W
 1 B W B
 2 W B W
 */
```

BGGL Highlights: Rules

- Rules in BGGL act like functions
- Pieces accepted as targets
- Composed of 4-tuple custom constraint syntax

```
rule pawn_capture(): BP, WP

{

    return test 1, diag, false,
      false;

}

/*

specifies rule for pawn capture on
   black, white pawns:

length: 1, (how far can it move?)

direction: diag, (how can it move?)

jump: false, (hops another piece?)

emptysquare: false (lands on empty?)

*/
```

BGGL Highlights: Move

- Moves interface with Pieces and the Board via 4- or 6- tuples

```
piece G;

move m = :^:G:0:0:1:1;

/*

G _ _     _ _ _

_ _ _  moves to   _ G _

_ _ _     _ _ _


move syntax = : <movetype> :
   <piece> : <row_source> :
   <col_source> : <row_target> :
   <col_target>;

*/
```

BGGL Tutorial: Tic-Tac-Toe

Critical Code: Game Rule Declarations

```
rule no_overwrite(): X, O {
    return test , , , true;  // the only special constraint is that the destination
                             // square should be empty
}

func getpiece(player p) returns piece {
       if (p == p1) { return X; } else { return O;}
}

func getwinner() returns player {
       int i;
       player winner;
       for (i = 0 to 2) {
               if (   <_i> == [X,X,X] || <|i> == [X,X,X] ||
                      </0> == [X,X,X] || <\0> == [X,X,X]) {
                  winner = p1;
               } else {
                       if (    <_i> == [O,O,O] || <|i> == [O,O,O] ||
                               </0> == [O,O,O] || <\0> == [O,O,O]) {
                           winner = p2;
                       }
               }
       }
       return winner;
}
```

BGGL Tutorial: Tic-Tac-Toe

Critical Code: Game Block 1/2

```
game {
        board =
        <[_,_,_]
         [_,_,_]
         [_,_,_]>; //empty tic tac toe board stored in global variable

        boolean done = false;
        player thisplayer = p1;
        int row; int col;
        piece currpiece;
        print board;
        int countmoves=0;

        while (!done) {

            print "Player " + thisplayer + ": " + getpiece(thisplayer);
            row = input "Enter row coordinate: ", int;
            col = input "Enter col coordinate: ", int;

            currpiece = getpiece(thisplayer);
            move m = :+:currpiece:row:col;
```

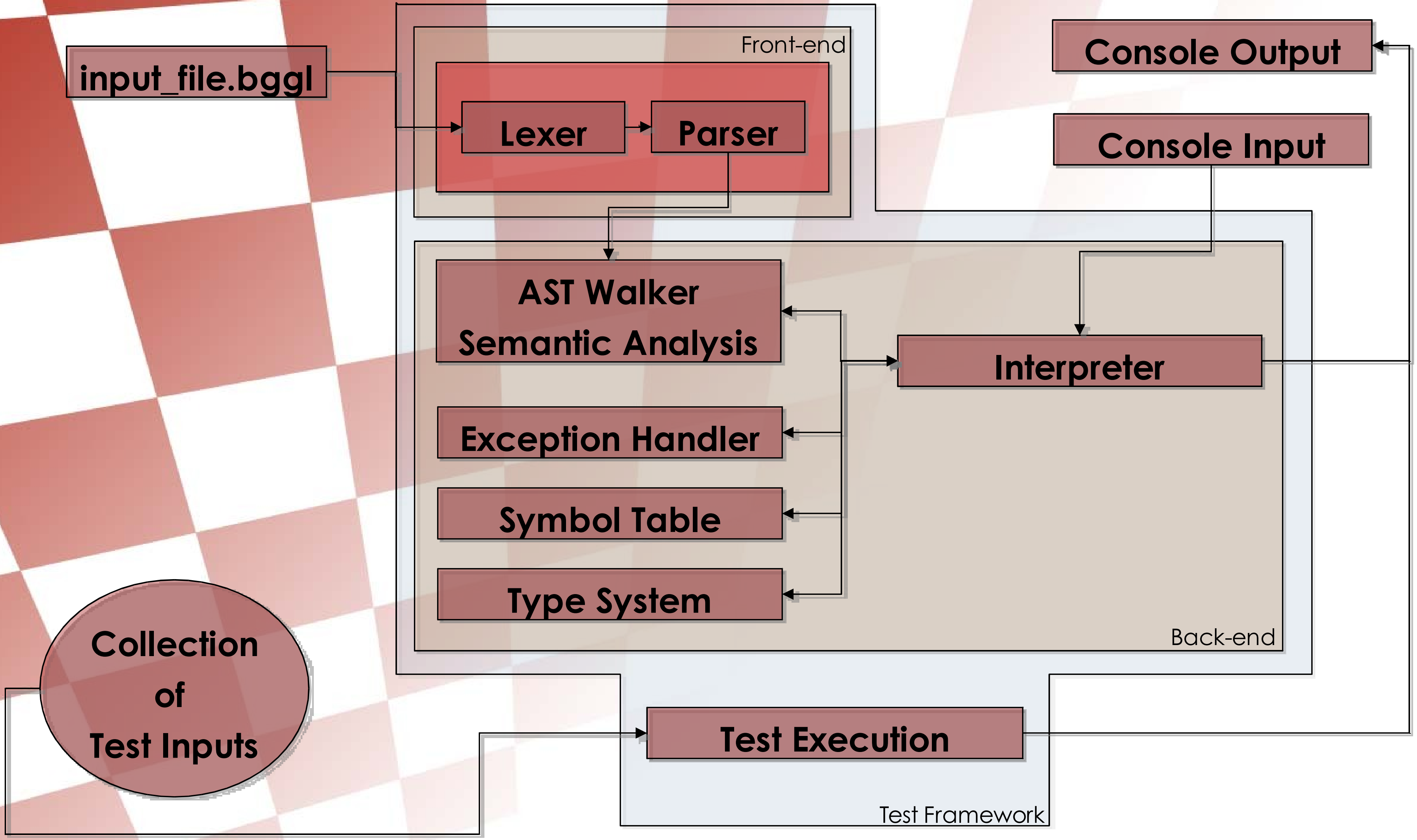
BGGL Tutorial: Tic-Tac-Toe

Critical Code: Game Block 2/2

```
       if (no_overwrite():m) {
                 apply m;
                 if (thisplayer == p1) {
                 thisplayer = p2;
                 } else {
                      thisplayer = p1;
                 } countmoves = countmoves + 1;
               }
               else { print "Invalid coordinate"; }
               print board;

               player winner = getwinner();
               if (winner == p1 || winner == p2) {
                       print "" + winner + " won!";
                       done = true;
               }
               else {
                       if (countmoves == 9) {
                               print "It's a draw!";
                               done = true;
                       }
               }
       }
}
```

BGGL Conclusion: Framework



BGGL Conclusion: Wishlist

- The implementation of turn{ } blocks as a specialized control flow mechanism
- Additional attention to usability via condensed syntax and semantics
- Better support for non-domain-specific tasks

BGGL Conclusion: Take-aways

The next time we build a programming language, we'll...

- Utilize similar directory organization, version control, and testing processes
- Emphasize the importance of initial planning by spending very late nights early in the process, not just at the end