```
     1     #!/usr/bin/perl
     2     #
     3
     4     #
     5     #A very basic tic-tac-toe program (the computer chooses randomly
)
     6     #
     7
     8
     9     use strict;
    10     use CGI;
    11     use Socket;
    12
    13     my ($rounds, $round_temp, $squares, $page, $x, $y, $z, $cell, $p
layer_move, @available_choices, $computer_move, @choices, $round, $winner, $
player_move_pretty, $computer_move_pretty);
    14     my ($round_minus_one);  #bug fix (was recording moves for round1
 as round2
    15
    16     $page = CGI->new();
    17
    18     print $page->header;
    19     print $page->start_html();
    20
    21     # print table beginnings
    22
    23     print ("<table width=\"90\%\" border=0 cellpadding=15>\n");
    24     print ("<tr valign=middle>\n");
    25
    26     # left cell is tic tac toe table
    27
    28     print ("<td align=center>\n");
    29
    30     #
    31     # find out which round it is so we know how to define $squares
    32     #
    33
    34     unless ($page->param('round')) {
    35        $round = 0;
    36     }else {
    37        $round = $page->param('round');
    38     }
    39
    40     #
    41     # set array of tic tac toe squares
    42     #
    43
    44     if ($round > 0) {
    45       $squares = [
    46                  [
    47                   $page->param('[0][0]'),
    48                   $page->param('[0][1]'),
    49                   $page->param('[0][2]')
    50                  ],
    51                  [
    52                   $page->param('[1][0]'),
    53                   $page->param('[1][1]'),
    54                   $page->param('[1][2]')
    55                  ],
    56                  [
    57                   $page->param('[2][0]'),
    58                   $page->param('[2][1]'),
    59                   $page->param('[2][2]')
    60                  ]
    61                ];
    62     }else {
```

```
63        $squares = [
64                    ['?', '?', '?'],
65                    ['?', '?', '?'],
66                    ['?', '?', '?']
67                   ];
68     }
69
70     #
71     # set array for determing history of moves (recorded by round)
72     #
73
74     if ($round > 0) {
75        $rounds = {
76                   round1 => {
77                              player => $page->param('round1_x'),
78                              computer => $page->param('round1_o')
79                             },
80                   round2 => {
81                              player => $page->param('round2_x'),
82                              computer => $page->param('round2_o')
83                             },
84                   round3 => {
85                              player => $page->param('round3_x'),
86                              computer => $page->param('round3_o')
87                             },
88                   round4 => {
89                              player => $page->param('round4_x'),
90                              computer => $page->param('round4_o')
91                             },
92                   round5 => {
93                              player => $page->param('round5_x'),
94                              computer => $page->param('round5_o')
95                             }
96                  };
97     }else {
98        $rounds = {
99                    round1 => {
100                              player => '?',
101                              computer => '?'
102                             },
103                   round2 => {
104                              player => '?',
105                              computer => '?'
106                             },
107                   round3 => {
108                              player => '?',
109                              computer => '?'
110                             },
111                   round4 => {
112                              player => '?',
113                              computer => '?'
114                             },
115                   round5 => {
116                              player => '?',
117                              computer => '?'
118                             }
119                  };
120    }
121
122    #
123    # increment $round to give it a new hidden value
124    #
125
126    $round = $round + 1;
127    $round_minus_one = $round - 1;
128    print ("Round is: $round<br>\n");
```

```
   129
   130     ##
   131     ## get player move using subroutine (subroutine stores it to $sq
uares array)
   132     ##
   133
   134     $player_move = $page->param('choice');
   135     if ($player_move) {
   136        $round_temp = "round" . $round_minus_one;
   137        player_moves($player_move, $page, $squares);
   138        $player_move_pretty = make_move_pretty($player_move);
   139        $rounds->{$round_temp}->{'player'} = $player_move_pretty;
   140
   141     #
   142     # evaluate for winner after player moves
   143     #
   144
   145        $winner = evaluate_board($squares);
   146        if ($winner eq "x") {
   147           print ("<font color='blue'>Player Won!</font><p>\n");
   148           print_final_table($squares, $page, $winner, $round, $round
s);
   149        }else {
   150
   151     #
   152     # check to see if player won. if player won, don't do the rest o
f this
   153
   154
   155     #
   156     # get available choices for computer choices
   157     #
   158
   159           @available_choices = get_available_choices($squares);
   160
   161     #
   162     # get computer move
   163     #
   164           $computer_move = get_computer_choice(@available_choices);
   165           ($x, $y) = split(/:/, $computer_move);
   166              #get coordinates for computer move and store in $x and
$y
   167           $squares->[$x][$y] = "o";   ## change square to "o"
   168           $round_temp = "round" . $round_minus_one;
   169           $computer_move_pretty = make_move_pretty($computer_move);
   170           $rounds->{$round_temp}->{'computer'} = $computer_move_pret
ty;
   171
   172        } #matches else {
   173
   174     } #matches if ($player_move)
   175
   176
   177     #
   178     # now that we have the array with computer and player choices, s
ee if there is a winner
   179     #
   180     $winner = evaluate_board($squares);
   181     if ($winner eq "o") {  #we already checked for x before
   182        print ("<font color = 'blue'>Computer Won!</font><p>\n");
   183        print_final_table($squares, $page, $winner, $round, $rounds);
   184     }
   185
   186     if (($winner ne "o") and ($winner ne "x")) {
   187        print ("<font color='blue'>No winner yet</font><p>\n");
   188
```

```
   189     # start form
   190
   191        print $page->startform(-method=> 'POST');
   192
   193     #print hidden values in form
   194
   195        print_hidden_values($page, $squares, $rounds);
   196
   197     # print hidden value for $round
   198
   199        print "<input type='hidden' name = 'round' value='$round'>\n"
;
   200
   201     # print hidden values for saving rounds
   202
   203
   204     # start tic tac toe table
   205
   206        print ("<table border=1 cellpadding=10>\n<tr>");
   207
   208     #
   209     # look through array elements ($squares) and find x's or o's
   210     # for all squares with no value, print a checkbox with the coord
inates
   211     # in the form of [0][0] as its name
   212     #
   213
   214        foreach $x(0..2) {
   215           if ($squares->[0][$x] eq "?") {
   216              print_cell($squares, $page, $x, "0");
   217           }else {
   218              print ("<td>" . $squares->[0][$x] . "</td>\n");
   219           }
   220        }
   221
   222        print ("</tr><tr>\n");
   223        foreach $x(0..2) {
   224           if ($squares->[1][$x] eq "?") {
   225              print_cell($squares, $page, $x, "1");
   226           }else {
   227              print ("<td>" . $squares->[1][$x] . "</td>\n");
   228           }
   229        }
   230
   231        print ("</tr><tr>\n");
   232        foreach $x(0..2) {
   233           if ($squares->[2][$x] eq "?") {
   234              print_cell($squares, $page, $x, "2");
   235           }else {
   236              print ("<td>" . $squares->[2][$x] . "</td>\n");
   237           }
   238        }
   239
   240        print ("</tr></table>");
   241
   242     #
   243     # print warning about picking multiple squares
   244     #
   245
   246        print $page->submit();
   247
   248        print ("<p><font color='red'>Note: if you pick more than one
square, your choice will be the upper and leftmost square that you choose!!<
/font><p>\n");
   249
   250
```

```
   251        print $page->endform();
   252     }
   253
   254     # end table cell
   255
   256     print ("</td>\n");
   257     print ("<td align=middle>\n");
   258
   259     # get printable versions of moves and print choices
   260
   261     if (($player_move) or ($computer_move)) {
   262        foreach $x(1..$round_minus_one) {
   263           $round_temp = "round" . $x;
   264           print ("<p><b>Round $x:</b><br>\n");
   265           print ("\tplayer: " . $rounds->{$round_temp}->{'player'} .
 "<br>\n");
   266           print ("\tcomputer: " . $rounds->{$round_temp}->{'computer
'} . "<br>\n");
   267        }
   268     }else {
   269        print ("No moves yet.\n");
   270     }
   271
   272     # end table
   273
   274     print ("</td></tr></table>\n");
   275
   276     print $page->end_html();
   277
   278
   279     sub player_moves {
   280        my $move = $_[0];  ##get move
   281        my $page = $_[1];  ## import page object
   282        my $squares = $_[2];  ## import array so we can change square
   283        my ($x, $y, $z);
   284
   285        foreach $x(0..2) {
   286           foreach $y(0..2) {         ##test for each square
   287              $z = "[$x][$y]";
   288              if ($move eq $z) {
   289                 $squares->[$x][$y] = "x";   ## define array element
for choice
   290              }
   291           }
   292        }
   293     }
   294
   295     sub print_cell {
   296        my $squares = $_[0];  ##import semi-existant array of squares
   297        my $page = $_[1];     ##import html stuffs
   298        my $x = $_[2];        ##import the number that the foreach is
 on
   299        my $row = $_[3];      ##import the row we are on
   300        my $cell = "[$row][$x]";  ##get square coordinates for use in
 naming checkbx
   301
   302        print ("<td>");
   303        print ("<input type='checkbox' name='choice' value='$cell'>\n
");
   304        print ("</td>");
   305     }
   306
   307     sub get_available_choices {
   308        my $squares = $_[0];
   309        my ($x, $y, $z);
   310        my @available_choices = ();
```

```
   311
   312        foreach $x(0..2) {
   313           foreach $y(0..2) {
   314              unless (($squares->[$x][$y] eq "x") or ($squares->[$x][
$y] eq "o")) {
   315                  $z = "$x:$y";    ## return in this form for later u
se (so we can split it by the colon)
   316                  push (@available_choices, $z);
   317              }
   318           }
   319        }
   320        return @available_choices;
   321     }
   322
   323     sub get_computer_choice {
   324        my @available_choices = @_;
   325        my $length = @available_choices;
   326        my $number = int(rand() * ($length - 1));
   327        my $choice = $available_choices[$number];
   328        return $choice;  ## this will be a coordinate, in the form of
 $x:$y from $z above
   329     }
   330
   331
   332     sub print_hidden_values {
   333        my $page = $_[0];
   334        my $squares = $_[1];
   335        my $rounds = $_[2];
   336        my ($x, $y, $cell, $round);
   337
   338        #print hidden values for cells
   339        foreach $x(0..2) {
   340             foreach $y(0..2) {
   341                $cell = "[$x][$y]";
   342                print ("<input type='hidden' name='$cell' value='" .
$squares->[$x][$y] . "'>");
   343                print ("\n");
   344             }
   345        }
   346
   347        #print hidden values for rounds (history)
   348        foreach $x(1..5) {
   349           $round = "round" . $x;
   350           print ("<input type='hidden' name='$round" . "_x' value ='
" . $rounds->{$round}->{'player'} . "'>\n");
   351           print ("<input type='hidden' name='$round" . "_o' value='"
 . $rounds->{$round}->{'computer'} . "'>\n");
   352        }
   353     }
   354
   355
   356     sub evaluate_board {
   357         my ($squares) = $_[0];
   358         my ($x, $y, $winner);
   359
   360         foreach $x (0..2) {
   361             if (
   362                 ($squares->[$x][0] eq $squares->[$x][1]) and
   363                 ($squares->[$x][1] eq $squares->[$x][2])
   364                ) {
   365                 $winner = $squares->[$x][0];
   366                 return $winner;
   367             }
   368         }
   369         foreach $y (0..2) {
   370             if (
```

```
   371                 ($squares->[0][$y] eq $squares->[1][$y]) and
   372                 ($squares->[1][$y] eq $squares->[2][$y])
   373                 ) {
   374                 $winner = $squares->[0][$y];
   375                 return $winner;
   376             }
   377          }
   378          if (
   379              (($squares->[1][1] eq "x") or ($squares->[1][1] eq "o"))

   380              and
   381               (
   382                 (($squares->[0][0] eq $squares->[1][1]) and
   383                  ($squares->[1][1] eq $squares->[2][2]))
   384                 or
   385                 (($squares->[0][2] eq $squares->[1][1]) and
   386                  ($squares->[1][1] eq $squares->[2][0]))
   387               )
   388              ) {
   389              $winner = $squares->[1][1];
   390              return $winner;
   391          }
   392      }
   393
   394      sub print_final_table {
   395         my $squares = $_[0];
   396         my $page = $_[1];
   397         my $winner = $_[2];
   398         my $round = $_[3];
   399         my $rounds = $_[4];
   400         my ($visitor, $visitor_name, $time);
   401
   402         ## print ending table
   403
   404         print $page->startform(action=>'tic_tac.cgi',
   405                                method=>'POST'
   406                               );
   407
   408         print_hidden_values($page,$squares,$rounds);
   409
   410         print ("<input type='hidden' name='round', value='$round'>\n"
);
   411
   412         print ("<table border=1 cellpadding=10>\n");
   413         print ("<tr valign=middle>\n");
   414         foreach $x(0..2) {              ##print first row
   415            print ("<td align=center>" . $squares->[0][$x] . "</td>\n"
);
   416         }
   417         print ("</tr><tr valign=middle>\n");
   418         foreach $x(0..2) {              ##print second row
   419            print ("<td align=center>" . $squares->[1][$x] . "</td>\n"
);
   420         }
   421         print ("</tr><tr valign=middle>\n");
   422         foreach $x(0..2) {              ##print third row
   423            print ("<td align=center>" . $squares->[2][$x] . "</td>\n"
);
   424         }
   425         print ("</tr></table><p>\n");
   426
   427         print ("<a href=\"http://soya.serve.com/cgi-bin/tic_tac.cgi\"
>Play Again!</a>");
   428
   429         print $page->end_html();
   430
```

```
   431        #print log of play
   432
   433        $visitor = $page->remote_host();
   434        if ($visitor =~ /\d*\.\d*\.\d*\.\d*/) {
   435         $visitor_name = gethostbyaddr(inet_aton($visitor), AF_INET);
   436        }
   437
   438        $time = localtime(time());
   439
   440        open (MAIL, "| /usr/sbin/sendmail -t");
   441        print MAIL "To: author\@example.com\n";
   442        print MAIL "Subject: tic tac toe results\n";
   443        print MAIL "\n$visitor, $visitor_name: $time: $winner on roun
d $round";
   444        close MAIL;
   445     }
   446
   447     sub make_move_pretty {
   448        my ($move) = $_[0];  #get move (either $player_move or $compu
ter_move
   449        my (%squares_names, $pretty_move);
   450
   451        if ($move =~ /:/) {
   452           $move =~ s/^(\d):(\d)/$1$2/;
   453        }
   454        else {
   455           $move =~ s/^\[(\d)\]\[(\d)\]/$1$2/;
   456        }
   457
   458        %squares_names = ("00" => "top left",
   459                          "01" => "top center",
   460                          "02" => "top right",
   461                          "10" => "center left",
   462                          "11" => "center",
   463                          "12" => "center right",
   464                          "20" => "lower left",
   465                          "21" => "lower center",
   466                          "22" => "lower right"
   467                         );
   468
   469       $pretty_move = $squares_names{$move};
   470       return $pretty_move;
   471     }
   472
   473
```