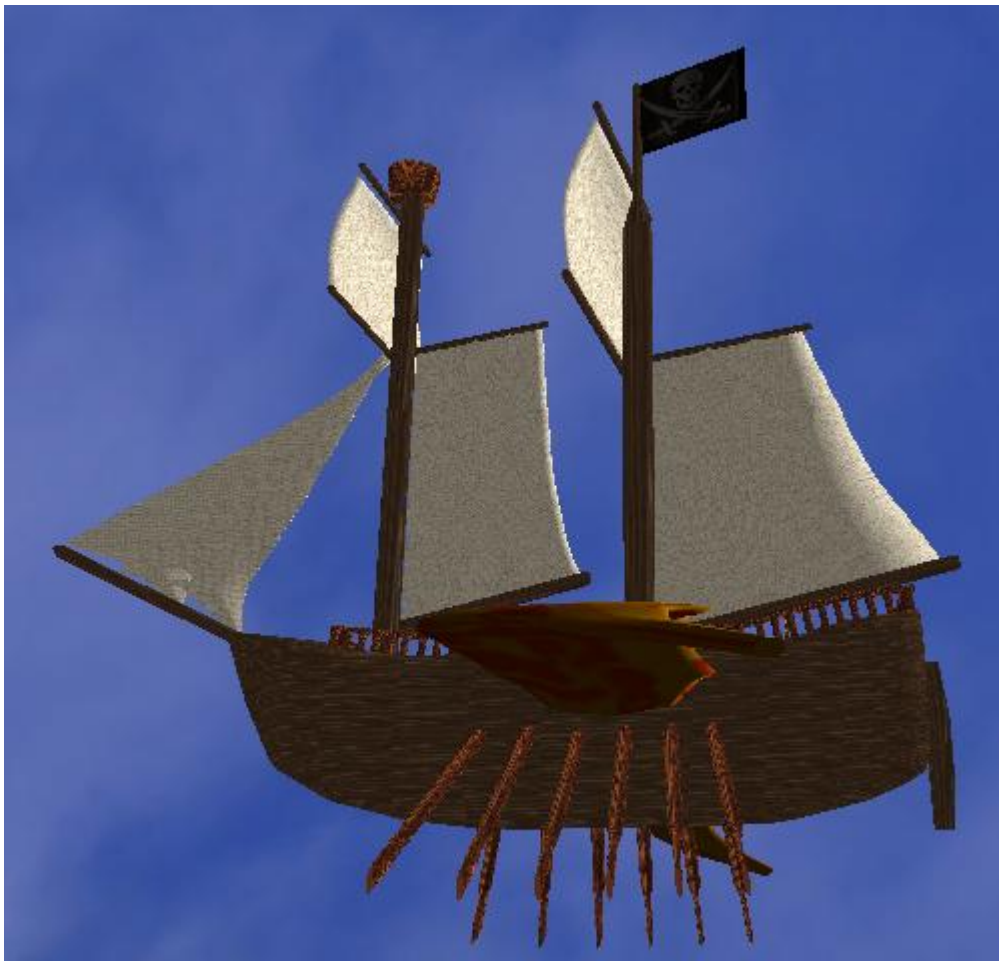


Path of the Masterful Putter Final Report

Ye Olde Bucklers of Swash:
Brad Tennis, Dave Buchfuhrer, Jon Dodge

April 13, 2004



Contents

1	Story	4
2	Gameplay Overview	4
2.1	Objective	4
2.2	Controls	4
2.3	Ball Powers	5
2.3.1	Fire Ball	5
2.3.2	Water Ball	5
2.3.3	Wind Ball	6
2.3.4	Earth Ball	6
2.4	Terrain Types	6
2.4.1	Green	6
2.4.2	Fringe	7
2.4.3	Fairway	7
2.4.4	Rough	7
2.4.5	Deep Rough	7
2.5	Hazards	7
2.5.1	Water	8
2.5.2	Sand	8
2.5.3	Off Course	8
2.6	Ball Sunk	8
2.7	Putting Completed	9
2.8	Level Description	9

3	Scoring	9
4	Graphical Interface	9
4.1	Display	9
4.2	Perspective	10
5	Sound	10
5.1	Background Sound	10
5.2	Sound Events	10
6	Budget	11
7	Known Issues	11
8	Possible Future Improvements	11
8.1	Extra Levels	11
8.2	Powerups	11
9	Acknowledgments	11

1 Story

Long ago, when the world was young, the four elemental spirits waged war on each other for dominion of the earth. Each spirit created armies of demons, imbued with elemental power to fight for them. The demons of the fire spirit immolated their foes with great gouts of flame, sending them back to the shapeless void from which they had been spawned, while the wind demons rained down death, borne aloft on cushions of air. Servants of the earth spirit tunneled under ground, stayed by no fortifications or defenses of their enemies, and fierce water demons lurked in every lake and river, unswayed by the most raging currents or the darkest depths. The armies of the elemental spirits ravaged the land until a powerful sorcerer banished the demons from the world and trapped each elemental spirit within a tiny crystal globe. Even so captured, the elemental spirits are able to weakly manifest their powers. And so, the elemental spirits continue their unceasing war, striving for mastery of the miniature golf field!

2 Gameplay Overview

This is a one hole miniature golf game which supports up to four players. Players take turns putting until all players have sunk their balls in the hole. Players may be added at any time, as long as there are no more than four players either putting or with their ball in the hole. Path of the Masterful Putter is a 3-D OpenGL application implemented using the GLUT library.

2.1 Objective

The objective of the game is to sink your ball in the hole using fewer strokes than the other players.

2.2 Controls

The game uses the arrow keys and the space bar, as well as the mouse. Moving the mouse left, right, up, or down is equivalent to pressing the corresponding keyboard arrow. The keyboard controls are as follows:

- ← Rotate clockwise around the ball.
- Rotate counter-clockwise around the ball.
- ↑ Increase the camera pitch.
- ↓ Decrease the camera pitch.
- m Toggle mouselook
- d Toggle particle effects

f Toggle full screen mode

p Pause

1 Add player with fire ball if one is not already in play

2 Add player with water ball if one is not already in play

3 Add player with wind ball if one is not already in play

4 Add player with earth ball if one is not already in play

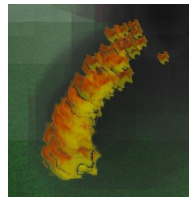
Space Hold to build up power, release to hit the ball. Power increases linearly with the amount of time that the space bar is held until two seconds are reached, at which point maximum power has been achieved.

Esc Quit game

2.3 Ball Powers

Each of the four balls available have different powers.

2.3.1 Fire Ball



When the fire ball hits another ball while the fire ball is moving, that ball is incinerated, and a new ball of the same type is spawned at the tee. It is not necessary that it be the fire ball's turn, only that it not be stationary when the collision occurs. Note that it is safe to hit the fire ball if it is stationary.

2.3.2 Water Ball



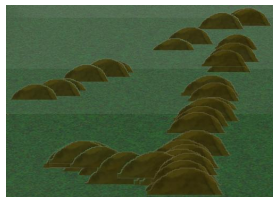
When the water ball hits water, it does not sink, nor is it reset to its previous position. The water ball can bounce and roll on water as if it were on fairway. Accordingly, the player of the water ball is not assessed a stroke penalty for colliding with a water obstacle.

2.3.3 Wind Ball



The wind ball is more weakly affected by gravity than the other balls allowing it to fly considerably further in the air.

2.3.4 Earth Ball



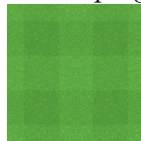
The earth ball tunnels under ground instead of rolling, making it immune to collisions with other balls (even if it manages to hit another ball while bouncing). As such, it is immune to the fire ball's power. Further, the earth ball has a maximum amount of damping that may be applied to it and so it not as affected by terrain types as the other balls. Lastly, the earth ball has an increased gravity applied to it, limiting its ability to fly through the air.

2.4 Terrain Types

There are various types of terrain that the ball can roll and bounce on during game play. Each is identified by a unique texture and each affects the ball's ability to roll and bounce in a different way.

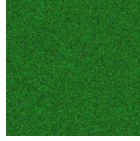
2.4.1 Green

The green is very short cut grass and is found only near the course cup. The green has the least amount of damping for rolling, and moderate damping for bouncing.



2.4.2 Fringe

The fringe borders the green and is intended to keep the ball close to the green is a player putts too hard. Fringe has a slightly higher amounts of damping for both rolling and bouncing when compared to the green.



2.4.3 Fairway

The fairway is fairly short cut grass that demarcates the three main paths from the tee to the hole (see the discussion of the course layout below). Fairway has a moderate rolling damp factor and a moderate bounce damp factor.



2.4.4 Rough

Rough tends to directly border the fairway and is meant to simulate a deeper grass. Both rough and deep rough (below) are intended to keep the player on the three main paths and prevent him from wandering too far off course. Rough has a high rolling damp factor and a moderate bounce damp factor.



2.4.5 Deep Rough

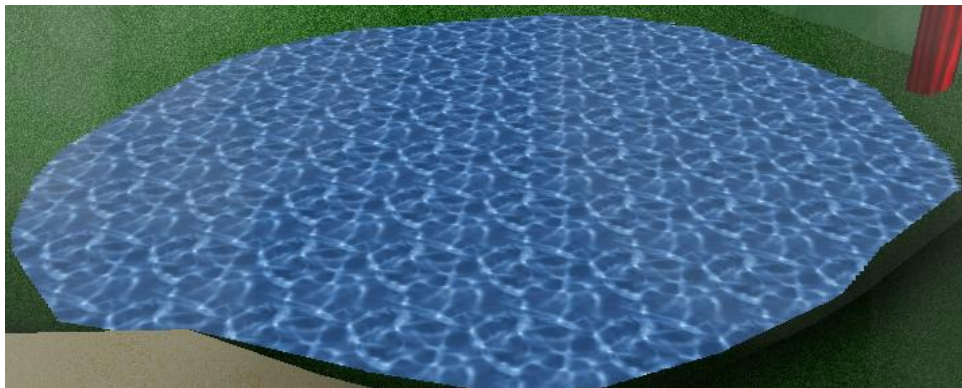
Deep rough is a more penalizing form of rough. As such, deep rough has an extremely high rolling damp factor and a moderate bounce damp factor.



2.5 Hazards

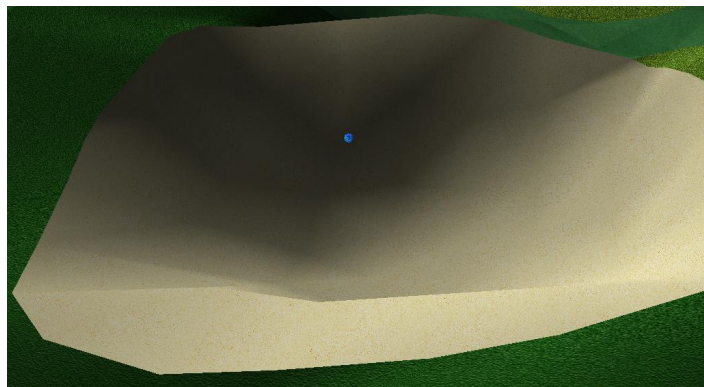
There are two main hazards on our course, namely water and sand hazards. Additionally, one may fall off of the course entirely by hitting the ball past the bounds of the world.

2.5.1 Water



When a ball other than the water ball enters a water hazard, that ball is reset to the last position it came to rest in, and the player using it is assessed a stroke penalty. Since the water ball treats water as fairway, it may bounce and roll on top of water hazards without penalty.

2.5.2 Sand



A sand hazard is meant to trap a ball hit into it. Accordingly sand hazards have a very high bounce damping factor so balls tend to simply stop when they fall into one. The roll damp factor for sand hazards is fairly moderate as the sand is well-groomed and fairly tightly packed.

2.5.3 Off Course

When the ball falls off course, it is reset to the tee and the player using it is assessed a one stroke penalty.

2.6 Ball Sunk

When the player completes the course by sinking his ball into the hole, the ball is removed from play and the player who was using it no longer takes a turn. The player's score is the number of strokes he used to get to the hole plus any penalties he may have incurred along the way.

2.7 Putting Completed

When all players have completed putting, the game ends. The camera is then reset to the center of the course and a message declaring the winner or winners is displayed. The winner is the player with the lowest score. If two players have the same score, then there is a tie. As above, a player's score is given by the number of strokes it took him to reach the cup plus any penalties incurred from hazards. Once all players have finished putting a new game may be started as normal.

2.8 Level Description



The level consists of three separate paths. Each path is marked by gates over the fairway. The paths are named according to the kanji on their representative gates. These paths are the water path, the sand path and the grass path.

The water path begins with the large loop connected to the tee area. It continues past a small lake, merging with the sand path (see below) for the approach to the green. Both the sand and water paths approach the green from the left side and are bordered on the right by a deep sand trap. The water trap is the trickiest path initially as the loop makes it very easy to fall into the water. However, once past the loop, the water path presents almost no obstacles.

The sand path begins slightly to the right of the water path. Initially the sand path is a narrow stretch of fairway between two lakes. It then passes through a small forest into a large patch of sand before meeting up with the water path for the final approach to the green. The sand path is very straightforward, although care must be taken not to get stuck in the forest and be forced to hit backwards to escape.

The grass path begins directly behind the tree area. It follows the outside edge of the map with a narrow valley of fairway. It eventually widens into a large field, bordered on the left by a lake. The grass path approaches the green from the right side, bordered on the left by a sand trap. The grass path presents the lowest possibility of falling into a lake, however the valley of fairway at the path's start is difficult to advance through.

All three paths are comprised of fairway bordered by water hazards as well as swaths of rough and deep rough. The green itself is bordered by fringe, intended to keep the ball from rolling off the green from overhard putts. Additionally, there are trees bordering the far edge of the green to help keep the ball from falling off the course entirely.

3 Scoring

A stroke is added to the player's score each time they putt and each time they are given a stroke penalty. As in golf, the player with the lowest score once all players have reached the hole is the winner. If two players have the same score, then they tie.

4 Graphical Interface

4.1 Display

The score for each player is displayed in the corners of the screen. The score for the fire ball is displayed in the top-left corner. The score for the water ball is displayed in the top-right corner. The score for the wind ball is displayed in the bottom-left corner. The score for the earth ball is displayed in the bottom-right corner. Additionally, there is a meter in the bottom center of the screen, which displays the current hit-strength. When the player holds down the space bar to hit the ball, this gauge fills from left to right to indicate the percentage of the maximum hit strength that the ball will be hit with. The gauge reaches a maximum after approximately 2 seconds.

4.2 Perspective

This game has a third-person perspective. The camera always looks at the current player's ball and may be rotated around it with the mouse or arrow keys as described above. If the ball is moving, the camera slowly follows the ball. When the ball comes to rest, the camera continues to look at it for 1.2 seconds before switching to the next player.

5 Sound

5.1 Background Sound

The sound playing in the background of the game is a midi file taken from a Japanese garden fighting scene in Shining Force CD.

5.2 Sound Events

The game features sounds voiced by the incomparable Supafly. They are played at various points in the game as follows:

- New player joining game when there is already at least one player in the game
Sound: “Here comes a new challenger!”
- Player’s turn with fire ball
Sound: “Fire ball!”
- Player’s turn with water ball
Sound: “Water ball!”
- Player’s turn with wind ball
Sound: “Wind ball!”
- Player’s turn with earth ball
Sound: “Earth ball!”
- Putting ends
Sound: “Victory! Victory! va va va va va va Victory!”

6 Budget

Our budget was strictly \$0.

7 Known Issues

It is possible to fall through surfaces at some points in the game. We are not sure if this is a flaw in the level design or in the physics engine.

There is a memory leak associated with loading new levels, the source of which was determined after the code freeze. However, since only a single level is loaded in the game, this doesn't pose a serious problem.

On a great many computers, the framerate for the released version of the game may be unplayably slow. There is an option to disable the drawing of particle effects (see controls) which greatly improves performance.

Sometimes the camera warps to the next player before the current player has stopped moving. The source of this error is unknown.

8 Possible Future Improvements

8.1 Extra Levels

It would be fairly simple to modify the code to allow for multiple levels, with cross-level score keeping. This would enhance game play because we would be able to relax the difficulty and size of levels, and more levels enhance replayability. However, there was not enough time to design multiple levels of the quality we demand of ourselves.

8.2 Powerups

If there were items scattered around the course that enhanced player or ball abilities, it might add to the fun of the game.

9 Acknowledgments

We would like to acknowledge Jason Murcko for providing us with sounds. We also acknowledge Kevin Hawkins and Dave Astle, authors of *OpenGL Game Programming*. On the same lines, we acknowledge Trent Polack, author of the helpful text, *3D Terrain Programming*. Our final acknowledgement goes to Professor Sweedyk for providing us with some of the code, and leading us in the right direction whenever things became difficult.