Sheepdog: Game and Level Design Studio

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Final Project Proposal
CSS 450, 2D Graphics
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Introduction

Sheepdog is an interactive computer game with 2-dimensional computer graphics. Users can create a game level by designing a landscape and building a customized flock of sheep. They can then play the level that they have created. This proposal describes the features and implementation strategy for the Sheepdog Game and Level Design Studio. Features that are noted as “future” will be considered during program design, but not actually implemented as part of the 450 course.

Overview

The Sheepdog game first starts in level design mode. Once the user has created a valid level, they can play the game. In both the level design mode and the game play mode, the user will see a main game window with two views. See Figure 1. One view shows a Map of the entire game area, and the other view showings the specific Play area within the world. See Figure 2. The Play view always shows the area that is in the Zoom Box shown in the Map view. The main game window will also contain one of two sets of graphical user interface (GUI) controls: the editing controls for level design mode, and the game controls for the game play mode. The user can
adjust the position and size of the Play view by using mouse controls in the Map view, as shown in Table 1.

![Sheepdog Level 2](image)

Figure 1: Map and Zoom Views

<table>
<thead>
<tr>
<th>Mouse Event</th>
<th>Action in Map view</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle/Down</td>
<td>Records the mouse position</td>
</tr>
<tr>
<td>Middle/Drag</td>
<td>Left motion zooms into the game world, right motion zooms out of the game world. Zoom amount is determined from the starting click position.</td>
</tr>
<tr>
<td>Right/Down</td>
<td>Moves the origin of the Zoom Box (and Play view), to the clicked position.</td>
</tr>
<tr>
<td>Right/Drag</td>
<td>Drags the Zoom Box.</td>
</tr>
</tbody>
</table>

Table 1: Mouse events and actions in the Map view

**Level Design Features**

In level design mode, users can create a game level. The game considers a level to be valid once it has a sheepdog, at least one Sheep, and enough designated Sheep Pen area to fit all of the sheep. No two objects can be placed on top of each other. All of the features below will be accessible through a graphical user interface (GUI) control panel, next to the main game window. See Figure 2, Figure 3, and Figure 4. Level design mode will also support the mouse events shown in Table 2.
Initially, there will be minimal error checking to ensure that the game is playable. In the future, features could be added to prevent the user from designing levels that are impossible to play, such as having the sheep pen completely blocked by obstacles.

<table>
<thead>
<tr>
<th>Mouse Event</th>
<th>Action in Play view</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left/Down</td>
<td>Add the current object type (landscape feature, sheep, or sheepdog) at the position clicked.</td>
</tr>
<tr>
<td>Left/Drag</td>
<td>Drag the object which was just added with Left/Down.</td>
</tr>
</tbody>
</table>

Table 2: Mouse events and actions in the Play view

**Designing Landscapes**
A user can design their own landscape by adding obstacles and creating designated Sheep Pen areas, into which the sheep must be herded. Initially the only obstacles available will be fences. In the future, ponds, mud pits, and closable gates may be added.

**Creating a Flock**
A user can create a flock, one Sheep at a time. Each Sheep has five attributes.

- Starting position
- Speed
- Sensitivity (affects how much a sheep will respond to a sheepdog)
- Herding tendency (how like a sheep will follow other sheep)
- Randomness (future feature)
- Turning radius (future feature)

Initially, these attributes must be set from the GUI when the user first creates each sheep. In the future, the user could select any existing Sheep at any time to adjust attributes, or delete the Sheep entirely. For now, each sheep will be displayed with basic graphic primitives. In the future, the user might be able to select different texture maps and sounds for each sheep.

**Creating a Sheepdog**
A user can create a single Sheepdog. Each sheepdog has five attributes.

- Starting position
- Speed
- Leadership (affects how much a sheep will respond to the Sheepdog)
- Turning radius (future feature)
- Special herding abilities that can be used for short durations (future features)

**Saving and Loading**
In the future, a user can save their work as a level, and then reload it again in the future. The level designer will also be able to provide a difficulty rating for their level, to be used for scoring.

**Graphical User Interface (GUI) for Level Design**
The graphical user interface (GUI) leads the user through the three steps needed to design a level, and then allows the user to play the game.
Figure 2: Step 1 of Level Design

Figure 3: Step 1 of Level Design
Game Features
In game play mode, users can move the Sheepdog object through the landscape and try to get all of the Sheep into the designated Sheep Pen areas. When the Sheep and Sheepdog move, their movement will be shown in two steps. In the first step, the animal will move half of its traveling distance, and rotate and extend its limbs. In the second step, the animal will move the remaining distance, and move its limbs back under the animal. In the future, more than two steps may be used, to show smoother animation. See Figure 5 for examples of a limb positions.
User Actions
To move the Sheepdog, the user can use buttons on the GUI next to the main game window, or the arrow keys on the keyboard. They can only move the Sheepdog left, right, up and down. The game tracks how long it takes to herd the sheep into the Sheep Pen areas.

Sheep
When the game starts, sheep begin moving in a random direction. If a Sheepdog comes near, they will move away from the Sheepdog. If other Sheep are nearby and moving, they may follow the other Sheep. The distance used to determine if a Sheep moves depends on the attribute values for the Sheep and (when applicable) the Sheepdog. Once a Sheep is moving it will continue in the same direction unless influenced by other Sheep, or the Sheepdog. If the sheep encounter a landscape obstacle, it will turn clockwise until it can move again.

Sheepdog
In the future, users might be able to customize their Sheepdog. They might be able to choose colors, or decide where to allocate Sheepdog Skill Points. For example, they might have a slower Sheepdog, but get a smaller turning radius, and greater leadership. Another future feature would be special Sheepdog abilities that can be used for a short duration. For example, a Sheepdog could have a powerful bark that affects sheep in a wide radius, but can only be used once every 10 seconds. For now, the sheepdog will be in constant motion, but in the future, it may be possible for the dog to stand still, or change speeds.

When the Sheepdog is within two Sheepdog widths of the edge of the current Play area (Zoom Box), the Play area moves with the Sheepdog. If the Sheepdog is at the edge of the game world, it stays there until the user provides another direction for it to move.

Clock, Pause, and Reset
A clock shows how much time has passed since the user started the level. If the user clicks Pause Game, the game stops, and the user cannot take any actions until they click Resume Game. In the future, the screen can be covered with an image so that users cannot see the landscape when the game is paused. If the user clicks Reset Game, the Sheep and Sheepdog return to their original positions, and start moving with new random directions.

Scoring
In the future, the game may provide a score for the user, based on the difficulty rating for the level, and the time it takes for the user to get all Sheep into Sheep Pen areas.

Graphical User Interface (GUI) for Game Play
The user can use a graphical user interface to control the Sheepdog’s direction and get information on how they are succeeding with the herding task. See Figure 6.
Implementation Notes
A game level will consist of a single Sheepdog, a collection of landscape features (just fences for now), a collection of Sheep Pen areas, and a collection of Sheep. The Sheepdog responds to user initiated actions that set direction, and to timer events that move the Sheepdog using the current specified direction and speed. The Sheep respond to timer events, considering the position of the Sheepdog and other Sheep. Neither the Sheep nor the Sheepdog can move through obstacles, or past the edge of the world. The game uses collision detection to determine how close a sheep is to the Sheepdog or other Sheep. Initially, boundaries will be determined for the sheep object, independent of moving parts. In the future, moving parts will be considered when calculating boundaries.

Project Schedule
The follow deliverables will be complete by the dates listed below.

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposal</td>
<td>November 14th, 2001</td>
</tr>
<tr>
<td>UI and Object/Event Framework Complete</td>
<td>November 28th, 2001</td>
</tr>
<tr>
<td>Hero Object (Sheepdog) and UI Demo</td>
<td>December 3rd, 2001</td>
</tr>
<tr>
<td>Collision Detection and Basic Game Logic Working</td>
<td>December 8th, 2001</td>
</tr>
<tr>
<td>Final Project Report and Demo</td>
<td>December 17th, 2001</td>
</tr>
</tbody>
</table>

Table 3: Project Schedule