Midway Math

Game Treatment and Project Proposal

RELEASE
November 10, 2003

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Modification Log

Name	Date	Rev #	Change
Austin	10/21/2003	01	Created
Austin	10/30/2003	02	Sketched possible game levels, more design work
Austin	11/1/2003	03	Completed Executive Summary
Austin	11/4/2003	04	Completed Product Specification
Austin	11/5/2003	05	Add flowchart, game level descriptions
Austin	11/8/2003	06	Removed "Test Your Strength" game level. Formatting changes, misc. cleanup
Austin	11/9/2003	07	Create .pdf format for review and critique
Austin	11/10/2003	08	Incorporate changes from peer review, mark for release

<u>Disclaimer</u>

This document has been created as part of CIS 587 – Computer Game Design and Implementation, taken Fall Term, 2003. This class is intended to partially fulfill the requirements for a Master's Degree in Software Engineering at the University of Michigan – Dearborn. All portions of this document are hereby owned and copyright 2003 by Austin Krauss, unless otherwise noted.

<u>Executive Summary</u>

This document contains the project proposal and design summary of a 3D game that teaches children basic mathematics. The game titled *Midway Math*, is intended to have a carnival-like atmosphere to incorporate mathematics education with carnival games commonly found on the midway.

The purpose of *Midway Math* is to exercise knowledge of the software engineering process and object oriented development as well as demonstrate game design principals learned in CIS 587.

<u>Game Story</u>

The game story will play a lesser role in *Midway Math* than other games. The basic story line will follow the trials of a child playing games on the midway to win prizes for his or her kid sister. The story line will progress each time a prize is won; the player will see the sister be presented with larger and larger prizes. Finally, once the player masters both math games, the kid sister will be presented with the grand prize, which will be a large stuffed animal, trophy, toy, etc.

<u>Game Play and Appearance</u>

Core game play will consist of the player trying to solve a wide range of basic math problems. There will be two different levels simulating two popular carnival games. Each level will be presented in a 3D world, through a first-person perspective. Menu selections, cut scenes, and introduction animations will be 2D bitmap animations and menus.

As each level is completed, the player will be given positive feedback for good performance, or encouraging feedback and hints for less than average performance. Negative feedback will be avoided in order to keep the learning entertaining and to avoid player frustration.

<u>Development specification</u>

As mentioned above, the game will be played in a 3D world environment. In order to accelerate development, the existing 3D engine developed for the *Speedy Delivery* project will be reused and adapted for *Midway Math*. Below are the core technical specification details that *Midway Math* will be built around:

- Created for Win32 platforms, DirectX 8 or better
- Coded using C++
- Proprietary 3D Engine
- Freeware 3rd party Physics Engine (*Tokamak* from Tokamak Limited)
- 2D pre-rendered backgrounds
- Freeware 3D objects from the web
- Possible professional 3D models purchased from Turbo Squid (www.turbosquid.com)

Product Specification

The software engineering methodogy to be followed will be one that loosely resembles rapid prototyping. With an existing engine already providing basic 3D rendering, scene management, and input functionality, work can begin towards the beginning of the development cycle on content creation. Additional scheduling and design specification will be found in the formal *Midway Math* design document.

Midway Math has a firm deadline date of December 19th, 2003. Because of the rigid delivery schedule, implementation of *Midway Math* will occur concurrently with work on an extended design document.

Production Team Description

The production team will consist of only Austin Krauss to do the design, implementation, and testing of *Midway Math*. Additional play testing may be conducted by friends and relatives of the author. Credit will be given to individuals or companies that provide content for *Midway Math* and all third-party licensing agreements will be fully complied with.

Target Audience

The target audience for *Midway Math* will be children in the 2nd through 4th grades. This roughly equates to children in the age range of 6 to 9 years old.

Because the game will have a carnival-theme, with the central story focusing around the player trying to win prizes for his or her little sister, the game may be more geared to young boys rather than girls. However, the game story will be gender-neutral so as to avoid alienating young girls that are interested in playing *Midway Math*.

Game Play

Game play will focus on the player trying to solve as many mathematics problems as possible in the given amount of time. To keep the game interesting and the child entertained, *Midway Math* will focus on having the player play carnival games to solve the math problems.

Options will be available so that the parent or child may set game preferences such as: learning grade level, types of math problems, and the time to complete a problem set. Statistics will also be kept so that the parent can analyze the child's performance at the end of the game to determine areas where he or she may need improvement.

Production Tools

Microsoft's Visual C++ 6 and Autodesk's 3D Studio MAX 4 will be the two primary production and content creation tools. The author possesses expertise with Visual C++ 6 and familiarity with 3D Studio MAX. The game will be designed and implemented using object oriented development techniques in the C++ programming language. Primary and secondary production tools are enumerated below along with their intended purpose:

Visual C++ 6

- Source code complier to be used in conjunction with the DirectX 8 API

3D Studio MAX 4

- Used for designing game levels and objects

Adobe Photoshop Elements 2

- Used to create and modify background art, as well as edit model textures

Tokamak Physics API

- A collection of C++ objects to incorporate dynamic, real-time physics into the game

Pandasoft DirectX Exporter

- A 3D Studio MAX 4 plugin to export game levels and objects to Microsoft's DirectX model format

CodeWright 6

- A source code editor providing more functionality than the Visual Studio IDE

Concurrent Versions System

- Version control system used for controlling game source code and content

Microsoft Word XP

- Document creation application

Microsoft Visio XP

- Technical design application (UML modeling)

Adobe Acrobat 5

- Document standardization formatting

Game Specification

The design goal of *Midway Math* here is to allow the make the player enjoy playing the carnival game, so that solving the math problems appear as a secondary task that will allow him or her to keep playing the carnival game. The different types of carnival games to be played are outlined in a subsequent section in this document.

What is it like to play the game?

Game interaction will vary from level to level (or, carnival game to game). Each level will present a unique scenario in which the player will have to solve math problems correctly in order to progress through the level. Each time a level is completed with sufficient success, rewards will be earned in the form of prizes, points, positive feedback, etc.

Interface Mockup

The main game screen will consist of the player's view of the game world, the math problem to be solved, the game clock, and the game score. Concept art showing the main game interface is available in a subsequent section in this document.

There are to be three user interface screens including the main game screen. These menu screens will provide functionality such as main menu selections, game options, and in-game pause menu options.


Main Menu Mockup Screen

Summary of story line

The story line is intended to be basic and, more importantly, gender neutral. To accommodate gender neutrality, a picture of the main game player will never be shown during game play and the player will never be referred to in the third person as "he" or "she". The proper pronouns will be "you" and "your" for example.

The game story is very simple: You and your kid sister have decided to spend the day at the local carnival. You've come to the carnival's main midway and test your skills at some of the many games to try and win prizes for your sister. Cut scene animations will be presented at the end of each game level that show the progress of the game's story.

Story boards

The introduction animation is intended to set the game story for the in-game reward sequences. Below is concept art detailing the introduction animation:
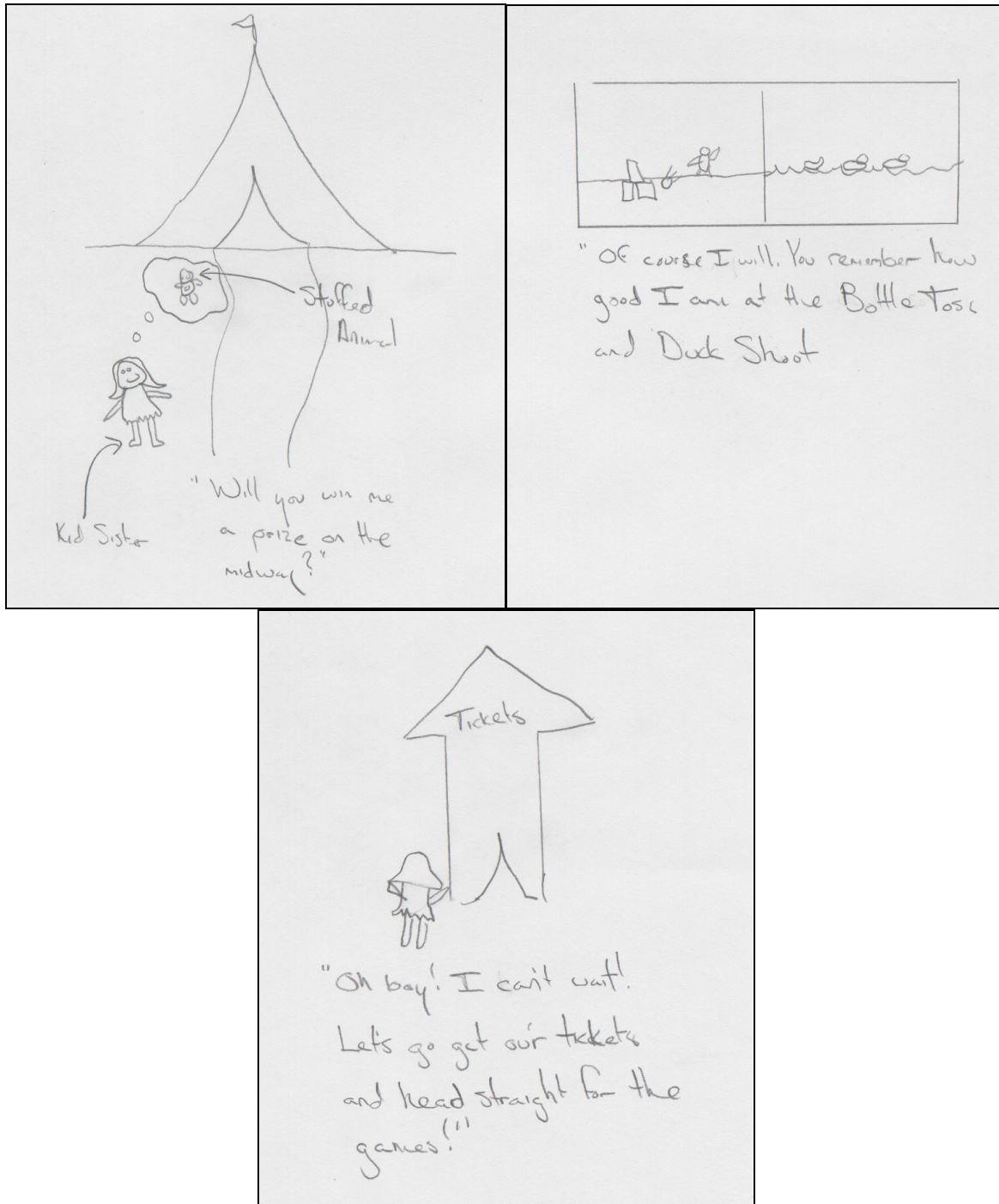
Intro Animation Story Board

<u>Character Bibles</u>

The character set is limited to the player and the kid sister. The player is never represented as an on screen figure. This is because the game is intended to be gender-neutral and played in the first person.

The kid sister will be shown during cut scenes and introduction animation. She will have simple feedback phrases such as "You're the greatest!", etc. The feedback may be spoken if appropriate sound clips are available or displayed on the screen for the player to read. The kid sister is intended to have a cartoon-like look as per the concept art below:

Kid Sister Concept Art

<u>How should the game be unique?</u>

Midway Math will be unique from other games of the same genre by providing the player with an arcade/action type of game play at the same time as working as a math learning tool. *Midway Math* will attempt to eliminate the "boredom" factor of simply solving math problems by providing a game with additional game play and story goals (such as winning prizes).

<u>How is it different from other games?</u>

Other edutainment games often stick to a 2D sidescroller type of interface. *Midway Math* provides a first person point of view in a 3D setting, allowing the player to associate the game world with many popular console games that are currently on the market. With this form, the child may not dismiss the game as "childish".

<u>What sort of control should the player have over the world?</u>

The player's movement is limited to the current carnival game that is being played. The player can view a limited range, and interact with the game world in a limited fashion, according to the particular carnival game.

Flowcharting

The flowchart below represents the main flow of the game. It should be noted that the process titled "Game Loop" is a standard representation of updating the game state, rendering the world, and checking for user input.
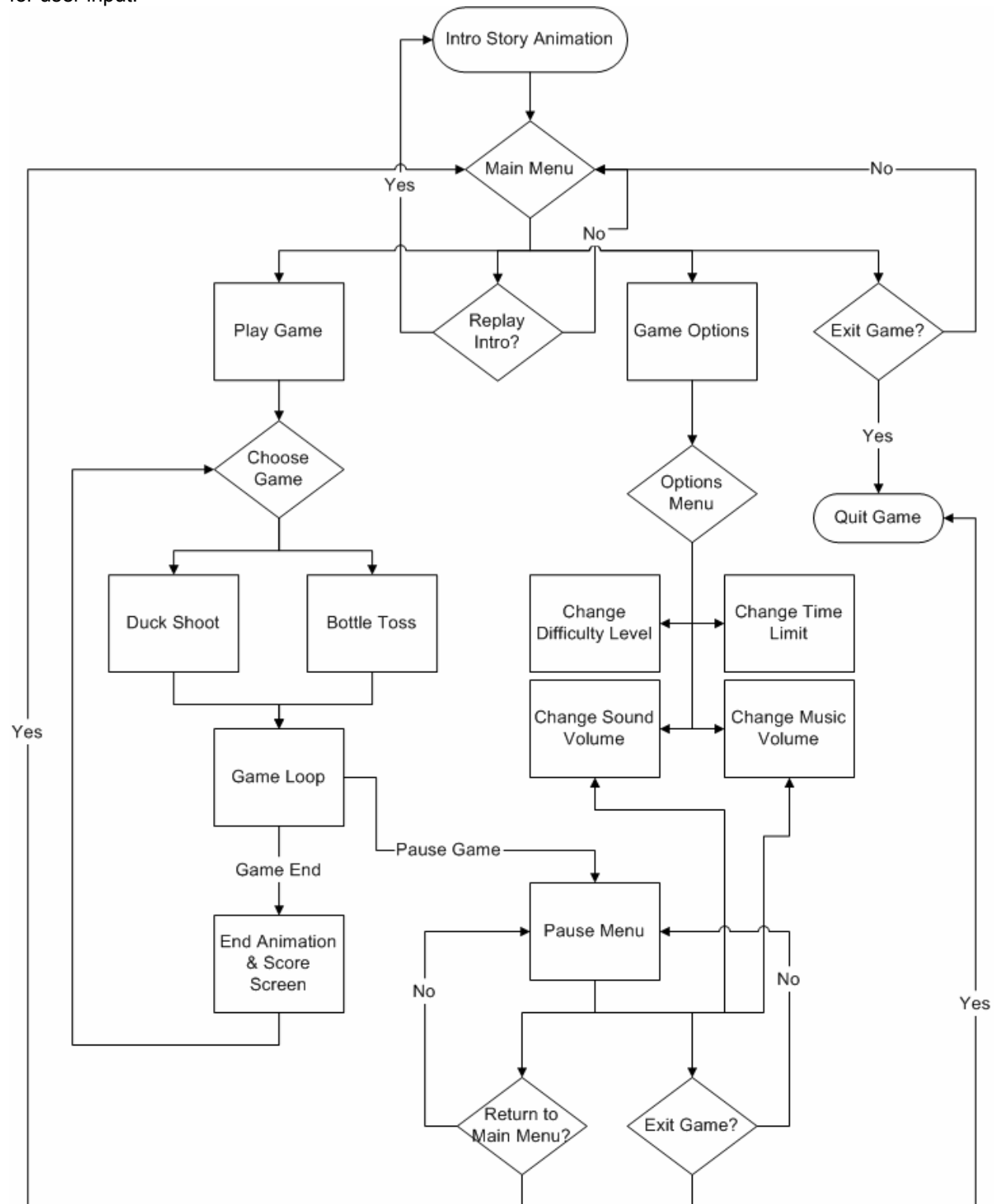
Carnival Game Level: "Duck Shoot"

In this level the player is presented with a 3D scene of duck decoys swimming around a circle. The player wields a water pistol or cork gun and shoots the ducks which have the correct answer to the particular math problem which is displayed above.

The goal is to shoot all the duck decoys within the time period to win the main prize.
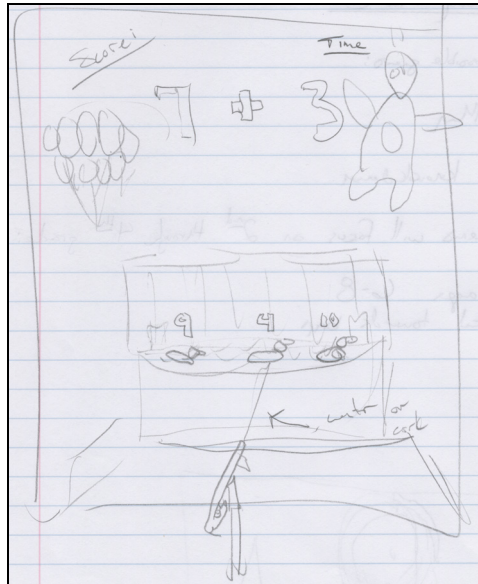
Duck Shoot Concept Art

Carnival Game Level: "Bottle Toss"

This game starts by displaying large pyramids of bottles stacked on top of each other. Each bottle has a number on it and the player is to "throw" a ball at the selected bottle using the mouse. If the number on the bottle is the correct answer to the math problem, the bottle falls down.

The goal is to knock all of the bottles down within the time period to win the main prize.