

Words With Kinect

Project Design

System Design

Introduction

Purpose

This design document will include specific details about the technology and hardware used in the creation of the “Words with Kinect” project. We will also use this document to further specify detail in regards to screen designs for the games and menus.

Scope

This document will cover the low level details on the system design of our project. This includes programming languages, API, and hardware specifications. It will also cover higher level concepts such as screen flow and games. Screenshots of the software are located towards the bottom of this document.

Requirements

Game Requirements

The following are requirements from our client, Dr. Donald Bear:

1. A portion of the games must have a timed component
2. Scoring is based on accuracy
3. All games must be designed to categorize words (e.g. Long A, Short A, or neither)

Functional System Requirements

The following are our functional requirements:

1. Local database of words
2. Randomization of words
3. Accurate hand/gesture recognition
4. Hand draggable controls

Non-Functional System Requirements

The following are our non-functional requirements:

1. Visually appealing to children. Colorful, but unobtrusive to the objective of helping children learn
2. Intuitive for children; children should be able to clearly know the goals of lessons or games and be able to complete them with simple controls
3. All images and content will be age-appropriate for a childrens’ game

Software Overview

Games

Words with Kinect will have many different games to help children learn English. These games are based off of the research of Dr. Bear. The games described below are designed to help children understand the structures of word parts by distinguishing them into categories and visualizing what category of word they need to be sorted in. There are currently three games in Words with Kinect: Matching, Word Sort, and Memory.

a. Matching (Figure 1)

In this game the user will be faced with 2 columns of pictures. The objective of the game is for the user to select pictures from either column and match them with a picture from the opposite column with the same category of word. There are 3 categories of words in this game: Long Vowel, Short Vowel, and Oddball. Per Dr. Bear's requirements, there will always be an "Oddball" category that is neither Long Vowel or Short Vowel. Correct matches receive 10 points added to the score, incorrect matches deduct 4 points from the score. There is an option to time the game.

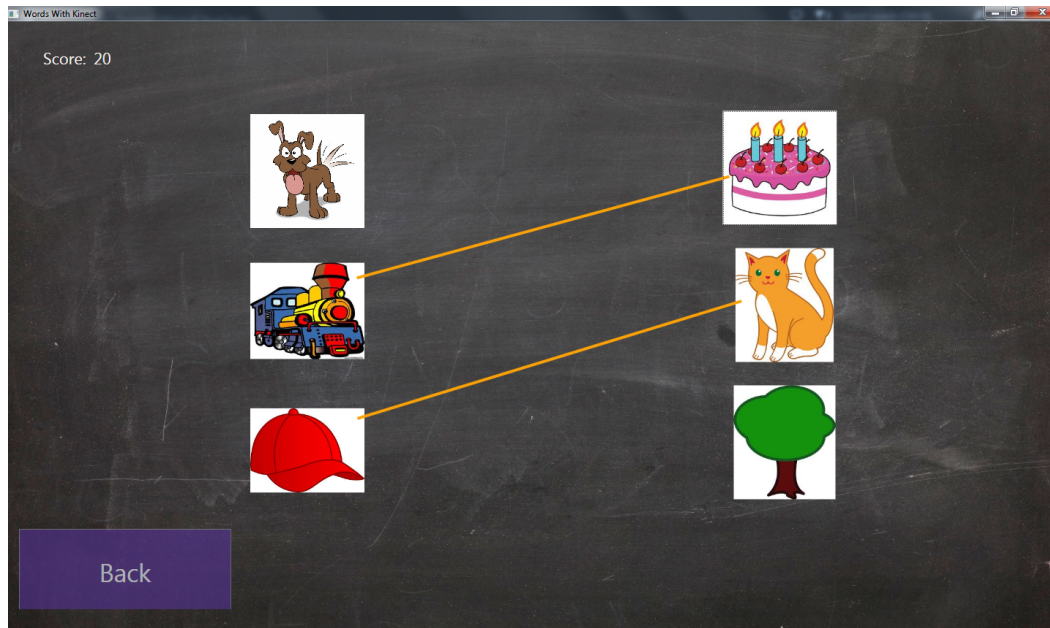


Figure 1 Matching Game

b. Word Sort (Figure 2)

In this game the screen is divided into 3 columns based on the category of the words (Long Vowel, Short Vowel, Oddball). The user must grab and drag the words from the word pool into the correct bin. The game is completed when all words are sorted correctly. There is an option to time the game.



Figure 2 Word Sort Game

c. Memory (Figure 3)

In this game there will be 12 facedown cards (4 columns, 3 rows) containing words. The user must pick 2 cards to match together. If the cards match, they disappear and 10 points are added to the score. If they do not match, they flip back to their original state and 4 points are deducted from the score. There is an option to time the game.

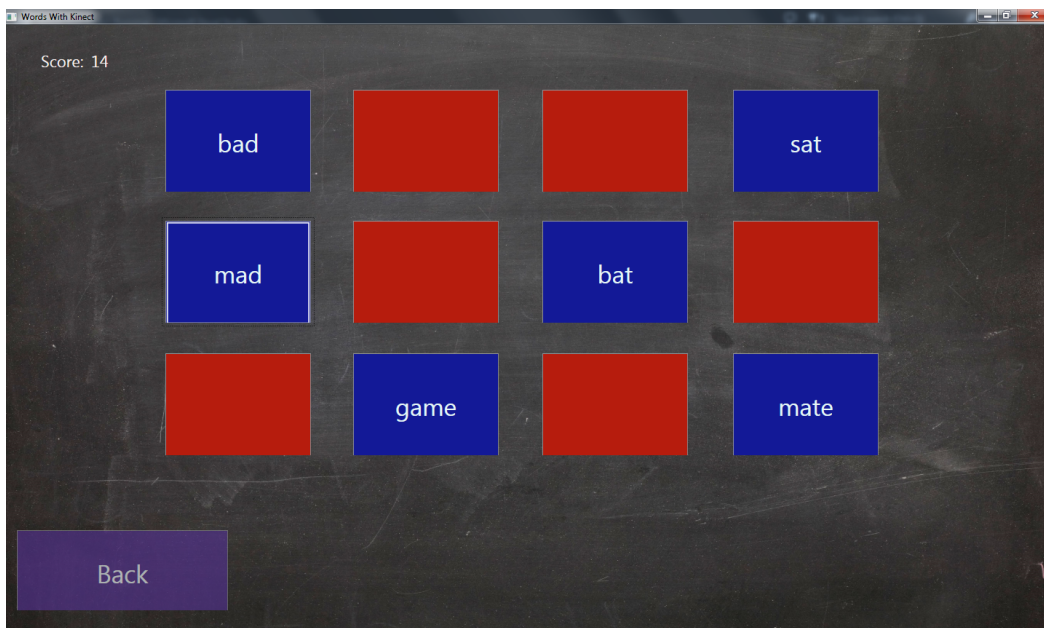
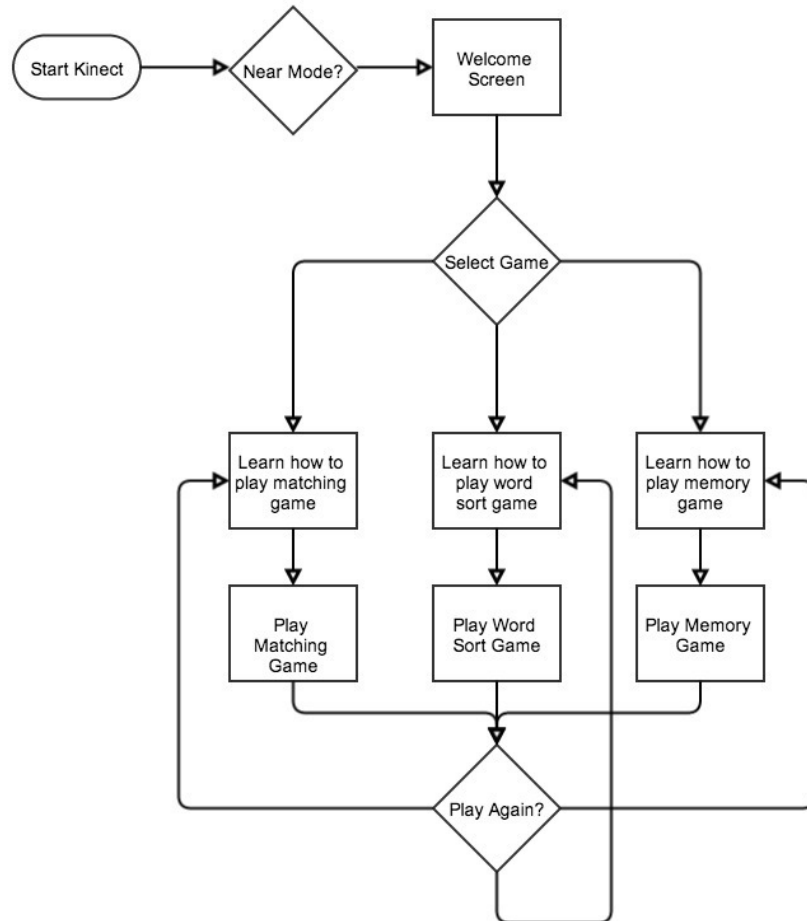


Figure 3 Memory Game

Functional Decomposition

This section will describe the process of a typical user who interfaces with our system. Below is the sequence of events that a typical user will experience:



Functional decomposition

Detailed Design

Input/output, Hardware specification

Input/Output specification and Hardware specification can be found from Microsoft for their Kinect. These specifications can be found here:

<http://msdn.microsoft.com/en-us/library/jj131033.aspx>

Hardware specification for the Kinect SDK is as follows:

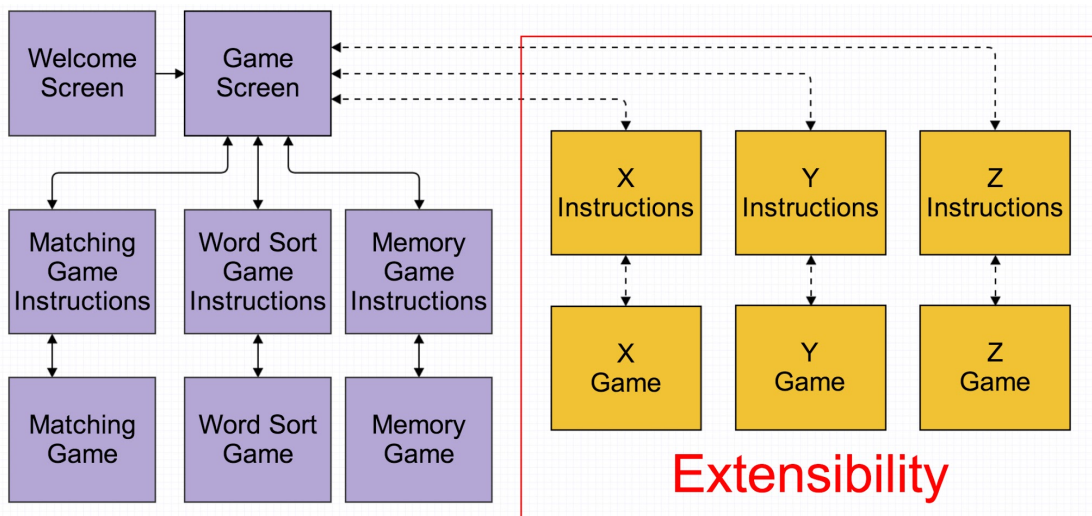
- 32-bit (x86) or 64-bit (x64) processor

- Dual-core 2.66-GHz or faster processor
- Dedicated USB 2.0 bus
- 2 GB RAM
- Microsoft Kinect for Windows Sensor

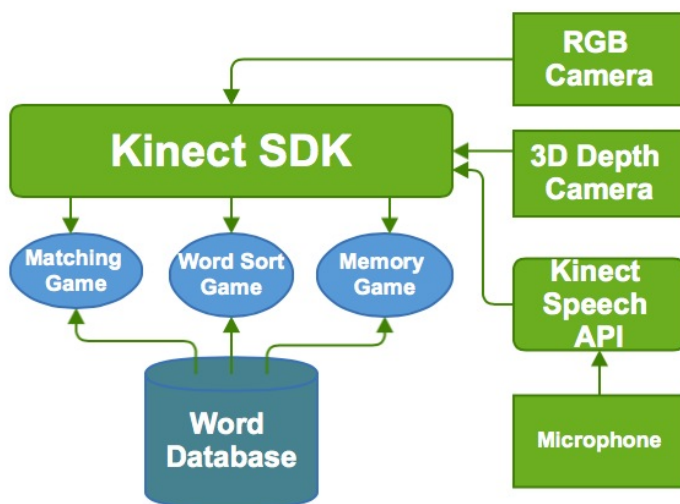
Hardware and Input/Output specification for the Microsoft Kinect itself is as follows:

- Communicates serially via USB
- The standard frame rate of 30 fps cannot be exceeded
- A display with a resolution of at least 640x480

Screen Flow



Architecture



Software specification

Use-Cases

Interacting with system

1. Users can select buttons by hovering over them with the virtual Kinect hand and pushing forward with their physical hand
2. Users can select buttons using a mouse to click them
3. Users can grab and drag items by hovering over them with the virtual Kinect hand and clasping their physical hand

Non-Functional Requirements

1. Extensibility; game modules will be designed with further extensibility in mind. Developers will be able to create their own games or use different categories of words for current games
2. Maintainability; software will be organized modularly and code will be uniform in order to maximize maintainability
3. Accessibility; buttons are designed to be large enough to be easily pressed with a hand gesture on a Kinect
4. Quality; Words with Kinect will accurately measure the child's performance
5. Accuracy; gesture and voice recognition will be accurate

Test specification

Prototyping

Small sample games will be designed based on the information we learn from Dr. Bear. The game is then taken to Dr. Bear where we will decide if they are teaching the children properly.

Testing

See attached testing plan below.

Works Cited (pictures for the Matching Game)

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