[*APPENDIX*] LIST OF COURSEWORK/COMPUTER SCIENCE PROJECTS

Ants vs. Some Bees

Created a [tower defense] game called Ants Vs. SomeBees inspired by PopCap Games' Plants Vs. Zombies. Combines functional and object-oriented programming paradigms, and involves understanding, extending, and testing a large program.

Bear Maps

Created a Google Maps-inspired project that parses xml data from open street maps to construct a graph connecting local restaurants and attractions in the Berkeley area. Created a quadtree to stitch together images to support high resolution zooming. Implemented the A* routing algorithm to calculate the shortest distance between two points and render a path on the web app.

Calorie Burner

Learned about Android SDK and developer tools through a fitness app and testing it on an emulator. The calorie burning conversion app works for various exercise types (i.e. pushups, situps, jumping jacks) and outputs the number of calories burned or the equivalent amount of another type of exercise. Refined GUI based on UI/UX design guidelines.

CPU

Designed the datapath, control scheme, ALU, and Register File for a 2-stage pipelined CPU, with certain custom MIPS instructions. We were not given any pre-built circuits, everything was created from basic gates, multiplexers, and registers. The best part was feeding the CPU a sequence of instructions and seeing the CPU and the various wires and circuits interact to produce the expected output. Learned about the: Datapath of a CPU, Pipelining, Control Scheme, and Logic Gates.

Editor

Built a text editor from scratch using the javaFX library inspired by existing text editors such as Sublime using a modified linked list and arraylist. Supports dynamic word wrapping, scrolling, open and saving existing files, arrow keys.

First Aid

Knowledge of first aid is invaluable in a crisis. Speech interfaces are a good match when quick, specific access is needed and the user needs to use their hands for something else. Coded first aid information from the Red Cross' Adult First Aid Reference into a voice app using Alexa and a Lambda server.

Game of Hog

Developed a simulator and multiple strategies for the dice game Hog, using control statements and higher-order functions (A.I.).

Great Firewall of China

Using VirtualBox, I investigated multiple aspects of the Great Firewall by examining and crafting raw network traffic.

MIPS Assembler and Linker

Created a program in C that converts MIPS instructions into machine code, and links multiple object files. Learned about: C Memory Management, MIPS Instruction Format, Compiler-Assembler-Linker-Loader.

NBody Simulation

NBody Simulation - wrote a program simulating the motion of N objects in a plane, accounting for the gravitational forces mutually affecting each object as demonstrated by Sir Isaac Newton's Law of Universal Gravitation. Program draws an animation of bodies floating around in space tugging on each other with the power of gravity.

Performance Programming

Optimized an algorithm that determined the depth of objects based on two slightly differing images (such as the left eye and the right eye). Achieved on average 10x speedup.Learned about: SIMD Extensions, Multithreaded Programming, Loop Un-rolling, Open-MP.

Recipe Assistant

Developed an Alexa VUI which implements cooking recipe retrieval, ingredient listing, and preparation directions. Once in a recipe, users can ask for a list of ingredients, or the recipe directions. This transforms Alexa into a great kitchen assistant!

Scheme Interpreter

Created a scheme interpreter within Python which allows the user to use a Scheme/lisp environment within Python. Includes features ranging from Turtle graphics to an algorithm in Scheme which calculates all the different partitions of change. Interpreter is fully functional and supports almost all the features typical of Scheme/lisp.

ThoughtJot

From ideation to presentation, developed a voice-to-text (stream of consciousness) journaling ecosystem composed of an Amazon Alexa Voice app, Android companion app, and Web app. Wrote Lambda functions which handle dialog conversions and refined utterances based on contextual interviews. Using Figma, Photoshop, Android Studio, created elegant GUIs for retrieving entries.

Yelp Maps

Created a visualization of restaurant ratings using machine learning and the Yelp academic dataset. In this visualization, Berkeley is segmented into regions, where each region is shaded by the predicted rating of the closest restaurant. Uses techniques from machine learning, to statistically analyze data patterns and improve performance.