Project Proposal for Graduate Independent Project

Background/References/Need

In Introduction to Computer Science 1 (ITSC 1212), during our second week of class, we teach binary and binary conversions. Previously, we have used [this website](#) to assist in teaching binary-to-decimal conversions, as it shows what bits need to be 0s or 1s to display a certain decimal number. The ASCII conversion is more difficult for some students, as it requires the use of a separate table for conversions.

As a Lead Instructional Assistant (Lead IA) and as a third-semester IA, I have noticed every semester that some students struggle with this problem solve assignment as they find it somewhat difficult to understand binary conversions properly, which is where my project comes in. I would like to create this project to help students understand the basics of computing, which starts with binary conversion. I have spoken with Dr. Najjar about it briefly a couple of months ago when I first had the idea, and she seemed on board. I will work on getting proper documentation with her if need be between now and the due date of this project.

Introduction

The purpose of this project is to provide a physical item that students can use to show the binary-to-decimal and binary-to-ASCII conversions for any given byte string of 0s and 1s. This device will have 8 LEDs along the top, each with its own toggle switch, to toggle a light on or off to demonstrate a bit. The device will read this as an input, display which bits are on, and display on a separate screen the decimal and ASCII conversion. A potentiometer will also be given as an input that will be used to set any given decimal number from 0 to 255, and then properly display the binary and ASCII conversions of that decimal number. The result will be a device capable of helping students learn binary conversions through a physical device.

Digital Fabrication

To make this project a reality, the device will need a case capable of containing all of the components, as well as having windows for all necessary screens, LEDs, or inputs. The case will be fully 3D printed, using some form of magnets, snaps, or screws to fasten everything together. The toggle switches themselves, unless a suitable component is found, will also be 3D printed, along with a knob for the potentiometer. Lastly, housing for the Arduino, breadboard, and battery will be provided inside the case using 3D printing.

Arduino

As said previously, one of my two outputs will be a set of 8 buttons, with an LED for every button to represent a bit, all 8 to create a byte. There will most likely be two other LCDs to show both the decimal and the ASCII representation, but that may be reduced to one LCD depending on how the rest of the project goes.

Inspirations

As I mentioned previously, I am a Lead Instructional Assistant and have seen students struggling with binary conversion. After looking at the website about binary cards, and after the day of the binary conversion problem solve activity, I believe that this project could be an important learning tool for some students. Along with that, if the one device goes well this semester with some testing, looking at making other versions of the device for the coming semesters is something that I am interested in helping with.