My Project Proposal

by
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Submitted to the Electronics Engineering Tech Program at Portland Community College
2015-04-09

Abstract:
My proposed project is to create a tester and identifier for common ICs that are used in school labs. This would both identify unknown chips and verify correct function. This would be of use in lab as well as potentially in industry to verify that components being used are working correctly.

Introduction:
Sometimes in school or professional situations we may be required to make large logic circuits. Occasionally, the chips we use may not be outputting the correct logic. This project aims to create a small, affordable test item to verify the logic function of IC logic chips.

This project will be created with multiple goals in mind, reaching as many as are possible in the allowed time. These goals are as follows:

1) Be able to verify the logic function of ICs
2) Be able to identify unknown logic chips
3) Create a case for the project
4) Verify the operational characteristics of other ICs, such as op-amps and flip flops
5) Evaluate other components such as resistors and capacitors.

The ultimate goal is to create a small, affordable test kit that can be used in labs to verify the operation of components. Currently, the only way to verify this functionality of ICs that I have seen in school labs is to apply logic states by hand and use a DMM to record the results. This project will reduce the time to verify the function of components and allow a student or professional to correct the problem or move on to checking their wiring faster.

Preliminary Research:
Currently, IC testers are available that can test many kind of general faults in any IC chip. These cost upwards of $1,000 however. My goal is to create a cheaper alternative that can be used in school labs for common specific component testing. By targeting specific chips, such as logic and amplifiers, we reduce the overall functionality but also reduce cost and complexity.

Digital IC Tester
Model 575A
MSRP $1,195 / 1 Yr Warranty

Overview | Docs & Software | Accessories | Where to Buy

The Model 575A is able to locate intermittent and temperature related faults by using its unconditional or conditional loop testing modes. Unknown device identification is easily accomplished by selecting SEARCH from the menu, selecting the number of pins on the device and activating Search Mode. The 575A will search its library and identify the device, displaying possible functional equivalents for replacement. As part of the IC test, the specific IC number, the functional description of the device, and the status of faulty pins are scrolled through on the built-in display.

Features:

- Comprehensive device library covers most TTL, CMOS, memory and interface devices
- 40 pin capability (NAND gates or CPUs)
- Identifies unmarked and house-coded devices
- Detects intermittent and temperature related faults
- Displays diagnostic information for individual pins
- Battery operated

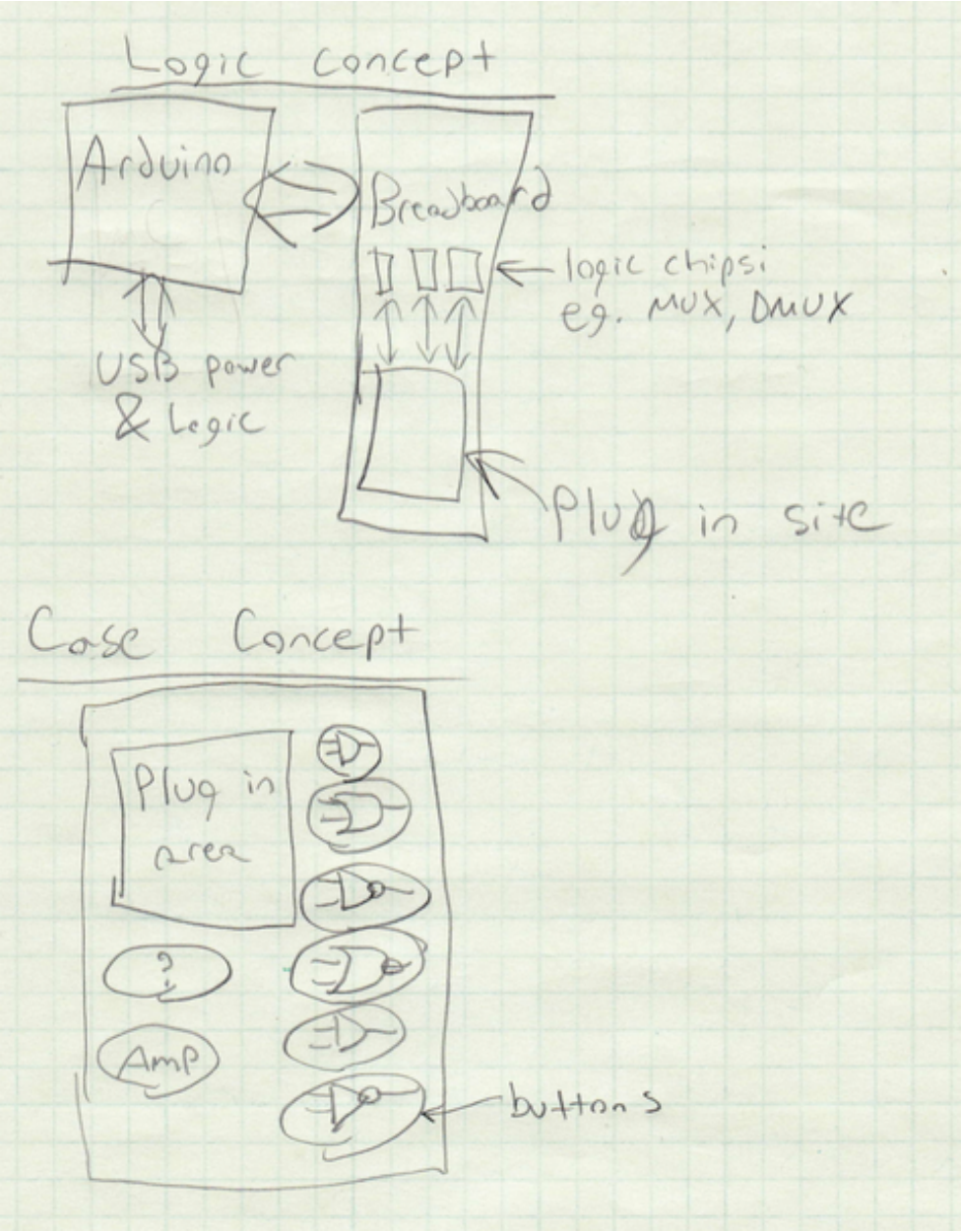
Other research: Conversations with fellow students has indicated that this would be a well received addition to lab studies.

Future Research:

1) How do I measure and create a case for the project. Currently, I do not know the size of the project or have any knowledge of CAD programs, but do have access to 3D printing and laser cutting equipment.
2) How to measure analog components. I understand already how to test digital functions using a microcontroller, but not how to measure resistance or capacitance.
3) Will I be able to identify unknown ICs? I think I can run test signals over each pin on the IC, but don't want to burn out the chip by applying an inappropriate voltage to a pin.

Generally, my approach is to work towards completing the project goals as outlined above, and learn how to create even more functionality that I have considered. Since I plan to base the logic in an Arduino microcontrolloer, this will mostly involve research on Arduino's website, which contains great programming resources. Lastly, I plan to ask others what additional features others may want that I have not yet considered.

Concept Work:



Applied EET Skills:
Digital to analog and analog to digital converters (EET 123): Knowing how to convert between analog and digital information will be very helpful, especially when testing op amps with this circuit.

Basic programing (EET 178): Learning how to program, especially adding libraries, will be very helpful when programming the micro controller.

Diode and transistor knowledge (EET 221): Knowing the characteristics of diode and transistors will allow me to potentially test these components.

Power regulation (EET 221): I learned several power regulation and protection circuits that will keep me from shorting out the micro controller.

Microcontroller use (EET 242): This class will provide the most important skills for this project as I plan to have all of the logic centered around a microcontroller.

Knowledge of op-amps (EET 222): Knowing the characteristics of op-amps will allow me to test these components.

Control systems (EET 273): Having knowledge of digital control systems will allow me to better control this circuit

Soldering (EET 261): A small part of Biomedical Equipment 1 taught us to solder which may play a part in the final presentation of this project.