

CAUSE AND EFFECT

TEAM: Circuit CitEE

1 Introduction

ADEC is the Association for the Disabled of Elkhart County. It is a program with several campuses and group residences throughout Elkhart and St. Joseph Counties. It is a group that is “working in partnership with all to help people with physical and developmental disabilities, live fuller, richer, more meaningful lives”(www.adecinc.com).

Our group is composed of Irere Romeo Kwihangana, Lauren Mahle, and Jaclyn Nord. Our aim is to help ADEC by creating a cause and effect game they can use in educational and recreational activities.

2 Problem Description

ADEC has requested a device to help demonstrate the cause and effect relationship of a physical action. A game in the form of a matrix with large, push-able buttons, which light up in a random sequence would accomplish this need. If the button is not pushed in a specified amount of time, then the game ends and must be started over. ADEC would like the game to be usable on either a flat surface, or upright. The game needs to be easy to use for people with physical and/or mental disabilities, often children.

3 Proposed Solution

Our team aims to create a simple game based on the same principle as Whack-a-Mole - a game aimed at demonstrating the cause and effect relationship. This game works by having several large buttons that can light up individually. When a user presses a lit button, the light turns off and another one turns on. The user continues to play until they do not press the correct (lit) button in the allocated time. Our preliminary draft design, based on our brainstorming and the problem statement given by ADEC, will have the following characteristics:

- Multiple buttons
 - Large, and easy to press
 - Will light up
- Flat game board with the ability to be propped up, similar to a desktop keyboard
- A scoreboard to keep track of how many buttons the player successfully hits in a row
- Different levels: easy, medium, hard and a progressive mode. Easy, medium and hard will have buttons that light up at that level's constant rate -- easy with the most time in between illumination and hard with the least amount of time. The progressive mode will

move the player from easy to hard mode based on how well the player performs along the way.

These features represent an initial list of requirements generated during our brainstorm. They are subject to changes based on the customer request, and continued research. This game should teach cause and effect by allowing the user to physically push a button (cause), and have one light turn off and another turn on(effect).

4 Demonstrated Features

There are several features that we will demonstrate in the Spring to prove that we have fully addressed our constraints:

- The buttons are lit in an entirely random sequence
- Pushing a lit button is counted as a correct answer, and the user is credited with one push
- Pushing a button causes an effect, in that a light goes off and another button is lit
- The board can be placed and played on a flat surface
- The board can be placed and played in an upright position
- The different cases(levels) have differing degrees of challenge
- A screen that will display the number of correctly pushed buttons
- On/Off switch

5 Available Technologies

Our project does not necessarily require any cutting edge technology. Our design will mainly consist of buttons to create the “cause” and either buttons or a switch to select the level. The board will need to be powered by an AC hookup, and will require a screen of some sort to display the user’s score. Therefore, we will need a circuit that will allow for the input of the buttons and an output to display the score and level, and be able to power the LEDs illuminating the buttons. The device will also need to have LEDs that can be easily replaced, so that the user can maintain the game.

6 Engineering Content

Aspects of engineering:

- Physical
 - Designing a board that will be easy for the target audience to use
 - Designing a board that will be durable and safe to use
 - Designing a board that will be easily repairable and replicable

- Circuitry - designing a board that will:
 - Incorporate lights
 - Have a screen for tracking scores and level
 - Allow for multiple buttons
 - Allow for use of AC power from a wall circuit
- Software
 - Code that will randomize which buttons are lit
 - Ability to vary between cases (levels)
 - Logic design for progressive function
 - Ability to track number of buttons pressed correctly (score), and display this number on the board
 - Ability to end game if button is not pressed in allowed time

7 Conclusions

While there are several very different aspects of engineering that will be involved in this senior design project, we are confident that we will be able to master and employ them all. This particular project is important to us because it has a real world application and a real world customer. At the end of this project, we plan on giving our finished product to ADEC in the hopes that they will be able to use it in their programs.