

CHAPTER 14
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Single Switch Serial Mouse Emulator

Designer: Joseph Santamauro

Client Coordinator: Prof. Les Cory, UMASS Dartmouth Center for Rehabilitation Engineering

Supervising Professors: Philip H. Viall, Thomas Ellis

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Introduction

Many computer programs utilize a pointing device such as a mouse. Some programs are enhanced by the use of a mouse, and some require a mouse. Many physically disabled individuals lack the ability to control a conventional mouse. For this reason they are unable to use certain programs. The single switch serial mouse emulator is controlled via a single momentary switch, while appearing to the computer as a conventional mouse. With this device, a disabled person who can operate any momentary switch, can effectively use any software package which relies upon a mouse for input. Since this device is a hardware solution, it does not suffer from the limitations inherent in many software based solutions. A photograph of the single switch serial mouse emulator is shown in Figure 14.1.

The single switch serial mouse emulator has four groups of LED's from which the user selects the desired mouse function. The first group of four LED's (top left) are used to select pointer movement: left, right, up, and down. The second group of three LED's (top right) select one of three button single clicks. The third group of three LED's (bottom left) select hold button and drag functions. The fourth group of three LED's (bottom right) select button double clicks. The emulator scans through each function group by illuminating all LED's in each group in succession. The user selects a group by pressing the switch when the desired group is illuminated. Once a group is selected, each LED in that group is illuminated one at a time. A function is then selected by pressing the switch when its corresponding LED is on.

Summary of Impact

The single switch serial mouse emulator enables a person with spastic quadriplegia associated with cerebral palsy to utilize software which requires the use of a mouse. Previous software solutions were ineffective in that they did not work with all soft-

ware packages, and often the results were unpredictable.

The mouse emulator plugs directly into the serial port of the computer, and from the computer's standpoint it is indistinguishable from a standard mechanical mouse. Both this project and the other (parallel) mouse designed at the same time will be evaluated to determine if either is more functional than the other for the intended application.

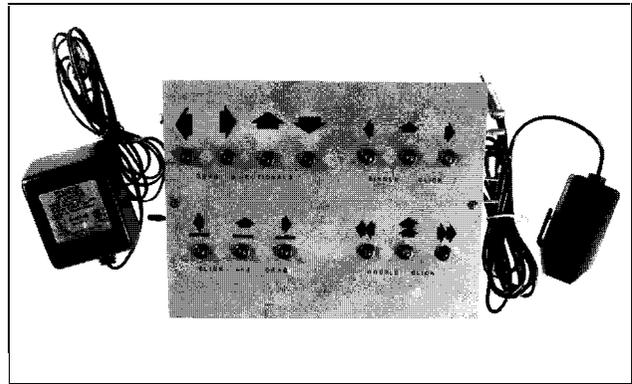


Figure 14.1. Photograph of Single Switch Serial Mouse Emulator.

Technical Description

The brain of the mouse emulator is an 8748 microcontroller, as shown in Figure 14.2. This microcontroller controls the scanning of the LED's through the lower four bits of port 1. The rate of LED scanning is determined by a subroutine programmed into the 8748. The pins of port 1 are connected to a 4-line to 16-line decoder (74154). The 74154 in turn drives each of the LED's. Each LED can be turned ON by applying its corresponding 4 bit code to the inputs of the decoder. The input code drives the corresponding output low, thereby enabling current to flow through the LED causing it to emit light. Since only one 4 bit code can be applied at once, only one LED can be on at any one time. Although

Single Switch Bus Mouse Emulator

Designer: Miki J. Barton

Client Coordinator: Prof. Les Coy, UMASS Dartmouth Center for Rehabilitation Engineering

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Introduction

This project is similar to the serial mouse emulator reported elsewhere in this chapter, except that this project emulates a bus mouse (parallel) rather than a serial mouse. Many of today's computer applications require the use of a mouse, or some form of pointing device. Many physically disabled individuals lack the ability to control a conventional mouse. For this reason they are unable to use these programs. The Single Switch Bus Mouse Emulator is controlled via a single momentary switch, while appearing to the computer as a conventional mouse.

The single switch bus mouse emulator has six groups of LED's from which the user selects the desired mouse function. The first group of eight LED's are used to select pointer movement: up, down, left, right, NE, SE, NW, and SW. The second group of three LED's select button single clicks. The third group of three LED's select button double clicks. The fourth group of three LED's select hold button and drag. The fifth group of LED's are used to change the rate of mouse pointer movement. The last group of LED's are used to change the scanning rate. The emulator scans through each function group by illuminating all LED's in each group in succession. The user selects a group by pressing the switch when the desired group is illuminated. Once a group is selected each LED in that group is illuminated one at a time. A function is then selected by pressing the switch when its corresponding LED is on. The device is shown in Figure 14.3.

Summary of Impact

The single switch bus mouse emulator (like the serial mouse emulator) enables a person with spastic quadriplegia associated with cerebral palsy to utilize software which requires the use of a mouse. Previous software solutions were ineffective in that they did not work with all software packages and often the results were unpredictable.

The mouse emulator plugs directly into the bus port of the computer and from the computer's standpoint it is indistinguishable from a standard mechanical mouse. Both this project and the other (serial) mouse designed at the same time will be evaluated to determine if either is more functional than the other for the intended application.

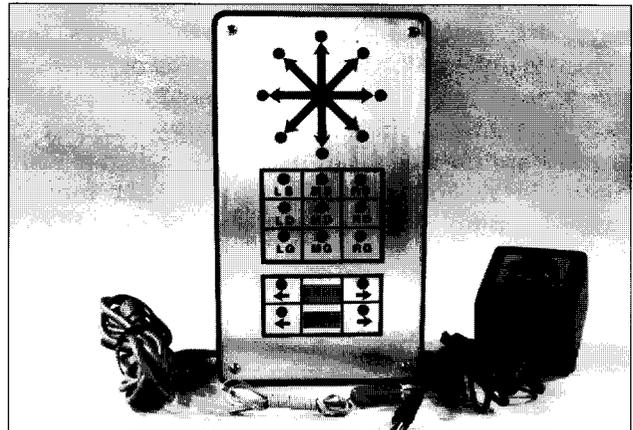


Figure 14.3. Photograph of Single Switch Bus Mouse Emulator.

Technical Description

The brain of the single switch bus mouse emulator (SSBME) is an 8748 micro-controller, as shown in Figure 14.4. This micro-controller controls the scanning of the LED's through the data bus. The lower four bits of port 1 are used to select which of the five 74LS374s (&bit latch) are to latch the value placed on the data bus. Each of the latches are selected by placing its corresponding value on port 1. This value drives a 74LS145 (4 to 16 decoder). The output of the decoder and the write (WR) line of the 8748 is combined using a 7432 (2-input OR gate) to drive the clock line of the latches. The 74LS374s drive each corresponding LED via a current limiting resistor (560 ohms). Each LED can be turned ON by latching a zero into its corresponding latch. A low bit at the latch drives the corresponding output low,

