

ICS3U0 Hardware Project - Mouse to Printer

Scenario: A user wishes to print a document, by pressing the print button on their monitor using their mouse.



Logitech M170 Wireless Mouse



Epson Expression Home XP-5200 Wireless All-In-One Inkjet Printer

1. On the bottom of the mouse, a small LED bounces light off a surface to determine if the mouse is moved ^[2].
2. A digital signal processor (DSP) is used for analysis, operating 18 MIPS (million instructions per second), detecting movement of the mouse, and determines how the mouse is moved^[2]
3. The mouse movement is converted to an electrical signal, and the electrical signal is sent to a electro transmitter, which emits the signal as a radio frequency (2.4GHz) ^[1]
4. The radio signal is received by a USB radio receiver in the computer, and sends the signal to the operating system.
5. The radio signal is sent to the operating system (OS), and the CPU (Central Processing Unit, responsible for processing and executing tasks) processes the mouse movement, putting the mouse cursor on the 'print' button ^[1]
6. The user clicks the mouse, and within the mouse, a microswitch detects when the button is pressed and released, converting it to an electrical signal. ^[3]
7. The mouse click is sent the same way as the mouse movement, clicking the 'print' button on the monitor

8. The operating system (OS) processes the print job request triggered by the user's click. It gathers the necessary data and instructions related to the document to be printed.
9. The CPU processes the document being printed, and converts it into a format readable by the printer.
10. If the document contains complex graphics or images, the GPU (Graphics Processing Unit) assists in rendering and processing these elements for inclusion in the print job.
11. The OS sends the print job to a print spooler, which is a software component responsible for managing the print queue. The spooler organizes print jobs in the order they were received and prepares them for printing. ^[4]
12. The print spooler communicates with the appropriate printer driver, which has been loaded into RAM (Random Access Memory). The driver is specific to the type and model of the printer being used.
13. The converted print job data is sent from the computer's RAM to the printer's hardware components responsible for data transmission, such as the USB controller or Network Interface Card (NIC), depending on the printer's connectivity.
14. The printer receives the data, and the CPU processes the data to prepare it for printing.
15. The CPU then sends the printing data to the printer RAM, which will be used for printing.
16. The printer's motherboard coordinates all the parts within the printer, activating them to be ready for printing.
17. Status Indicators and Controls: The printer's status indicators (e.g., LEDs) and control buttons, managed by the printer's CPU and RAM, provide feedback and allow user interaction during the printing process.
18. The printer checks for paper, ink, and connection, making sure that everything is present for a successful print job.
19. A nozzle head is activated, and the print engine applies ink or toner to create the image, with nozzles shooting the ink onto the paper. ^[5]
20. The printer's internal mechanisms handle the pathing and feeding of the paper within the printer, ensuring it goes along a smooth path. ^[6]
21. Once the print job is finished, the printed pages are collected in the output tray.
22. The printer sends the data of the print job being completed to the computer, using the USB controller or Network Interface Card (NIC), depending on the printer's connectivity.

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