Autonomous USB to USB Mass Storage Data Transfer Mechanism and Paraphernalia

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Abstract

In this paper, we describe the working mechanism of the proposed device to transfer data between two USB drives without the use of a host device i.e. a computer. In the digital age, data transfer has become the most important part of our lives. All parts of life find themselves connected by the common thread of data transmission. And to succeed and to promote the human enterprise, the need of the hour is efficient data transfer mechanisms. The proposed device tries to achieve this efficiency by minimizing the components in the data transfer process and thus optimizing it.

Keywords — *USB, Host, Data Transfer, Stationary computer host, Microcontroller, Memory Controller, Flash memory, Flash Drives.*

I. INTRODUCTION

Data in its all varied forms has always been a necessity for human race; from the data regarding the rain patterns for efficient agriculture, to the data needed to invest successfully on the Wall Street, we are always in search for avenues to collect and share data.

The human obsession with data takes a new and amplified form in this age of high speed computers and thus the need of the hour is to optimize the offline data transfer and collection procedure. Since the inception of computing industry, the offline transfer of data has been the main source of hassle, and we have come a long way from magnetic tape and huge discs to USB flash drives, but there is still much scope for further improvement in our data transfer methods. The latest breakthrough in the data transfer and transmission are the USB drives, USB drives have been a great improvement on its predecessors; considering their superior data storage capacity of up to 2 terabytes, a huge leap from the 110 kb data storage limit for the magnetic tape; their high reusability and shelf life, much desired properties when considering data storage methods.

There have been great advancements in the field of online data transmission, from high speed optical fibres to the space satellites specifically designed for data sharing across the globe; but the field of offline data transmission has not seen any such drastic advancements. The process of offline data transfer has always been the same: the first user has to share the data with the hub; the hub then processes the data and transfers the data to the second user. The main reason for the inefficiency of current methods of offline data transmission is the cost of the hardware. Even today, a simple ask like transferring data between two USB drives can be a challenge for an average person. The current method requires an additional computer for transferring data, which makes data transfer an onerous process; person first needs to find a computer to transfer the data to and then the data is transferred from the computer to the desired location(a USB drive). This process is inefficient in its very basis, because of the involvement of a device other than those directly involved in data transfer (the computer); the computer is the main cause of loss of efficiency in the process, as it consumes much power and also is responsible for the low data transfer speed.

The most efficient way to optimize the data transfer method is to replace the computer with a device that is specially designated for the job of transferring data as opposed to the conventional computers, which have to perform a lot of other functions. This marshalling of a computer's processing power towards data transfer is the key to increasing the transfer speed and thus optimizing the whole process.

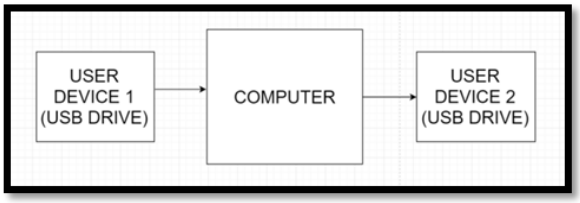

Fig. 1 Block Diagram of General Overview of the Data Transfer Process

II. RELATED WORKS

There have been some research in the field of USB to USB data transfer; the devices proposed have featured ARM architecture and USB 3.0 interface, which is quite outdated today. Rupali C. Bachalkar (2015) used Raspberry PI, a small programmable module with preinstalled hardware like RAM, CPU, and microprocessors, to create a

system to transfer data between two pen drives. OmprakashGawali (2013) used ARM architecture for data processing and transfer. MukeshTiwari (2013) used VDIP 2 Module incorporating VLC1L IC chip. Rahul.R.Menon (2015) used VNC1L chip to transfer data between two USB drives. Today we need a faster data transfer mechanism, which is not only cost effective, but also aesthetically pleasing, efficient and simple enough for non-technical users to operate.

III.CONSTRUCTION

A. Background

The offline data transfer methods have evolved to a great extent from the rudimentary low speed magnetic tapes to the high speed USB 3.0 drives in the modern era. The optimization has always been from the perspective of the user's memory device, rather than from the perspective of the hub and this perspective is the source of the inefficiency, as said earlier.

The current technology in the field of data transmission is USB 3.0, with a practical data transfer rate of 100 megabytes per second, they are quite impressive, but are totally dependent on an external device like an offline network hub (computer). This dependence limits the flash drives' use, and thus causing the whole transmission system to be inefficient in spite of the high data transfer rate.

The proposed device eliminates the external host by integrating the USB flash drive with the imbedded computer (host in offline network). The device consists of a host device, an input USB port, and an output USB port.

The users insert the devices they want to exchange the data between in the two USB ports, any one of the USB ports can be permanently used as the input for a flash drive, and the other port can be used as the output port, where the other USB drive can be inserted.

The device has very basic components, the simplicity and cost effectiveness of the components is to make the device accessible to even the most technically uninformed and economically weak users.

Fig. 2 Block Diagram for General Overview of Proposed Data Transfer Mechanism

B. Components

1) The Hardware

The basic purpose of the proposed device is data transfer and thus high performance hardware is necessary. The device uses the following hardware components-

- USB 3.0-

As the basic and sole purpose of proposed device is data transfer, it needs a high speed data transmission medium like USB 3.0; the USB 3.0 is the latest advancement in the portable data storage systems, it offers the data transmission speeds of up to 625mb/s. This tremendous increase In speed makes the device efficient, as faster data transfers mean less time for device's operation and thus decreased power consumption.

- Battery pack-

The proposed device uses relatively inexpensive Li- Ion batteries to power the computers. The batteries maintain a constant 5V DC supply and thus ensure the safety of the processing equipment. The LI-Ion batteries are known for their high reusability and dependability, and thus assure to be worth of their slightly high cost, in comparison to the button cells or AA batteries.

- Processor-

The processor used is preferably ARM-7 or Raspberry Pi; other processors can also be used as alternatives. Raspberry Pi is selected for its versatility and high processing power, the ports for LCD screen provide easy functionality; further, the low cost of Raspberry Pi presents another advantage in terms of greater user outreach.

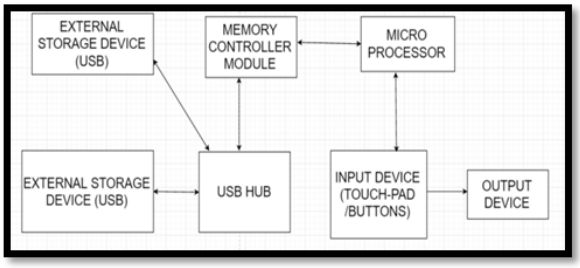

Fig. 3 Block diagram of Data Flow

- Display –

The display in the device is an LCD/ TFT screen. The display is integrated in the device and can be made touch sensitive. The touch sensitive variant of the proposed device may be slightly costlier than the standard version, but the accessibility advantage that it provides is definitely worth the cost.

- Control panel-

The standard version of the proposed device would be equipped with a cross pattern keypad for navigation (up, down, left and right) and a functionality button at the center of the cross pattern keyboard. The functionality button can be used to select different options like transfer, copy, paste,

select etc. The sample rubric for the keypad is given in the illustration.

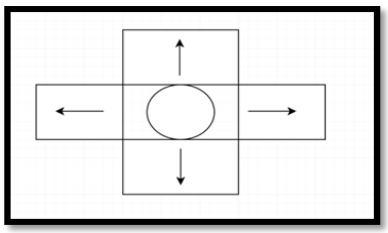

Fig.4 Proposed pattern for keypad

*2) **The software***

The hardware and software are incomplete and dysfunctional without each other and thus the device needs a software interface to compliment the processing power that the computer has. The device uses Linux operating system for its free availability, which makes the device inexpensive. The software is supposed to support the touch or keypad inputs, and Linux OS does that very efficiently. Further, the Linux OS can be updated very easily and thus always gives the user the best experience. S

C. Proposed Algorithm

1. External storage device such as a USB drive is connected to the USB port provided in the proposed device.
2. The second USB drive is connected to the second USB
3. The USB drive is connected to the USB hub
4. The USB hub is connected to the memory controller module
5. The memory controller module is connected to the micro-processor
6. The microprocessor is connected to the input device such as a touchpad or keyboard
7. The input device is connected to the output device such as a LCD/ TFT screen
8. The output device displays the files and folders that the two devices
9. The input device allows the user to select the files to transfer
10. The user can select from copy, select paste or delete option by navigation keys and selecting desired operation by functionality button
11. The user waits for the transfer to process
12. The user turns off the device by using the power switch.

D. Physical Construction

- The device has two USB ports
- The microcontroller, memory controller module and the USB hub are compactly packed in fashion as shown in figure
- Only the USB ports are exposed, the remaining system is enclosed in the case
- The power button and the battery module are enclosed inside the body of the proposed device.

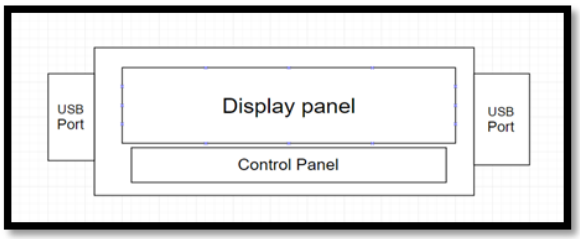

Fig.5 Proposed Physical Structure of the Device

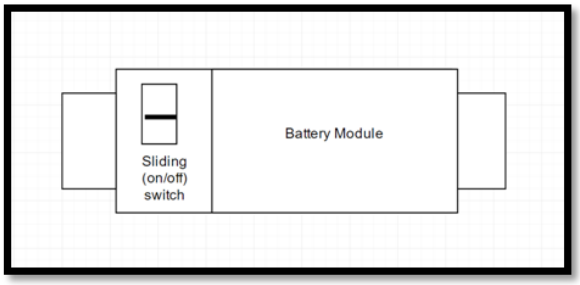

Fig.6 Back View of the Proposed Device

IV. CONCLUSIONS

The proposed device is the perfect fit for the basic purpose of its invention. The device proves to be brimming with market potential and scope for advancement at the same time. The device provides a simple yet efficient solution to a daily life problem, and thus has the potential in both product and consumer based marketing scenarios, the versatility and efficiency of the device present further opportunities for both commercial and technical advancement.

Although there has been some research addressing the issue of USB to USB data transfer, but the technical specifications of the research have not yet been integrated in to a user friendly and interactive environment. This integration of technology in the life of people is what actually makes the proposed device stand out from the previous works. Also; the previously proposed technologies have used outdated mechanisms, which decrease the efficiency of the system. The proposed system uses the most cost efficient and powerful processing power and combines it to create a device that has real life application and market potential. Also as, this stratum of market is not being tapped currently.

The device finds its applications in all walks of life including but not limited to banking industry, stationary (printing) industry to transfer files directly to printers, educational institutions, digital photo studios etc., and quality of omnipresence can optimize the process: as the users increase in number,

the demand for the device increasing and thus incentivizing further improvisations and optimizations, in a way similar to the optimization and advancement of mobile phones.

ACKNOWLEDGMENT

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