SMART USB – 'Wireless Data Transfer'

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ABSTRACT

In the cutting edge time, PCs and portable workstations has turned into an indivisible piece of our bustling life. One of the normally utilized gadgets for information exchanges is Universal Serial Bus (USB) streak drives. Because of developing innovation, USB gadgets are shriveling step by step, yet not the types of gear which is required to get to them. Information exchange utilizing convenient gadgets is the most critical factor of the present situation. Information exchange between two pen drives is for the most part done utilizing portable PCs or desktops. In any case, it isn't generally conceivable to convey such a substantial size gadget to the specific area. So to conquer this issue, equipment which is more reduced to convey anyplace is composed. Here the exchange of information is done between two pen drives without utilizing any PCs or tablets. Utilizing this framework, the exchange of records should be possible from wherever on the planet.
Keywords : USB Drive, Data Transfer, Portable ARM 11, FAT32, Java, Linux, Raspberrypi, USBDrive.

I. INTRODUCTION

In age of Digitization, where almost all the computing needs are undertaken wirelessly, there are a few devices which are still widely accepted across the globe. One such device is a USB flash drive which is one of the most popular storage devices used. USB devices help in maximizing productivity of any operation and is accepted by people of all age. The list of pros is endless; however, there a few cons which sometimes make it difficult for us to use these devices to their full capacity. One such major flaw is the need of a computing device to access, read and write data to and from the device. This is one of the major flaws which renders the devices inaccessible at all times. A secure control protocol for USB mass storage device with mutual authentication and key agreement between client and server is proposed in [7]. In portable storage based personalization, users can personalize a computer booting from the USB storage media is described in [8].The proposed system describes a way to complete this task wirelessly, without the need of any computing device. The methodology shows that two USB devices are connected to each other wirelessly, and using this technology, files form one USB to another can be accessed, read and transferred among each other without actually have to be near a computing device or be connected physically. [Fig: 1]

II. WIRELESS TECHNOLOGIES

There are various standards for supporting Wireless Technologies. Some wireless PAN technologies that can be used here are Bluetooth, WI-Fi, ZigBee, Home RF, Wireless USB (Cypress Standard) and Certified Wireless USB.

A. Wi-Fi (IEEE 802.11b) [2]

Wi-Fi, widely used for connecting personal computers in internet, is based on carrier sense multiple access with collision avoidance (CSMA/CA) with a Direct Sequence Spread Spectrum (DSSS) Technique.

B. Bluetooth (IEEE 802.15.1) [3]

Bluetooth is mainly used for devices that have regular Charge (e.g. mobile phones). Bluetooth operates under a Time Division Duplex (TDD) polling scheme with a Frequency Hopping Spread Spectrum (FHSS) technique,

with Gaussian frequency shift keying (GFSK) modulation. The nominal data rate is 1 Mb/s using a 1-MHz channel, while the effective maximum data rate is 721kb/s, with a range between 10 to 100m.

C. HomeRF [4]

HomeRF is similar to Bluetooth; it also uses FHSS access technique but with less hopping rate. The channel band widths 5 MHz for a higher data rate of 5 Mb/s.

D. ZigBee (IEEE 802.15.4) [5]

The ZigBee standard has been developed specifically for remote monitoring and control. ZigBee networks are designed to save the power of the slave nodes. For most of the time, a slave device is in deep-sleep mode and wakes up only for fraction of time to confirm its presence in the network. The targets of ZigBee are low cost applications where the battery cannot be changed (battery life time of 1-2 years) with limited requirements of bandwidth.

III. LITERATURE SURVEY

Several devices have been developed to overcome the reliance of a user on a PC for transferring data among distinct storage devices. One of the recently developed similar systems had used USB host controller (VNCIL) along with microcontroller ARMLPC 2138.[1] A Pen drive is an external device which is used to store the data and also help us to move files or folders from one central processing unit to another; hence they are in addition called as USB flash drives. An USB flash drive includes flash memory, which is interfaced with integrated Universal Serial Bus (USB). USB flash drives are not fixed and rewritable, and physically much minor than a disc. Since, to copy data from one Pen drive to another pen drive, third medium is needed and pen drives are USB slave device, since USB slave devices cannot directly converse with another USB slave devices.

a) Computer Independent USB to USB Data Transfer Bridge by Tushar Sawant.[6]

Under this project, a system is designed using which, two USB devices are connected to each other using a USB Bridge. It consists of 4 connecting wires between the device and the Host using which, large chunks of data can be transferred among the two devices. This system is battery operated. [6]

b) Data Transfer with the Help of USB Host Controller without PC by Anurag Sharma.[11]

In this paper, VDIP2 Module is connected to ATMEGA16 microcontroller with the help of MAX232 IC. This IC is used for conversion of signals with RS232 compatible. Both the USB devices are connected to a USB Host Controller which also has a VDIP2 Module. It also has a LCD display which can used to view the files that are to be accessed, read or written. [11].

IV. SYSTEM ARCHITECTURE

The USB to USB data transfer device consist of following main parts:

A. Raspberry Pi

The Raspberry Pi is a compact and smart computer that has been developed to provide low-cost computer and free software to students. Raspberry Pi has the availability of Linux software stack which easier to connect to the internet and variety of programming languages can be used. But, accessing hardware is not a real-time which interfacing with the hardware can be deferred if the CPU is busy.

B. Touch Screen

The touch screen displays the content of the pen-drive once we run the application on the touch screen. The content of the pen-drive are shown in the tree like structure where you can able to see the select the subfolder or the entire folder to be transfer from source pen drive to destination pen-drive. Once finish with the data transfer you can close the application or can transfer another file. If the USB drive is full then it will ask to release some memory from pen drive for the data transfer. Also Linux environment help to detect the virus in the pen-drive.

C. USB Host Controller

The USB Host Controller sub module is the main hardware used by both the USB Controller Module and the File System Controller Module. It interfaces the USB flash drives and converts raw data and information to their proper NRZI encoding as specified by the USB technical specifications. The system uses the Raspberry pi, a programmable microcontroller and USB multi-role embedded s t /peripheral controller, which has its own Basic Input/output system and framework program. Most of the software sub modules make use of the

available framework where the functions are already abstracted and simply need to be enabled and customized depending on the application [6].

D. File Manager

The File Manager Sub module is responsible for all file management functions/features that are available in the system. These features include copying a file or folder, overwrite, rename, delete, and browsing of the source and destination flash drive.

V. Hardware Specifications

1. Raspberry Pie Zero W Microcontroller
2. Wi-Fi Module
3. Memory Buffer
4. ALU
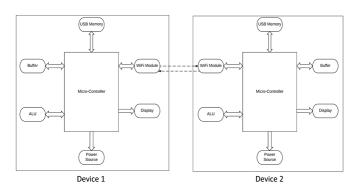5. LCD Display
6. 5V DC Power source
7. USB Flash drive

VI. EXISTING SYSTEM

The existing system suggests that two USB flash drives are to be connected to a USB bridge. On successful connection, the microcontroller connected to it grants access and the contents on the USB Flash drive are displayed on the LCD Display. Users can then selectively transfer the desired files from USB1 to USB 2. Users can also delete desired files on the USB as per their convenience.

VII. PROPOSED SYSTEM

The proposed system suggests that files can be easily transferred between two USB devices wirelessly, without any physical contact. On pressing a multi action trigger button, a wireless connection is established between the two USB flash drives. Once the connection is established, the Raspberry Pie on the receiver's unit gains access to the memory of the sender's unit. The user can then transfer files from one USB.

Architecture Diagram

Device 1   Device 2

VIII. SYSTEM WORKING

The USB to USB Bridge transfer data from one pen-drive to another. The data is selected with the help of touch screen and it can be transfer form source to destination pen-drive. Also it has the internet option so you can transfer data on the internet and also has an audio and video port.

A. Hardware Initialization

The USB device should be connected to the hardware after the system boots. When a USB device is connected to the hardware, the initialization starts. Normally it takes 1 or 2 seconds to initialize it. Consider a case when we connect the USB device to the hardware in between the boot process, then the error comes into picture as "USB device not recognized".

B. System Flow

The system allows the user to select files or folders/directories for copying from a source USB drive to a user selectable directory in the destination USB drive. The USB drive has four pins. The VCC and Ground are the power supply signals to the device. D+ and D- are the data lines through which actual data transfer takes place. Both D+ and D- are bidirectional lines, both carrying data in single direction at a time and data is modulated into deferential voltage levels to be transferred over them. The directions of D+ and D- are reversed in TDM manner to transmit and receive data. It is connectivity with peer-to-peer communication [9].Fig. 2 System Flow Diagram Figure shows the system setup while figure shows the general block diagram of the system. The system allows the user to select files or folders/directories for copying from a source flash drive to a user selectable directory in the destination flash drive. In addition, the system is able to check if there is sufficient memory space for the file/folder/directory to be copied onto the destination US drive; if not, the system requests the user to delete some files or

folder/directories to free some memory in the destination USB drive[6].

B. Start Up

The Start-up sub module handles the system start-up. It deals with the detection of the USB devices attached to the system. The sub module checks the USB ports for USB devices and their properties. For the system to start-up properly, there must be (1) two USB devices attached; (2) The USB devices must fall under the Mass Storage Class (MSC) device class and (3) under the Solid State device subclass; and (4) it must use the FAT 12/16/32 file system. If any of the conditions fail other that the 2 USB device requirements, an error would be raised.

C. Error Bit Handling

The Error Bit Handling Sub module is responsible for adding error-checking bits to the data about to be sent. Furthermore, the sub module also checks the received packets from the sender flash drive for corrupted data. The sub module forwards an acknowledgement (ACK) handshake in return if the received packet does not contain any errors.

D. Packet Handler

The Packet Handler sub module handles all packet generation and interpretation. The sub module generates packets without error checking bits, which will be used as either data, or command packets depending on the command sent by the File System. Controller Module. Requests are interpreted and the error free results and status notifications are sent as output.

E. Proposed Algorithm

The Proposed Algorithm is as follows:
i.   Select the suitable development board.
ii. Check whether the OS is supported or not.
iii. Connect the USB device to check functionality.
iv. Interface the touch screen and keypad as a User interfaces.
v.   Check the communication between the USB device and the board.
vi. Explore the device contents on touch screen.
vii. Select a particular file, and by using the option COPY, copy at file to destination device
viii. The selected file is then copied into destination USB device that is connected in one of the two USB ports.
ix. If another copy operation is to be performed, then go to 'step vi '.
x.   Terminate the process.

F. Termination

One of the features of USB2.0 specification is that when the USB device remains un-accessed for more than 3msec, it (the USB device) goes into the sleep mode. The USB can now be ejected.

IX. ANALYSIS

On comparing wireless PAN technologies table [1] was drawn in the below. Following table is indicating the ranges of each technology frequency band and data rates. Now a day's different technologies are in market like as Bluetooth, Wi-Fi, HomeRF, ZigBee. The frequency band of HomeRF is more than others.

TABLE 1. VARIOUS WIRELESS PAN TECHNOLOGIES

Sr No	Technology	Range	Frequency band	Data rates
1	Bluetooth	10-100m	1 MHz	1Mbps
2	Wi-Fi	10-50m	3.1-10.6 GHz	110mbps-480mbps
3	HomeRF	50m	5MHz	10mbps
4	ZigBee	3-10m	2.4 GHz	110-480Mbps

Any of the protocol can be used for supporting wireless Data transmission based on the user requirements. As most of the people are very much familiar with Wi-Fi, it is better to have one of the options.

X. Execution of Task

The following flowchart shows the stepwise flow of the execution of the task. First step show the initialization of the system. Next step defines the initialization of the USB peripheral and system components. The steps ahead define the exploring and selecting the operation. The second last step shows the operation completion whereas the last step shows the termination of the process. The flowchart of operation is as shown in the figure 2 below.
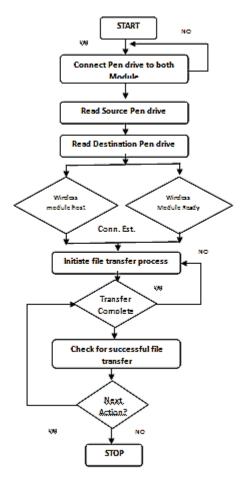
Fig 2: Flowchart

XI. CONCLUSION

Transferring the data through USB in today's scenario is the most common task. However, the problem is that for transferring the data to a personal computer or laptop is difficult if u don't have any of them. Therefore, we came up with an easy and affordable device, which can transfer the data between two USB data drives without the help of PC or laptop. Another advantage of this device is that it is battery operated so there is no need of power supply connection every time and data transfer can take place at any place.

XII. REFERENCES

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