Quality Checking of Storage Devices Using Moore's Law

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ABSTRACT

Today the computer storage devices have been product for different company and different size. The products to be change the quality of product also change. As computer technology advances, computers became more powerful, while their size decreases of memory chips and increase storage capacity. This is because the basic unit of the storage devices has decreased in size. This Measurement consists of nano-scale measure for main memory, the secondary storage devices including magnetic drums, magnetic tapes, magnetic disks, and optical disks. These devices vary with respect to their speed, memory and capacity. We have select different files to interchange the storage devices and measures speed to count time, How to read, write and erase of memory devices? How much time takes write to file in storage devices? This result to Moore's law; however, using currently available technology, storage devices should reach a lower limit.

Keywords: measurement, storage devices, Memory Chip, Nano Scale.

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I. INTRODUCTION

A device capable of storing data, the term usually refers to mass storage devices, such as disk and tape drives. In a computer, storage is the place where data is held in an electromagnetic or optical form for access by a computer processor. Computer data storage; often called storage or memory refer to computer components, devices and recording media that retain digital data used for computing for some interval of time.

Likes and dislikes apart, in basic terms, computer storage can be defined as "device or media stores data for later retrieval". From the definition, we can see that the storage device possess two features namely "storage" and "retrieval". A storage facility without retrieval options seems to be of no use a storage device may store application programs, Databases, Media files etc....

As we see in modern day computers, storage devices can be found in many forms. Storage devices can be classified based on many criterions. Of them, the very basic is as we learned in schools Primary storage and Secondary storage. Storage devices can be further classified based on the memory technology that they use, based on its data volatility.

The following list gives a few classifications of memory devices.

- Primary and Secondary and Tertiary Storage
- Volatile and non-volatile storage
- Read only and Writable storage
- Random Access and Sequential Access storage
- Magnetic storage
- Optical storage
- Semiconductor storage, etc...

II. RELATED WORKS

G. E. Begtrup was measured in Nano scale Reversible Mass Transport for Archival Memory;

we synthesize the required heterogeneous nanostructure consisting of a nano tube with an enclosed iron nano particle shuttle in a single step via paralysis of ferrocene in argon at 1000 °C. The nano tube memory elements are then ultrasonically dispersed in is opropanol and deposited on a substrate.

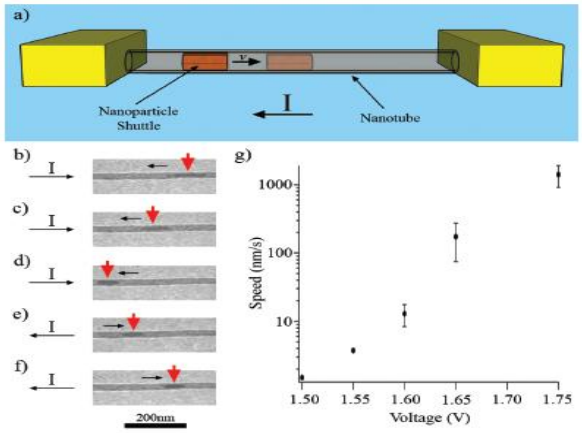

Figure1. Nanoshuttle memory device.[BEG 09]

The speed of the shuttle can be tuned over several orders of magnitude by varying the applied bias voltage V, as shown in Figure 1g. Just beyond a threshold for the onset of motion at $V \sim 1.55$ V, the shuttle moves at a rate of ~1 nm/s, on the order of the speed of slow continental drift,14 while at V) 1.75 V, the highest bias applied to this device, the shuttle moves at 1.4 μm/s, comparable to the speed of the motor protein myosin. With other devices we have observed that the shuttle velocity can be increased by at least 4 orders of magnitude beyond this, exceeding 2.5 cm/s, the maximum speed we can detect at high magnification due to the frame rate of our TEM video camera. The true top speed could be considerably higher.

III.MEMORY AND STORAGE DEVICES

Memory storage density is a measure of the quantity of information bits that can be stored on a given length of track, area of surface, or in a given volume of a computer storage medium. Generally, higher density is more desirable, for it allows greater volumes of data to be stored in the same physical space. Density therefore has a direct relationship to storage capacity of a given medium. Density also generally has a fairly direct effect on the performance within a particular medium, as well as price.

- **Hard Disk Drive**

An approach to high performance data recording is discussed that provides nanoscale digital electron beam recording onto rotating disc media using a gated Carbon NanoTube (CNT) as a miniature precision electron-beam emitting source. With the ability to record marks in the low nanometer range and to achieve gigahertz modulation bandwidths per channel, this technology may provide a future upgrade path for Hard Disc Drives. In addition, the Nano Technology Disk (NTD) approach allows other options not readily available with magnetic technology, such as dense arrays of Read/Write heads and high performance archival HDD's employing different media.

The basic approach is to adapt the existing hard disk drive technology shown in **Figure 2** and obtain a major upgrade in performance by replacing the magnetic Read/Write (R/W) head at the end of the actuator arm with a CNT based NanoHead Assembly (NHA)

Figure2. Typical Multi platter Hard Disk Drive

- **Read Only Memory.**

Read only memory (ROM) disks are the most popular form of low-cost information storage media. Current ROM disks also called Compact Disks Are made by injection molding, have a data storage density of ;0.68 Gbit/in2, and are read using

a focused laser beam[KRA 97]. To meet the future demand for ROM disks with increasing information storage densities, methods must be developed for low-cost manufacturing of such disks with replicated data patterns, and for inexpensive read-back techniques suitable for retrieving high-density information.

One promising approach is to develop ROM disks with ultrahigh-density topographical bits and to use proximal-probe based read-back. ROM disks of topographic bits with 45 Gbit/in2 storage densities have recently been demonstrated by a group from IBM.1 In that work, features as small as 50 nm were produced by electron beam lithography and replicated on a glass substrate using a photo polymerization 2P process.

- **Compact Disk(CD)**

Compact Disk another common storage media of the early 2000s, stores data in small pits in plastic surface that is then covered with a thin layer of reflective metal. The standard defines pits that are 0.83 micrometers long and 0.5 micrometers wide, arranged in tracks spaced 1.6 micrometers apart, offering a density of about 0.90 Gbit/in²

- **Dissociated vertical deviation(DVD)**

DVD disks are essentially a "product improved" CD, using more of the disk surface, smaller pits (0.64 micrometers), and tighter tracks (0.74 micrometers), offering a density of about 2.2 Gbit/in². Further improvements in HD DVD and Blu-ray offer densities around 7.5 Gbit/in² and 12.5 Gbit/in², respectively (for single-layer devices in both cases). When CDs were first introduced they had considerably higher densities (and overall capacity) than then-current hard drives, however hard drives have improved much more quickly than optical media, and by the time the latest blue-laser systems become widely available in 2007, the average hard drive will store somewhere between 500 and 750 GB with densities between 150 and 250 Gbit/in².

- **Removable Disk (Memory Chip)**

It is safe to assume that the exponential trends in capacity and price performance will continue. These trends have been consistent for over half a century. Even if the limits of miniaturization are reached with current technology, formats will become available that lead to new paradigms and even higher densities. Carbon nanotubes, for example, would enable components to be arranged atom-by-atom. The memory capacity of the human brain has been estimated at between one and ten terabytes, with a most likely value of 3 terabytes.* Consumer hard drives are already available at this size.

128 GB micro-SD cards are being planned for 2011* and there is even a 2 TB specification in the pipeline.Well before the end of this decade, it is likely that micro-SD cards (such as that pictured above) will exceed the storage capacity of the human brain. By 2030, a micro-SD card (or equivalent device) will have the storage capacity of 20,000 human brains. By 2043, a micro-SD card (or equivalent device) will have a storage capacity of more than 500 billion gigabytes - equal to the entire contents of the Internet in 2009. By 2050 - if trends continue - a device the size of a micro-SD card will have storage equivalent to three times the brain capacity of the entire human race.

- **Floppy Disk**

A floppy disk controller (FDC**)** is a special-purpose chip and associated disk controller circuitry that directs and controls reading from and writing to a computer's floppy disk drive (FDD). This article contains concepts common to FDCs based on the NEC µPD765 and Intel 8072A or 82072A and their descendants, as used in the IBM PC and compatibles from the 1980s and 1990s. The concepts may or may not be applicable to, or illustrative of, other controllers or architectures.

IV. DATA COLLECTION

The data collection process was carried out using a micro second's clock for the purpose of measuring the speed of write in the storage devices. The following measurement tables shown below.

File Type / SIZE	Floppy Disk (1.44MB)	Removable Disk (4.GB)	Compact Disk (700MB)	DVD (4.5 GB)
	H:M:S:MS	H:M:S:MS	H:M:S:MS	H:M:S:MS
Doc(1.08MB)	00:00:40:56	00:00:43:16	00:00:49:55	00:00:42:37
Pdf(1.18MB)	00:00:39:06	00:00:36:45	00:00:31:32	00:00:34:37
Zip(1.05MB)	00:00:36:56	00:00:37:12	00:00:39:33	00:00:37:11
Jpg(1.04MB)	00:00:37:33	00:00:32:56	00:00:24:05	00:00:38:62
Media file(1.10MB)	00:00:42:62	00:00:44:10	00:00:49:16	00:00:45:27
Mp3 file(1.05MB)	00:00:55:75	00:00:34:52	00:00:25:54	00:00:37:34
Ppt(1.07MB)	00:00:34:42	00:00:31:45	00:00:27:47	00:00:35:12
Average	**00:00:40:09**	**00:00:37:05**	**00:00:35:20**	**00:00:38.60**

Table1. Copy a file from Hard disk to External storage devices

This table1 copy a file from hard disk to external storage devices to display measuring time. How much time take a file copy it. This measurement conducted using floppy disk, removable disk, Compact Disk and DVD. We can count time from starting to finish of file exchanging time. The time to be counted as hours, minutes, Seconds and Microseconds. We choose a file size is 1.05 Megabytes, The average times to be count it.

- ✓ The average times take a floppy disk for 40 seconds and 09 microseconds.
- ✓ The average times take a removable disk 37 seconds and 05 microseconds.
- ✓ The average times take a compact disk 35 seconds and 20 microseconds.
- ✓ The average times take a DVD 38 seconds and 60 microseconds.

File Type / SIZE	Floppy Disk (1.44MB)	Removable Disk (4.GB)	Compact Disk (700MB)	DVD (4.5 GB)
	H:M:S:MS	H:M:S:MS	H:M:S:MS	H:M:S:MS
Doc(1.08MB)	00:00:02:10	00:00:01:82	00:00:02:04	00:00:02:10
Pdf(1.18MB)	00:00:02:06	00:00:02:02	00:00:01:75	00:00:01:87
Zip(1.05MB)	00:00:02:13	00:00:02:05	00:00:01:56	00:00:01:42
Jpg(1.04MB)	00:00:01:76	00:00:01:74	00:00:02:42	00:00:02:52
Media file(1.10MB)	00:00:01:45	00:00:01:23	00:00:02:33	00:00:02:17
Mp3 file(1.05MB)	00:00:02:23	00:00:02:17	00:00:02:99	00:00:02:65
Ppt(1.07MB)	00:00:01:65	00:00:01:36	00:00:01:45	00:00:01:65
Average	**00:00:01:91**	**00:00:01:77**	**00:00:02:07**	**00:00:02:05**

Table2. Copy a file from External storage devices to Hard disk

This Table2 also display same measurement of table1. But the files exchange from external storage devices to Hard disk. The times to be minimized of this measurement witch compare table1.

- ✓ The average times take a floppy disk for 1 second and 91 microseconds.
- ✓ The average times take a removable disk 1 second and 77microseconds.
- ✓ The average times take a compact disk 02 seconds and 07 microseconds.
- ✓ The average times take a DVD 02 seconds and 50 microseconds.

File Type / SIZE	Floppy Disk (1.44MB)	Removable Disk (4.GB)	Hard Disk 160 GB
	H:M:S:MS	H:M:S:MS	H:M:S:MS
Doc(1.08MB)	00:00:01:10	00:00:01:08	00:00:01:04
Pdf(1.18MB)	00:00:01:06	00:00:01:32	00:00:01:75
Zip(1.05MB)	00:00:01:13	00:00:00:87	00:00:00:56
Jpg(1.04MB)	00:00:00:76	00:00:01:07	00:00:01:42
Media file(1.10MB)	00:00:01:22	00:00:00:73	00:00:00:64
Mp3 file(1.05MB)	00:00:00:72	00:00:00:84	00:00:01:99
Ppt(1.07MB)	00:00:00:85	00:00:00:65	00:00:00:82
Average	**00:00:00:97**	**00:00:00:93**	**00:00:1.17**

Table3. Delete a file from storage devices to Recycle Bin

This table3 display measuring time for delete a file from storage devices to recycle bin. How much time take a file delete it. This time value is very low with compare table1 and table2. The maximum average time is only microseconds.

Moore's law describes a long-term trend in the history of computing hardware. The number of transistors that can be placed inexpensively on an integrated circuit doubles approximately every two years. This trend has continued in a smooth and predictable curve for over half a century and is expected to continue until 2020 or later.

The capabilities of many electronic devices are strongly linked to Moore's law: processing speed, memory capacity, sensors and even the pixels in digital cameras. All of these are improving at exponential rates as well. This is dramatically

enhancing the impact of digital electronics in nearly every segment of the world economy.

In 2011, Intel unveiled a new microprocessor based on 22 nanometre process technology. Codenamed Ivy Bridge, this is the first high-volume chip to use 3-D transistors, and packs almost 3 billion of them onto a single circuit. These new "Tri-Gate" transistors are a fundamental departure from the two dimensional "planar" transistor structures that has been used before. They operate at much lower voltage and lower leakage, providing an unprecedented combination of improved performance and energy efficiency. Dramatic innovations across a range of electronics from computers to mobile phones, household appliances and medical devices will now be possible.

V. CONCLUSION

This Measurement consists of nano-scale measure for main memory, the secondary storage devices including magnetic drums, magnetic tapes, magnetic disks, and optical disks. These devices vary with respect to their speed, memory and capacity. We have selected different files to interchange the storage devices and measures speeds to easily count time to take a file copy them. The following information is suggested.

This measurement was conducting table1 as high value to compare table2 and table3. The external storage devices were a low capacity memory to compare hard disk. So the external storage device take a time is high. The hard disk is very high storage device so the empty memory space is large. Hard disk data take a time store very low. Table3 as display as delete a file storage device to recycle bin. Every data to delete is within microseconds so the data need not write it only move it so the deleting a file take very low microseconds.

- **Advantages:**
  - Very fast access to data. Data can be read directly from any part of the hard disc (random access). The access speed is about 1000 KB per second. So the files write it fast.
  - They are very cheap to buy and floppy disc drives are very common. The storage capacity and accessing speed is very low. The data are stored in Random access memory.
  - CD-ROM's hold large quantities of data Accessing speed is common and writing a file in read only memory.
  - They are relatively tough as long as the surface does not get too scratched.

- **Disadvantages:**
  - It can however be a real disaster when they eventually fail because few home users have the data on their home computer hard drive.
  - They have very small storage capacity compared to modern alternatives such as USB memory sticks.
  - They are easily physically damaged if unprotected and magnetic fields can damage the data.
  - They are relatively slow to access because floppy discs rotate far more slowly than hard discs, at only six revolutions per second, and only start spinning when requested. The access speed is about 36 KB per second.
  - Not all modern computers have floppy disk drives.
  - You cannot save files to a CD-Rom (although CD-R and CD-RW discs now exist which can be written to)

VI. REFERENCE

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