

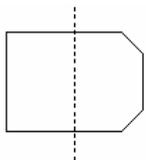
## Chapter 4

## Asymmetry

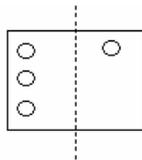
**Description**

Most natural and biological systems are symmetrical in structure. The left side of a man looks similar to the right side. But if you try to observe deeper into the system you can discover a lot of asymmetries within that symmetrical structure like the heart on the left side and liver on the right. Most man-made systems also contain specific asymmetries within a broad symmetrical structure. Strategic placements of asymmetries can increase efficiency in symmetrical structures.

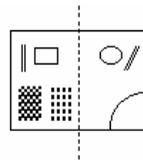
The objective of *Principle<sup>(4)</sup>: "Asymmetry"* is to consider changing the shape or properties of an object from symmetrical to asymmetrical. Asymmetrical structures are found in hardware where the left side is very much dissimilar with the right side. For example, there are asymmetries in the keyboard. The special Esc key, the numeric keypad, the large enter key etc. all asymmetrically located.



Difference in  
Shape or size



Difference in  
number of elements



Difference in  
Other parameters

**Benefits**

- ☞ Asymmetry is used to balance a system and to improve design consistency.
- ☞ More efficient use of space
- ☞ More effective use of resources
- ☞ Improve balance of complicated systems
- ☞ Marking objects or items to differentiate from others
- ☞ Increases system efficiency or performance
- ☞ Increase user convenience
- ☞ Ease of operation
- ☞ Improves aesthetic appearance
- ☞ Improves ergonomic features
- ☞ Increases flexibility and compatibility

**Application situations:**

Let's analyze where a system normally tends to be asymmetrical. When a system has even number of elements, such as four wheels, it's possible to place equal number of elements at both the sides. But when the system has odd number of elements, like one nose, three wheels, one steering etc., those are to be placed at the center to make the system symmetrical. There are two difficulties in keeping all those things in center, First- there may not be enough space to organize all those odd numbered items at the center, Second- it may not be convenient or efficient to place specific components at the center. In those cases, the system is made asymmetrical.

- ✓ Where both sides of a system do not demand equal load- asymmetrical data transfer, Asymmetric compression, Asymmetrical Digital Subscriber Line (ADSL).
- ✓ To improve balance in the system- introducing asymmetrical skills and experiences.
- ✓ The number of items are odd which cannot be equally divided- such as, right protecting notch of a floppy disk.
- ✓ Where it's required to differentiate a few from the rest others- visited hyperlinks in a different color, syntax highlighting in different colors.
- ✓ Improve ergonomic features- asymmetrical structure of keyboard, mouse and other devices.
- ✓ Increase aesthetics- asymmetric icons for mouse pointers.
- ✓ Better usage of screen space- Asymmetric structure of user interfaces.

4.1 If an object or system is symmetrical make it asymmetrical or introduce lines of asymmetries.

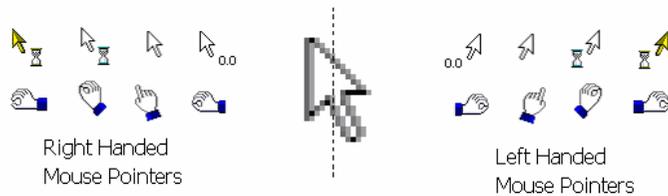
**Special Characters**

Using special characters like `/* */` (java / c), `//, ', Rem` (Visual Basic), `<!-- -->` (HTML) etc. to indicate that the following line of text is a comment and not program code.

- ☐ Using special characters in programs such as line separators `;` and code block separators `{ }` in c language. Other special characters like `..` for current directory `..` for parent director.
- ☐ Using JavaScript within special brackets or tags in a html page. `<%@ Language= JavaScript %>`
- ☐ Wild cards - Searching files by giving wild card options like `*.exe`, `report?.doc` etc.

**Asymmetric mouse pointers**

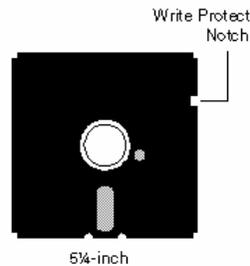
The structure of a standard mouse pointer is asymmetrical, it points either towards left or towards right. The pointers for right handed mouse point towards left and pointers for left handed mouse points towards right. This is made intentionally to provide user comfort.



### Asymmetry in computer hardware

Most hardware devices are asymmetrical in structure. Even if some of them look symmetrical from outside, there are many internal components, which are placed in asymmetrical order. Besides components like power switches, adjustment buttons etc. are always placed one side of the device, which creates asymmetry.

- ⇒ Asymmetry on the keyboard layout- (i) The large enter key on the keyboard, (ii) the isolated navigation keys, (iii) the dispersed layout of the characters on the keyboard shows asymmetry.
- ⇒ Speakers in surround sound - Using a combination of large and small speakers in surround sound, the multi channel audio output.
- ⇒ Write protecting notch- The index hole and write protecting notch are found on one side of the floppy and not in both sides.



- ⇒ Similarly the write protecting notch in 3½ inch floppies, in flash memories and other types of disks are examples of asymmetries.
- ⇒ Labels on CD - The labels or stickers are placed on one side of the CD. This is intentionally made to keep the labeled side facing upwards and avoid mistakes of putting upside down.

### Asymmetric compression

Asymmetric compression for video files which are quick to decode during playback. Asymmetric compression is more efficient in compressing video and graphic files compared to symmetric compression.

- ⇒ Using asymmetric compression to control Spam- The idea is to force senders of email to spend more time before sending the emails. In other words the sender pays more than the receiver as it opens faster at the receiver's end.
- ⇒ Asymmetric compression for data backup. This mechanism is just in the other direction to asymmetric video compression. In making routine backup files, we fully expect that most of the

backup files will never be retrieved. Hence backup time is more important than the restore time. A fast compression at the cost of slow decompression is useful in this case.

- ⇒ Asymmetric encryption (also known as public key encryption)- which uses one key to encrypt a message and another key to decrypt. It is more powerful than symmetric encryption where the same key is used to encrypt and decrypt.

### Plugs and Connectors

The asymmetrical structure of all plugs and connectors to prevent the incorrect usage of the connectors. The earth pin is differently shaped than the other pins. Various connectors like power plug, IDE connectors, SCSI connectors, serial port connectors, parallel port connectors etc. have corresponding asymmetries in both male and female sockets so that they cannot be joined in wrong direction.

- ⇒ Special connectors - Special connectors with complex shape/ pin configurations to ensure correct assembly.
- ⇒ The expansion slots of a mother board where the expansion cards are inserted.
- ⇒ Red wire and green wire-The red wire indicating positive current in power supply cables inside PC assembly.
- ⇒ Computer tables- The specially built computer tables to keep cabinets and keyboards. Computer chairs and other such special furniture for convenience and comfort.

### 4.2 If an object is already asymmetrical, increase the degree of asymmetry

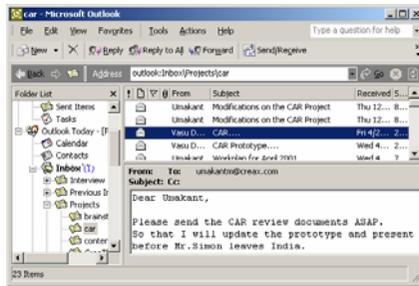
#### Syntax highlighting

Using different colors to highlight syntax in a program editor or word processor. For example, in a program editor the Keywords are shown in one color, comments in another color, mistakes in different color etc. Again within the code, the begin and end of a block may be shown in different font styles.

- ⇒ (i) Using underlining for hyperlinks in web pages. (ii) Changing color of the hyperlinks after viewing the linked web page.
- ⇒ Code Indenting - Use of indenting and line spacing to make the program code better formatted and more organized.
- ⇒ (i) Bullets and numbering in formatting paragraphs. These options start a paragraph differently than others. (ii) Using different levels of bullets and numbering, such as, 1.a, 1.a.1, 1.a.2 etc.

### Asymmetrical user interface

The asymmetrical structure of the user interface gives more possibilities to keep various options on the screen, like windows explorer, Microsoft outlook etc. The left panel of outlook shows a tree-view of folders and right side shows the details of messages.



- ⇒ When a create a shortcut of a program, the shortcut icon has a small curved arrow in the lower left corner. This arrow helps identifying it as a shortcut (or link) and not the original program.
- ⇒ The commonly used asymmetrical layout of the web page- containing page links on the left and the textual content on the right.
- ⇒ A cut piece from the pie chart.
- ⇒ Tooltips- Displaying tool tips on top of buttons, hyperlinks and special areas on the application screen or web page.

### 4.3 Change the shape of an object or system to suite external asymmetries

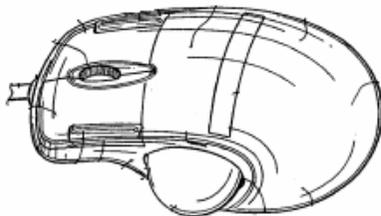
The interaction between human and computer is fundamentally asymmetric. We always like to feed less (or nothing) to the computer and in turn expect more (or everything) from the computer. This is always kept in mind while building computer interfaces, whether serious or entertainment stuff.

#### Ergonomic computer devices

Most devices are operated by a single hand, either left or right. As shape and efficiency of both the hands differ, it is more effective to design the device to suite that particular hand. There are continuous improvements on the ergonomic features of computer peripherals and devices.

##### INVENTION:<sup>8</sup> Ergonomic mouse

There are many input devices for the computer starting from mouse to trackballs. It is necessary to improve the ergonomic features of a mouse to make it more comfortable for the user to operate for a long period of time.



McLoone, et al. invented an ergonomic input device (US patent 6590564, Assignee Microsoft, July 2003) which comfortably supports the hand of the user while the fingers

are associated with the buttons. The finger-side surface includes four input buttons and the scrolling wheel. The thumb-side surface is fairly steep and almost at right angles to the finger-side surface for better grip.

- ⇒ Ergonomic keyboard to keep on user's lap- Compaq invented an ergonomic keyboard (US Patent 5825612) whose bottom side is wavy and configured to receive the top portions of the user's thighs which stabilizes the keyboard thereon.
- ⇒ Structure of headset- The headset with speakers is shaped to fit on the human head having microphone connected at one side.

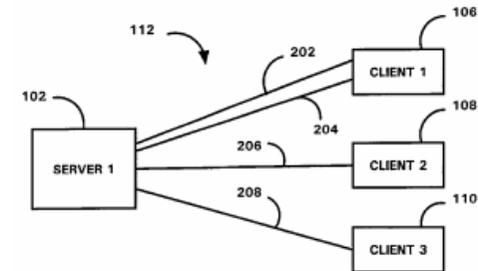
#### Asymmetrical Data Transfer

Asymmetrical data transfer as in Asymmetrical Digital Subscriber Line (ADSL).

##### INVENTION:<sup>9</sup> Efficient data transfer from client to server

An RDBMS typically incorporates periodic backup operation in which the data is copied from client to the server. This requires a lot of bandwidth and slows down the normal operations. Typically these transfers are avoided during peak hours and scheduled for evening hours. How to make these transfers faster and efficient.

Carlson et al. found a solution of efficient data transfer from client to server (Patent 6526434, Assignee IBM, Feb 2003). According to the invention, there are two data links between a client and a server. The first data link is used to provide the server with identification of data to be transferred. The second data like has faster data rate than the first data link. The actual data is transferred in the second data link. The system provides efficient transfer of large data blocks from clients to server over a network.



- ⇒ D channel for ISDN -The D channel (Delta Channel) is used for transmitting control information where as the B channels (Bearer Channel) sends data in ISDN service.
- ⇒ Asymmetric networks - Asymmetric networks, means most of the data flows in one direction and very little moves reverse. Suitable for most business networks involved in software distribution, data replication etc.
- ⇒ Asymmetrical Modulation- applied by certain modems, by using most of the bandwidth for data transmission in one direction and a small portion of the bandwidth for control information to travel in opposite direction.
- ⇒ Asymmetrical windows and packets - the new feature in Cisco routers to manage the traffic between two X.25 data terminal equipment devices with both different window sizes and different packet sizes.

### Custom installation

Custom installation is useful to install only those tools or components of the software which are required by the user. As the name says a custom installation may install the same software differently for different user.

- ⇒ Custom made application tailored to the exact need of the user as compared to a general horizontal market application.
- ⇒ Heterogeneous data - data that comes from a mixture of sources including one or more SQL server databases.

### Asymmetrical skills and experiences

A project team consists of persons of various skills and experience. A typical software development team may consist of analysts, architects, developers, managers etc.

- ⇒ Inter group coordination- Allow the software engineering staff to actively participate with other groups in the organization such as other project engineering groups to address system level requirements, objectives and issues. Known as Inter-group coordination in CMM level 3.
- ⇒ Asymmetry in human face is used as identifications in biometric authentication mechanism. Facial asymmetry provides powerful clues to face identification methods.

#### CASE 10. Asymmetric multiprocessing in Interactive Image Guided Surgery (IIGS)

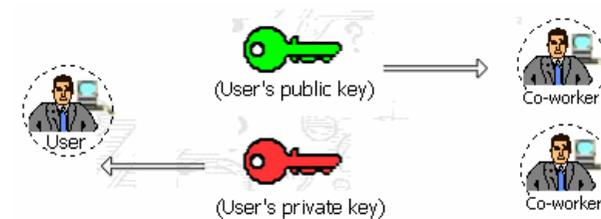
There are some complex systems where all the activities do not carry equal importance. Some activities are real-time and mission critical which require more processing attention than others which are not so important. In such cases the system cannot afford to delay a critical activities because of overloading low priority activities. This requires asymmetrical multiprocessing, where the load on the processors are not balanced but the critical activities are always given high priority and processed by a dedicated processor.

For example, in computer assisted medical surgery, a surgeon does surgery on the real time while looking at the images on the computer screen. It's very critical to track the exact position of the surgical location and surgical equipments and display real time image on the screen. This activity requires very high importance and cannot be slowed down by any other activity of the medical equipment. In this case, the equipment needs a separate processor for the critical activities and use the first processor for routine/ less critical activities.

#### CASE 11. Asymmetric encryption in Pretty Good Privacy (PGP)

A normal encryption mechanism uses the same key for encryption and decryption. This method although simple, is not very powerful. Asymmetric encryptions are stronger and more secured than symmetric encryption.

PGP is one of the popular encryption mechanism based asymmetric encryption which uses two keys, a public key and a private key. The public key that is given to any one who wants to receive a message and the private key that you use to decrypt messages that you receive. PGP is very popular as it is effective, easy to use and free.



#### CASE 12. Cinepak asymmetric video compression

The video files are large in size and required to be compressed for storage. A symmetric compression uses the same algorithm to compress and uncompress files. So the compression time is almost same as the decompression time. However in some cases the decompression speed is more important than compression. Probably we can afford any amount of time to compress the file but we cannot compromise on the decompression speed. This is particularly required in case of video compression.

Cinepak, the most popular codec for delivering video for multimedia applications, uses asymmetric compression. Asymmetric methods require substantially more work to go in one direction than they require in the other. In this case, the compression step takes far more time and system resources than the decompression step. Compression is a one time job, developer probably can tolerate a much longer time for compression. Decompression is done by every viewer, which should be achieved fast for satisfactory viewing.

#### CASE 13. Asymmetrical Digital Subscriber Line (ADSL)

Any Internet connection supports both downloading and uploading. But in most cases the volume of downloading is more than the volume of uploading. So why not to give higher bandwidth to downloading than uploading.

Bell Labs developed a technology known as Asymmetrical Digital Subscriber Line (ADSL) to transmit compressed data on a regular telephone line, having one high speed unidirectional data channel and one low speed bi-directional data channel. That means you can download faster than you can upload. ADSL supports downstream data rates from 1.5 to 9 Mbps but upstream data rates from 16 to 640 kbps.