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----- ASSIGNMENT 1 -----

Human Computer Interaction (IT-920)

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Q1.   Write a note on the history of the knowledge domain Human Computer Interaction (HCI).

<u>Ans:</u>   From the beginning of the last century, there has been a study on a person's performance in the factories with emphasis on manual tasks. As machines were in widespread use in weapons systems in the Second World War, the study of man's interaction with machines has been a topic of study. Extensive research was conducted on physical characteristics of machines and systems and how these affected user performance in the context of any system.

Later on, when use of computers became widespread across the world, an increasing number of researchers specialised in studying the interaction of humans & computers, concerning themselves with the physical, psychological and theoretical aspect of the process. This study was formally called 'man-machine interaction' and later on called 'human-computer interaction.' In the later years, emphasis was given to computers as computers became an integral part of our everyday life.

With the growing domain of information science and technology, computer systems had to be designed for work environments which could store, access and manage information for organisations. HCI involves design, implementation and evaluation of Interactive systems in the context of users task and work. Interaction between a human and a computer could be direct or indirect. Direct as to dialog with feedback and control of the process; Indirect as in batch processing or intelligent sensors controlling the environment. The domain involves studying about design of the interaction between a user and a computer system to accomplish a task.

Q2.   Compare Graphical User Interface and Web User Interface

Ans: Graphical User Interface and Web User Interface are both interactive software designs and provide a high visual experience through a screen. However, they have their differences in areas of User Device, User Focus, Data and Information, User Task, Navigation, Response Time, Task Efficiency, Security, etc. A few of these criterias are discussed below.

1.   User Device:

In the case of a GUI, the characteristics of the user interface devices such as monitors and modem are well defined and screens appear exactly as specified.

However, in case of a Web User Interface, the user devices may range from handheld mechanism to the high-end workstations, it will be generated by both the hardware and the software.

2.   User Focus:

GUI systems are normally well defined applications and the data about transactions and processes.

Web applications are all about information and navigation.

3.   Data and Information:

In GUI systems the data is created and used by known and trusted sources.

The Web is full of unknown content and web content is highly variable in organisations.

4.   User Tasks:

In GUI systems, the user can install, configure, personalise, start to use and upgrade the programs and people become familiar with many of its features.

Web Users do linking to sites, browsing or reading the pages, filling out forms, registering for services participating in transactions, downloading and saving the pages, etc.

5.   Navigation:

The GUI, the users navigate through structured menus, lists, trees, dialogs and wizards.

The Web users navigate through links, bookmarks and typed URLS.

Q3.   Elaborate on the connection between human characteristics and user interface design.

Ans: In order to design something for someone, we need to understand their capabilities and limitations. The design of any user interface is made, keeping in mind human characteristics and psychology. Different interface designs are deemed appropriate for different tasks and to be used by different types of users. But the goal is to design a consistent interface which is easy to use.

UI designs consisting of menus depend more on recognition than recall as compared to a command line interface. Both these interfaces have their own benefits and demerits. So designing is all about the end user. Seeing familiar icons grouped together increases learnability of the interface and is ideal for novice users. However, experienced users may enjoy the flexibility and robustness of a command line or query interface.

A visually attractive interface could be appealing for a beginner but in the end the functionality of the interface is what will get the work done. The user should not find the interface difficult to use as it will directly affect user performance.

Q4.   Write a note on screen navigation design.

Ans: Users interact at several levels:

- Widgets: The appropriate choice of widgets and wording in menus and buttons will help users know how to use them for a particular selection or action.

- Screens or windows: Users need to find things on the screen, and understand the logical grouping of buttons.

- Navigation within the application: Users need to be able to understand what will happen when a button is pressed, to understand where they are in the interaction

- Environment: The word processor has to read documents from disk, perhaps some are on remote networks. Users swap between applications, perhaps cut and paste.

On the web, there is less control of how people enter a site and on a physical device we have the same layout of buttons and displays no matter what the internal state.

Q5.   What is ergonomics? How is ergonomics connected to HCI?

Ans: Ergonomics (or human factors) is traditionally the study of the physical characteristics of the interaction of human and machine and how the design of the interactive system affects user performance. The domain of ergonomics in HCI deals with how the controls are designed, the physical environment in which the interaction takes place, the layout and physical qualities of the screen, and how the interface enhances or limits user performance. It addresses issues on the user side of the interface, covering both input and output, as well as the user's immediate context.
Since ergonomics is connected to the design of the interaction, it is connected to HCI in a number of ways to achieve user-centric design goals in computer systems.

The connection of ergonomics and HCI starts with understanding the physical working environment of the users catering to their health and safety. These are a few factors that directly affect the quality of the interactions and user performance.

- *Physical position*: Users should have all necessary tools and displays in their vicinity. They should be provided with proper chairs with back support and adequate breaks.
- *Temperature*: Extremes of hot or cold temperatures will affect performance and health of the user. Experimental studies show that performance deteriorates at high or low temperatures, with users being unable to concentrate efficiently.
- *Lighting*: Adequate lighting should be provided to allow users to see the computer screen without discomfort or eye strain.
- *Noise*: Excessive noise can be harmful to health, causing the user pain, and in acute cases, loss of hearing. Noise levels should be maintained at a comfortable level in the work environment.
- *Time*: The time users spend using the system should also be controlled. Excessive screen time can be harmful to users, particularly pregnant women.

In addition to the physical working environment, the use of colour in displays is an ergonomics issue as it has to do with human psychology and the perceptual limitations of humans. In HCI, the two communication parties have some limitations with the use of colour. The machine has its own limitations with regard to colour, including the number of colours that are distinguishable and the relatively low blue acuity. On the other hand, a large population of people suffer from deficiency in colour vision and different colours are instinctively perceived in a different way.

Q6.   Give a suitable example of direct and indirect manipulation, in the context of HCI.

Ans: In the context of HCI, the user interacts with a computer system either directly or indirectly.

An example of direct manipulation can be a Word processor running on a desktop. The changes in this interface are directly made by the User and are

instantly visible based on real time input from the User. This type of interaction in which the User can get real-time feedback from the interface is called direct manipulation.

On the other hand, an example of Indirect manipulation would be a User interacting with an interface to send in requests for a few processes and then receive a report of the results. The interface that the user provides the input should give feedback that the actions have been registered. This interface then sends requests as a batch which is processed by another application which then together gives the output to the user. This is an example of indirect manipulation.

The indirectness also causes problems with simple monitoring tasks. Delays due to periodic sampling, slow communication and digital processing often mean that the data displayed are somewhat out of date. If the operator is not aware of these delays, diagnosis of system state may be wrong.

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