CSC 323 HUMAN COMPUTER INTERACTION

REVISION

QUESTION ONE

a. Explain the meaning of the following as used in the study of Human-computer Interaction.

i. Human-computer Interaction [1 mark]

Human-Computer Interaction (HCI) is a multidisciplinary field concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them.

ii. Usability [1 mark]

Usability refers to the ease of use and learnability of a human-made object. In the context of HCI, it specifically focuses on how efficiently and effectively users can interact with a system to achieve their goals.

b. State any three goals of Human-computer Interaction. [3 marks]

1. Enhancing user satisfaction by improving the usability and accessibility of interactive systems.

2. Increasing user productivity by designing systems that are efficient and effective in supporting user tasks.

3. Ensuring user safety and well-being by minimizing errors and providing clear feedback mechanisms.

c. Explain the basic principles/attributes that support usability?

 [3 marks]

1. Learnability: The system should be easy for new users to learn.

2. Efficiency: Users should be able to accomplish tasks quickly and with minimal effort.

3. Memorability: Users should be able to remember how to use the system after a period of not using it.

4. Error prevention and recovery: The system should minimize the occurrence of errors and provide clear ways for users to recover from them.

5. Satisfaction: Users should find the system pleasant and satisfying to use.

d. Suppose you are asked to design a system to support the desk clerks in a bank office. Why is it a good idea to play the role of desk clerk yourself for some time, as part of the analysis activities?

[2 marks]

- Gain firsthand experience and insights into the tasks, challenges, and needs of desk clerks.

- Understand the workflow and interactions involved in the daily activities of desk clerks.

- Identify pain points, inefficiencies, and areas for improvement in the current system or workflow.

- Develop empathy for the end-users, which can lead to more user-centered design decisions.

e. What are the Problems with usability engineering?

[2 marks]

- Balancing usability with other design constraints such as cost, time, and technical feasibility.

- Ensuring that usability testing represents the diversity of potential users and their contexts of use.

- Addressing subjective aspects of usability, such as aesthetic preferences, which can vary among users.

- Integrating usability considerations throughout the entire design and development process, rather than treating it as an afterthought.

f. Outline the memory structure.

[2 marks]

- Sensory memory: Briefly stores sensory information from the environment.

- Short-term memory (STM): Holds a limited amount of information for a short period, typically around 20-30 seconds.

- Long-term memory (LTM): Stores vast amounts of information for long periods, potentially indefinitely.

g. What are the Devices for virtual reality and 3D interaction?

[2 marks]

- **Head-mounted displays (HMDs):** Devices worn on the head that immerse users in virtual environments.

- **Motion controllers:** Input devices that track users' movements and gestures in 3D space.

- Data gloves: Gloves equipped with sensors to track hand and finger movements for interaction in virtual environments.

h. Define Reasoning and state three main types of reasoning?

[4 marks]

- Deductive reasoning: Drawing specific conclusions from general principles or premises.

- Inductive reasoning: Inferring general principles from specific observations or examples.

- Abductive reasoning: Forming hypotheses to explain observed phenomena or data.

i. How the HCI ensure the following when designing, selecting, commissioning or modifying software: that it is suitable for the task and that it provides feedback on performance.

[2 marks]

- Conducting task analysis to understand user needs and requirements.

- Iteratively designing and testing the software with user feedback.

- Incorporating usability principles and guidelines into the design process.

- Implementing clear feedback mechanisms to inform users of their performance and system status.

j. With examples explain the various types of users and the organizational issues to be considered in designing an interactive system?

[4 marks]

i. HCI ensures that software is suitable for the task and provides feedback on performance by:

j. Various types of users in designing an interactive system include:

- Novice users: Users who have little or no experience with the system or similar systems.

- Experienced users: Users who are familiar with the system and its functionalities.

- Casual users: Users who use the system intermittently or for specific tasks.

Organizational issues to consider include:

- User training and support: Providing adequate training and support resources for users.

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- User roles and permissions: Defining user roles and access levels based on organizational hierarchy and responsibilities.

- System integration: Ensuring compatibility and integration with existing organizational systems and processes.

- Security and privacy: Implementing measures to protect sensitive data and ensure user privacy.

QUESTION TWO

a. What are the steps for Interaction design process?

1. Understanding and specifying the context of use: This involves identifying the users, their tasks, and the environments in which the interactive system will be used.

2. Identifying user needs and establishing requirements: This step involves gathering information about what users need from the system and translating those needs into design requirements.

3. Designing alternatives: This step involves generating different design solutions to meet the identified requirements.

4. Building interactive versions: This step involves creating prototypes or mock-ups of the design solutions to test with users.

5. Evaluating the designs: This step involves testing the prototypes with users to gather feedback and refine the design.

6. Iterating on design: Based on the feedback received during evaluation, the design is refined through iterative cycles until it meets user needs and requirements.

b. Explain any TWO levels of interaction with computer? [2 marks]

1. Direct manipulation: In direct manipulation interfaces, users interact with graphical objects or representations of objects in a real-world metaphorical way. For example, dragging and dropping files in a graphical user interface (GUI) or using touch gestures on a smartphone screen.

2. Conversational interfaces: Conversational interfaces allow users to interact with computers using natural language, often through text or speech input. Examples include virtual assistants like Siri or chatbots used for customer service.

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c. There are a number of factors to be considered in the analysis and design of a system using HCI principles. Discuss any THREE of these factors. [6 marks]

1. User characteristics: Understanding the demographics, skill levels, and preferences of the intended users. This includes factors such as age, gender, cultural background, and technical expertise.

2. Task analysis: Analyzing the tasks users need to perform with the system and designing interfaces that support efficient task completion. This involves breaking down tasks into subtasks, understanding task dependencies, and identifying user goals.

3. Environmental considerations: Taking into account the physical and social environments in which the system will be used. Factors such as lighting, noise levels, privacy concerns, and social norms can impact the design and usability of the system.

d. Explain the meaning of prototyping and state the techniques used during the prototyping

process. [2 marks]

Prototyping refers to the process of creating simplified versions of a system or interface to explore design ideas, test functionality, and gather feedback from users. Techniques used during the prototyping process include:

1. Paper prototyping: Creating hand-drawn sketches or paper-based mock-ups of the interface to quickly iterate on design ideas and gather feedback from users.

2. Wireframing: Developing low-fidelity digital prototypes using specialized software or tools to visualize the layout and structure of the interface without detailed design elements.

3. Mock-ups: Building more detailed prototypes with visual elements such as colors, fonts, and images to simulate the look and feel of the final interface.

4. Interactive prototypes: Creating functional prototypes with basic or limited functionality to simulate user interactions and test usability.

d. Discuss any two main approaches to prototyping. [4 marks]

1. Throwaway or rapid prototyping: This approach involves quickly creating prototypes to explore design ideas and gather feedback, with the intention of discarding them once the final design is developed. It emphasizes speed and flexibility in the prototyping process.

2. Evolutionary or incremental prototyping: This approach involves gradually refining and expanding prototypes based on feedback from users and stakeholders, with the goal of evolving them into the final product. It emphasizes iterative development and continuous improvement of the prototype.

f. What are the several factors that can limit the speed of an interactive system? [2 marks]

1. Hardware limitations: The processing power, memory, and other hardware components of the system can affect its speed and responsiveness.

2. Software complexity: Complex software algorithms, heavy graphical rendering, or inefficient code can slow down the system.

3. Network latency: Communication delays between the user's device and servers or other networked devices can impact the speed of interactive systems, especially for web-based or cloud-based applications.

4. User interface design: Poorly designed user interfaces with cluttered layouts, excessive animations, or unnecessary visual effects can hinder the speed and efficiency of user interactions.

QUESTION THREE

a. What are the mental models and why they are important in interface design?

Mental models are representations that individuals create in their minds to understand how something works. In interface design, mental models refer to users' conceptualizations of how a system operates based on their prior knowledge, experiences, and interactions with similar systems. They are important in interface design because:

- They influence users' expectations and behaviors when interacting with the interface.

- Designing interfaces that align with users' mental models can enhance usability and ease of learning.

- Understanding users' mental models allows designers to anticipate potential issues, reduce cognitive load, and create more intuitive interfaces.

b. Outline the stages in Norman's model of interaction.

1. **Execution**: Users initiate actions to interact with the system based on their goals and intentions.

2. **Evaluation**: Users perceive the system's response to their actions and assess whether it matches their expectations and goals.

3. **Formulation**: Users interpret the system's feedback and update their mental models accordingly to plan their next actions.

4. **Perceiving the state of the world:** Users observe the system's state and perceive how it corresponds to their mental model of the system and the task at hand.

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c. Explain how you can assess/evaluate the interface of an interactive system using the following techniques:

i. Heuristic Evaluation [2 marks]

  - Involves usability experts systematically evaluating an interface against a set of usability principles or heuristics.

  - Experts identify usability problems and violations of design principles based on their knowledge and experience.

  - Provides quick feedback on interface usability and identifies potential issues early in the design process.

ii. Think aloud protocol [2 marks]

  - Users verbalize their thoughts and actions as they interact with the interface.

  - Provides insight into users' cognitive processes, decision-making, and difficulties encountered during interaction.

  - Helps identify usability issues, understand user expectations, and validate design decisions.

iii. Ethnography [2 marks]

  - Involves observing and studying users in their natural environment to understand their behaviors, needs, and challenges.

  - Provides rich contextual insights into users' interactions with technology and the social dynamics influencing their usage patterns.

  - Helps designers gain empathy for users, identify unmet needs, and inform the design of more user-centered solutions.

d. Outline Any TWO the approaches present for user support [2 marks]

1. Documentation and Help Systems:

  - Providing user manuals, online help guides, tutorials, and FAQs to assist users in learning and using the system.

  - Offering contextual help within the interface, such as tooltips, inline guidance, and guided tours, to provide on-demand assistance.

2. Training and Education:

  - Conducting training sessions, workshops, or webinars to educate users on how to effectively use the system.

- Offering online courses, certification programs, or knowledge bases to deepen users' understanding of the system's features and functionalities.

e. Analyze Cognitive walkthrough: on what usability attribute is focused, when can be applied, who is involved in evaluation and state requirements to perform cognitive walkthrough of a system [6 marks]

- **Evaluation**: A small team, including designers, developers, and usability experts, walks through the system step by step, imagining themselves as users with specific tasks to accomplish.

- **Scenarios**: The team creates scenarios representing typical user tasks or goals, specifying the sequence of actions users would take to achieve them.

- **Analysis**: For each step in the scenario, the team evaluates whether the interface provides sufficient cues, feedback, and support for users to understand what actions to take and how to proceed.

- **Iteration**: Based on the findings from the walkthrough, the design team iteratively refines the interface to improve its clarity, consistency, and ease of use.

Requirements to perform a cognitive walkthrough of a system include:

- Clear understanding of user tasks and goals.

- Availability of design prototypes or mock-ups.

- Involvement of a diverse team with expertise in interface design, usability, and the target domain.

- Willingness to iterate and refine the interface based on the walkthrough findings.

QUESTION FOUR

a. Discuss the principles of good UI design. Evaluate the suitability of the manual tour booking form using UI design principles. [5 marks]

- **Clarity**: The form should be easy to understand and navigate. The manual tour booking form should clearly label each field and provide instructions where necessary. For example, each section (such as date, destination, and accommodation) should be clearly labeled to avoid confusion.

- **Consistency**: The design elements and layout should be consistent throughout the form. Consistency ensures that users can predict the location of fields and buttons, reducing cognitive load. For example, the font style, size, and color should be consistent across all sections of the form.

- **Simplicity**: The form should be streamlined and free of unnecessary complexity. Complex forms can overwhelm users and lead to errors. The manual tour booking form should only include essential fields and options, eliminating any extraneous information or steps.

- **Efficiency**: The form should allow users to complete their task quickly and with minimal effort. This can be achieved by organizing the fields logically, minimizing the number of required fields, and providing autocomplete or dropdown options where possible.

- **Feedback**: The form should provide clear feedback to users after each interaction. This includes validation messages for incorrect inputs, confirmation messages upon successful submission, and progress indicators to show users where they are in the booking process.

b. Define Moore's law [2 marks]

Moore's Law is the observation made by Gordon Moore, co-founder of Intel Corporation, in 1965, which states that the number of transistors on a microchip doubles approximately every two years, leading to a doubling of computational power. In essence, Moore's Law predicts the exponential growth of computing power and the shrinking of electronic components over time.

c. What are the stages of execution and evaluation cycle? [2 marks]

- Execution: In this stage, users interact with the system, initiating actions and performing tasks according to their goals and intentions.

- Evaluation: Users evaluate the system's response to their actions, comparing it against their expectations and goals. They assess whether the system's behavior matches their mental model and whether it supports them in achieving their objectives.

d. Decide how the 'golden rules and heuristic help interface designers take account of cognitive psychology? Illustrate your answer with the design of Microsoft office word. [8 marks]

- **Visibility of system status:** Word provides visual cues, such as the blinking cursor, to indicate where the user is typing and the current editing mode.

- **Match between system and the real world:** Word uses familiar concepts such as "Save" and "Print" to represent actions, making it intuitive for users.

- **User control and freedom:** Word allows users to undo and redo actions easily, giving them a sense of control over their editing process.

- **Consistency and standards:** Word follows consistent interface conventions across its applications, such as the ribbon menu layout and keyboard shortcuts, enhancing user familiarity and predictability.

- **Error prevention:** Word provides spelling and grammar checkers to help users catch errors before finalizing their documents, reducing the likelihood of mistakes.

e. What are the benefits of usability evaluations? Describe at least three. [3 marks]

- Identifying usability issues: Evaluations help uncover usability problems early in the design process, allowing designers to address them before implementation.

- Improving user satisfaction: By addressing usability issues, evaluations can enhance the user experience, leading to greater satisfaction and acceptance of the product.

- Saving time and resources: Catching usability issues early can prevent costly redesigns and rework later in the development cycle, saving time and resources.

- Informing design decisions: Usability evaluations provide valuable feedback that can inform design decisions, helping designers prioritize features and improvements based on user needs and preferences.

QUESTION FIVE [20 MARKS]

a.) Describe the characteristic difference between the question dialogue and command line dialogue of the line-oriented interface [6marks]

- Question dialogue: In a question dialogue, the system prompts the user with questions or prompts requiring specific responses. These prompts guide the user through a series of interactions, typically in a linear fashion, to gather necessary information or input. The user provides responses to the questions posed by the system. This interaction style is more structured and guided, leading the user through a predefined sequence of steps.

- Command line dialogue: In a command line dialogue, the user interacts with the system by entering commands or instructions directly into the interface. The system does not prompt the user with questions; instead, the user initiates actions by typing commands and parameters. This interaction style is more flexible and allows users to execute various commands in any order, providing greater control and customization options.

b) Virtual system have three sensory cues, describe supported in the three dimensions [6marks]

- Visual cues: Visual cues are sensory inputs perceived through sight. In virtual systems, visual cues are supported through graphical representations of virtual environments, objects, and characters. These visual elements provide users with spatial information, depth perception, and visual feedback, enhancing the sense of presence and immersion within the virtual environment.

- Auditory cues: Auditory cues are sensory inputs perceived through hearing. In virtual systems, auditory cues are supported through sound effects, ambient audio, and spatial audio positioning. These auditory elements help users localize objects and events within the virtual environment, providing additional context and enhancing the sense of realism and immersion.

- Tactile cues: Tactile cues are sensory inputs perceived through touch. In virtual systems, tactile cues are supported through haptic feedback devices such as vibration motors, force feedback controllers, and tactile feedback gloves. These devices simulate physical sensations and interactions within the virtual environment, allowing users to feel textures, impacts, and interactions, further enhancing the sense of presence and immersion.

c) Define the term interface architecture and show its importance on the interaction design [4marks]

Interface architecture refers to the structure and organization of the components and interactions within an interface system. It encompasses the design principles, patterns, and frameworks that govern how users interact with the system and how the system responds to user input. The importance of interface architecture in interaction design lies in its role in shaping the user experience and facilitating effective communication between users and the system. A well-designed interface architecture:

- **Provides clear and intuitive navigation:** A well-structured interface architecture helps users easily navigate through the system, find relevant information, and perform tasks efficiently.

- **Supports usability and user satisfaction:** By organizing interface elements logically and consistently, interface architecture enhances usability and user satisfaction, reducing cognitive load and frustration.

- **Facilitates scalability and flexibility:** A robust interface architecture accommodates changes and updates to the system, allowing for scalability and flexibility in adapting to evolving user needs and technological advancements.

- **Enables seamless integration:** Interface architecture defines the interactions and interfaces between different system components, enabling seamless integration with external systems and services, enhancing interoperability and usability.

d) Discus the advantages of a screen containing label fields to be filled by the user [4marks]

- **Clarity and guidance:** Label fields provide clear instructions or prompts to users, guiding them on what information to input. This reduces ambiguity and errors, enhancing usability.

- **Consistency:** Using label fields maintains consistency in the layout and presentation of input fields across the interface, making it easier for users to understand and interact with different parts of the system.

- **Accessibility:** Label fields improve accessibility for users with disabilities or diverse needs by providing descriptive text cues that can be interpreted by screen readers or assistive technologies.

- **Data validation:** Label fields can be paired with input validation mechanisms to ensure that users enter valid data, reducing the likelihood of errors and improving data quality.

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