Q.1) Explain Interaction Design Basics & various interaction styles for human & computer

→ 1. Interaction design is about creating interventions in often complex situations using technology of many kinds including PC software, the web and physical devices.

2. A simple definition of design is acheiving goals within constraints.

3. Golden rule of design - understand your materials. For HCI, the obvious materials are the human and the computer.

4. Understanding computer involves limitations, capacities, tools and platform whereas, huma have psychological, social aspects & human error.

5.

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What is              Scenarios
wanted               task analysis
                                        Guidelines
                  → Analysis            Principles         Precise
Interviews            ↑       ↓                            specification
Ethnography                  → Design →
                                        ↓       → Implement &
                  Prototype ←                      Deploy
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What is there   Evaluation   Architectures
vs   heuristics   documentation
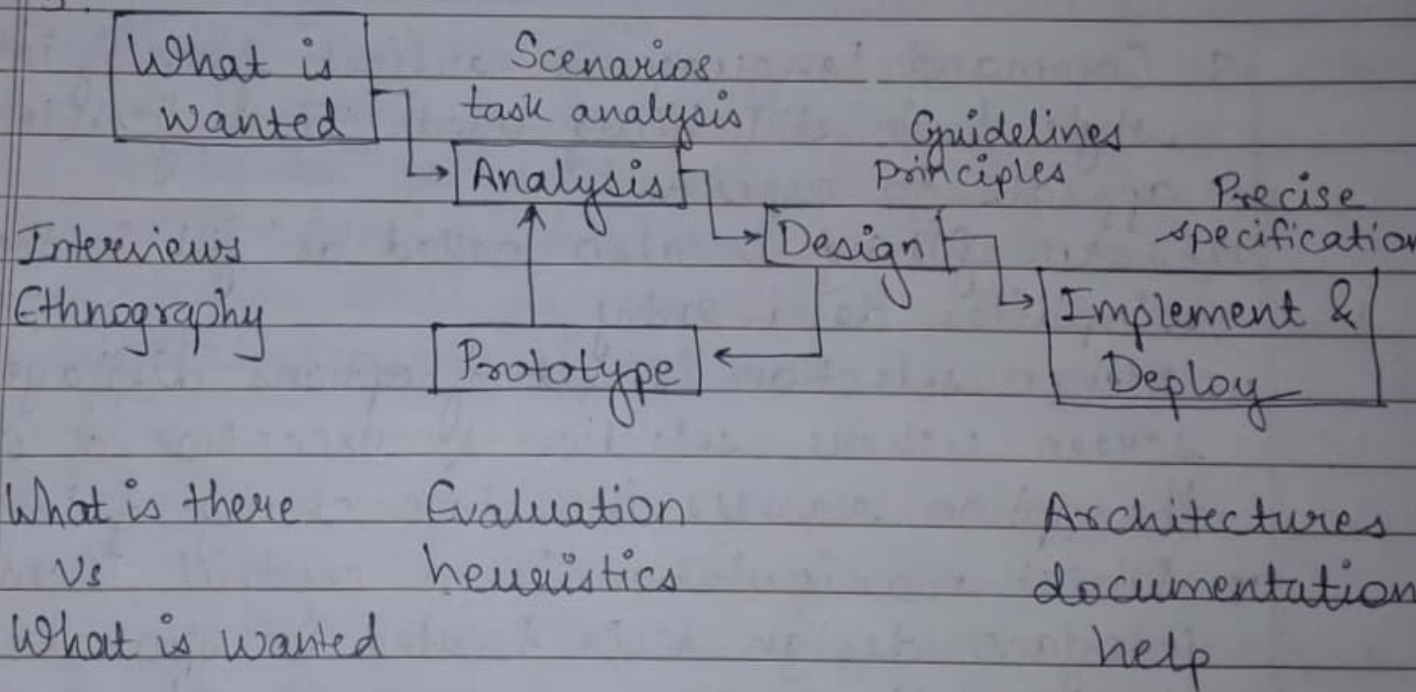What is wanted   help

Fig: Interaction design process

6. Human can be considered as information processor, receiving input from world, storing, manipulating & using information & reacting to information received. Information is received through senses particularly.

7. In case of computer, it uses sight, hearing and touch. It is stored in memory either in temporarily in sensory or working memory or permanent in long term memory. It can be used in reasoning & problem solving.

8. Various interaction styles are as follows,

Interaction styles —
1. Command language
2. Form Filling
3. Menu selection
4. Direct manipulation

9. Command language is earliest form of interaction style & is still being used. It is flexible, appeals to experts.

10. Form filling is also called as 'fill in the blanks' simplifies data entry.

11. Menu selection is set of options displayed on screen where selection & execution of one of the option results in state change of interface.

12. Direct manipulation is a central theme in interface design & is treated in separate encyclopedia entry.

Casestudy :
Consider 13 points in a rectange. Draw any design of your choice :

Depending on the imagination of every individual, different designs will be drawn by using same points.

Q.2) Elaborate software processes applied in HCI for construction, structuring & development of software in HCI.

→ 1. Construction :
  (i) The first activity is a high level decomposition of the system into components that can either be brought in form of existing software products or be developed from scratch independently. An architectural design performs this decomposition. It is not only concerned with functional decomposition of system.

  (ii) Determining which components provide which services. It must also describe the independencies between separate components & the sharing of resources that will arise between components.

2. Structuring :
  (i) The architectural design provides a decompo

-sition of the system description that allows for isolated development of separate components which will later be integrated. For these components that are not already available for immediate integration, for designer must provide a sufficiently detailed description so that they may be implementated in some programming language.

(ii) The detailed design is a refinement of the component description provided by the architectural design.

(iii) The behavior implied by the higher level description must be preserved in more detailed description. The language used for the detailed design must allow some analysis of the design in order to access its properties.

3. Development :

(i) The detailed design for a component of system, should be in such a form that it is possible to implement it in some executable programming language.

(ii) After coding the component can be tested to verify that it performs correctly, according to some test criteria that were determined in earlier activities.

(iii) More practical work concentrates on the automatic generation of tests from output of earlier activities which can be performed on piece of code to verify that it behaves correctly.

Q.3 Write short note on for HCI design principle &
rules including following terms -
→ ⓐ Design principles -

   1. Visibility -
        Visibility is the basic principle that more
   visible an element is the more likely users
   will know about them & how to use them.
   2. Feedback -
        Giving the user feedback whilst processing
   an action is fundamental when it comes
   to HCI design. If a user does not get
   the proper feedback, they may think something
   is wrong or they did not perform the action.
   Therefore they will perform the action again &
   this could lead to errors.
   3. Affordance -
        Affordance in terms of design means how an
   object should physically be used, we should
   be able to visually see what that object or
   thing should be used for design is instantly
   recognizable & we automatically know wha
   to do with it.
   4. Mapping -
        The term natural mapping comes from proper
   & natural arrangements for the relations
   between controls & their movements to the outco
   from such action into the world.
   5. Constraint -
        Restricting the kind of interactions that car

take place. Reduce the chance of error. Can also work to focus users attention to needed task.

6. Consistency –

Designing interfaces to have similar operation & use similar elements for achieving similar task. Systems are usuable & learnable when similar concepts are expressed in similar way.

(b) Principles of support usability –

1. Learnability –

Refers to the ease with which users can begin effective interaction & achieve maximal performance.

2. Principles of learnability –

(i) Predictability – Determining the effect of future actions based on past theory.

(ii) Synthesizability – Accessing the effect of past actions.

(iii) Familiarity – How prior knowledge applies to new system.

(iv) Generalizability – Extending specific interaction knowledge to new situations.

3. Flexibility –

Refers to multiplicity of the ways the user & system exchange information.

4. Principles of flexibility –

(i) Dialogue initiative – Freedom from system imposed constraints on input dialogue.

(iii) Multithreading - The ability of a system to support user interaction for more than one task at a time.

(iii) Task migratability - Passing responsibility for task execution between user & system.

5. Robustness -

The level of support provided to user in determining successful achievement & assessment of goals.

6. Principles of robustness -

(i) Observability - The ability of user to evaluate the internal state of system from its perceivable representation.

(ii) Recovarability - The ability of user to take corrective action, once an error has been recognized.

(iii) Responsiveness - It refers to how the user perceives the rate of communication with the system.

(iv) Task conformance - The degree to which system services support all user's of tasks.

(c) Eight golden rules of Interface design -

The eight golden rules of interface design are

(i) Strive for consistency in action sequences, layout, terminology, command use & so on.

(ii) Enable frequent users to use shortcuts, such as abbreviations, special key sequences & macros, to perform regular, familiar actions more quickly.

(iii) Offer informative feedback for every user action, at a level appropriate to magnitude of action.

(iv) Design dialogs to yield closure so that the user knows when they have completed a task.

(v) Offer error prevention & simple error handling so that, ideally, users are prevented from making mistakes & if they do, they are offered clear & informative instructions to enable them to recover.

(vi) Permit easy reversal of actions in order to relieve anxiety & encourage exploration, since the user knows that he can always return to the previous state.

(vii) Support internal locus of control so that the user is in control of the system, which responds to his actions.

(viii) Reduce short term memory load by keeping displays simple, consolidating multiple page displays & providing the time for learning action sequences.

(d) HCI patterns -

1. A pattern is an invariant solution to a recurrent problem that designers face by providing a solution statement.

2. The pattern states the problem & the solution but also includes a rationale explaining where the pattern has come from & in what context is applied, and examples to illustrate the pattern. They are characterized by -

(i) They capture design practice & embody knowledge about successful solution.

(ii) They capture common properties of good design. They do not tell designer how to do something but what needs to be done.

(iii) They represent design knowledge at varying levels ranging from social & organizational issues through conceptual design to detail widget design.

(iv) They are not neutral but embody values within rationale.

(v) The concept of a pattern language is a generati & can therefore assist in the development of complete design.

(e) Design rules —

1. Designing for maximum usability. The goal is of interaction design.

2. Principles of usability - general understanding.

3. Standard & guidelines - direction for design.

4. Design patterns capture & reuse design knowledge.

5. Types of design rules —

(i) Principles —
   (a) Abstract design rules
   (b) Low authority
   (c) High authority

(ii) Standard —
   (a) Specific design rule
   (b) High authority

ⓒ Limited application.
(iii) Guidelines -
  ⓐ Lower authority
  ⓑ More general application.

Ⓕ HCI design standards -
  1. Set by national or international bodies to ensure compliance by a large community of designs standard require sound understanding theory & slowly changing technology.
  2. Hardware standards are more common than software high authority & low level details.
  3. ISO 9241 defines usability as effectiveness.

Q.4) Discuss direct manipulation employeed in various HCI applications.
→ 1. Direct manipulation is an interaction style in which object of interest in UI are visible & can be acted upon via physical, reversible, incremental actions that receive immediate feedback.
  2. Applications of direct manipulation in HCI -
  (i) Video game
  (ii) CAD [Computer aided design] -
      Mechanical engg, electronic circuitry.
  (iii) Driving a car -
      Sterring wheel, pedals, windshield can act direct manipulation interface.

(iv) Spatial data management -
   Users could zoom in on colour display of the world.

(v) Airline reservation system -
   Draggable screens, touch screens.

Q.5) What is role of universal design, user centered design, task analysis/GOMS and graphic design in the design process phase of HCI.

⇒ 1. Universal design -

(i) Universal design is about designing systems that they can be used by anyone in any circumstance.

(ii) Multimodal systems are those that use more than one human input channel in interaction.

(iii) Universal design means designing for diversity including :
   (a) People with sensory, physical or cognitive impairment.
   (b) People of different pages.
   (c) People from different cultures & backgrounds.

(iv) Multimodal systems provide access to system information & functionality through a range different input & output channels, exploiting redundancy such systems will enable users with sensory, physical or cognitive impartmen to make use of channels that they can use most effectively but all users benefit from multimodal system that utilizes more of our senses in an involving interactive experience.

2. Task Analysis -

(i) Task analysis is the process of analyzing the way people perform their jobs, the things they do, the things they act on & the things they need to know.

(ii) Three different approaches of task analysis -
    (a) Task decomposition
    (b) Knowledge based techniques
    (c) Entity relation based analysis

(iii) Information for task analysis can be drawn from existing documentation, observation of workers doing the tasks.

3. GOMS -

(i) Goal : These are the users goal describing what the users wants to achieve. Further in GOMS the goals are taken to represent a memory point for users.

(ii) Operators : These are lowest level of analysis. They are basic actions that user must perform in order to use the system.

(iii) Methods : Goals can be split into subgoals. In GOMs these two goal decomposition method CLOSE-METHOD and LT-METHOD.

(iv) Selection: Use the word select where the choice of method arises, GOMS does not leave this as a random choice but attempts to predict which method will be used.