

Task Models and Dialogs

6.1 Task Analysis

Q.1 What is task analysis ? Explain three different approaches to task analysis.

Ans. : • Task analysis is the process of analyzing the way people perform their jobs.

- The listing of actions a user carries out in performing a task.
- For example, a person preparing an overhead projector for use would be seen to carry out the following actions :
 1. Plug in to main and switch on supply.
 2. Locate on/off switch on projector
 3. Discover which way to press the switch
 4. Press the switch for power
 5. Put on the slide and orientate correctly
 6. Align the projector on the screen
 7. Focus the slide
- In Human Computer Interaction, task analysis is the recording of physical and perceptual actions of the user whilst executing the task.
- There are many different approaches, notations and techniques.
 1. Task decomposition : Splitting task into (ordered) subtasks.
 2. Knowledge-based techniques : What the user knows about the

task and how it is organized

3. Entity/object based analysis : Relationships between objects, actions and the people who perform them.

Q.2 What are the aims of task analysis ?

Ans. : • Task analysis verifies that the set of actions employed by the user does accomplish the task.

- Task analysis explicitly describes the procedure that the user actually employs since this may be different from the expected series of actions.
- Task analysis is used to :
 1. Predict the time taken to learn a new task and become a proficient user of the particular application / machine. Task analysis may reveal how difficult one method is to learn compared to another.
 2. Predict the time taken for a proficient user to accomplish the set task - this can reflect whether the interface is good at supporting exploration. Is it quicker to simply explore by trial and error.

Q.3 How the task analysis help in requirements capture and systems design ?

Ans. : • Task analysis in itself is not a form of requirements capture as it refers to the existing system, not the planned system, and it includes many elements which are not part of the system.

- However, it makes a strong contribution toward the complete statement of requirements.
- The original statement of requirements given by a client will mention the new elements required and possibly refer to the existing system and its functionality
- The task analysis of an existing system can help in two ways :
 1. The analyst can ask 'Which of the existing objects, tasks, etc., should be in the new system?'

2. The formalized presentation of the existing state of affairs may help the client to clarify what the novel features are to be. It may be decided to automate whole tasks or roles, or simply specific subtasks.
- As the high-level design of the system progresses, task analysis continues to play a role.

Q.4 What is GOMS ? List and explain elements of GOMS.

Ans. : • The GOMS is an acronym for goals, operators, methods and selection. GOMS is a task analysis technique.

- GOMS is family of user interface modeling techniques.
- The GOMS model has four components : goals, operators, methods and selection rules.
 1. **Goals** - Tasks are deconstructed as a set of goals and subgoals. In GOMS the goals are taken to represent a 'memory point' for the user
 2. **Operators** - Tasks can only be carried out by undertaking specific actions. Example : To decide which search engine to use.
 3. **Methods** - It represent ways of achieving a goal. Example : drag mouse over field.
 4. **Selection Rules** - The method that the user chooses is determined by selection rules

Q.5 Explain advantages and disadvantages of GOMS.

Ans. : Advantages :

1. Easy to construct a simple GOMS model and saves time.
2. Helps discover usability problems.
3. Gives several qualitative and quantitative measures.
4. Less work than usability study.

Disadvantages :

1. Only work for goal directed tasks.



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2. Not for the novice user
3. Not ideal for leading edge technology systems
4. Not as easy as heuristics analysis, guidelines.

Q.6 Create a GOMS description of the task of photocopying a paper from a journal. Discuss the issue of closure in terms of your GOMS description.

- Ans. :**
- One possible GOMS description of the goal hierarchy for this task is given below. Answers will vary depending on assumptions about the photocopier used as the model for the exercise.
 - In this example, we will assume that the article is to be copied one page at a time and that a cover over the imaging surface of the copier has to be in place before the actual copy can be made.

Goal : PHOTOCOPY-PAPER

Goal : LOCATE-ARTICLE

Goal : PHOTOCOPY-PAGE repeat until no more pages

[Select Goal : SELECT-PAGE --> CHOOSE-PAGE-TO-COPY]

Goal : ORIENT-PAGE

OPEN -COVER

POSITION-PAGE

CLOSE-COVER

PRESS-BUTTON

Goal : VERIFY-COPY

LOCATE-OUT-TRAY

EXAMINE-COPY

Goal : COLLECT-COPY

LOCATE-OUT-TRAY

REMOVE-COPY (outer goal satisfied!)

Goal : RETRIEVE-JOURNAL



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OPEN-COVER

REMOVE-JOURNAL

CLOSE-COVER

Selection rules exist if a spoiled copy was printed. Consider the following :

Rule 1 : SELECT-PAGE if last page was copied successfully or start of article.

Note : The goal SELECT-PAGE is only valid if we are at the start of the article or the last copy was successful. If the last copy was spoiled then we must recopy the current page, so only a re-orientation would be required.

Goal : PHOTOCOPY-PAPER

Goal : LOCATE-ARTICLE

Goal : PHOTOCOPY-PAGE repeat until no more pages

[Select Goal : SELECT-PAGE --> CHOOSE-PAGE-TO-COPY]

Goal : ORIENT-PAGE

OPEN-COVER

POSITION-PAGE

CLOSE-COVER

PRESS-BUTTON

Goal : VERIFY-COPY

LOCATE-OUT-TRAY

EXAMINE-COPY

Goal : RETRIEVE-JOURNAL

OPEN-COVER

REMOVE-JOURNAL

CLOSE-COVER

Goal : COLLECT-COPY

LOCATE-OUT-TRAY

REMOVE-COPY (outer goal satisfied!)

- Closure to Outer Goal, must force user to collect copy last

Q.7 What is hierarchical task analysis ? Explain with example.

Ans. : • Task analysis is used mainly to investigate an existing situation. Hierarchical task analysis involves breaking a task down into subtasks, then sub-sub-tasks and so on.

- These are grouped as plans which specify how the tasks might be performed in practice.
- HTA focuses on physical and observable actions, and includes looking at actions not related to software or an interaction device.
- Start with a user goal which is examined and the main tasks for achieving it are identified. Tasks are sub-divided into sub-tasks.
- Example Hierarchical Task Analysis
 - 0. In order to buy a DVD
 - 1. locate DVD
 - 2. add DVD to shopping basket
 - 3. enter payment details
 - 4. complete address
 - 5. confirm order

plan 0 : If regular user do 1-2-5.

If new user do 1-2-3-4-5.

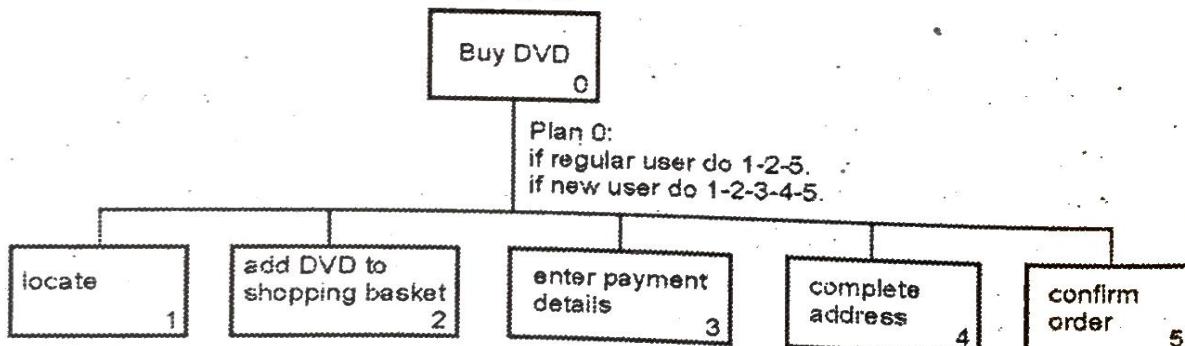


Fig. Q.7.1

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Q.8 What is task migratability ?

Ans. : • It is transfer of control for execution of tasks between system and user. It should be possible for the user or system to pass the control of a task over to the other or promote the task from a completely internalized one to a shared and cooperative venture.

- Hence, a task that is internal to one can become internal to the other or shared between the two partners. Example of task migratability is spell checking. It is equipped with a dictionary, you are perfectly able to check your spelling by reading through the entire paper and correcting mistakes as you spot them.
- This task is perfectly suited to automation, as the computer can check words against its own list of acceptable spellings.
- It is not desirable, to leave this task completely to the discretion of the computer, as most computerized dictionaries do not handle proper names correctly, nor can they distinguish between correct and unintentional duplications of words.
- In those cases, the task is handed over to the user. The spell-check is best performed in such a cooperative way.
- In safety-critical applications, task migratability can decrease the likelihood of an accident. For example, on the flight deck of an aircraft, there are so many control tasks that must be performed that a pilot would be overwhelmed if he had to perform them all.

**6.2 DOET (Design of Everyday Things),
Warning and Error**

Q.9 Explain design of everyday things with example.

Ans. : • **Industrial design :** The professional service of creating and developing concepts and specifications that optimize the function, value, and appearance of products and systems for the mutual benefit of both user and manufacturer.

- **Interaction design :** The focus is upon how people interact with technology. The goal is to enhance people's understanding of what can be done, what is happening, and what has just occurred. Interaction design draws upon principles of psychology, design, art, and emotion to ensure a positive, enjoyable experience.
- **Experience design :** The practice of designing products, processes, services, events, and environments with a focus placed on the quality and enjoyment of the total experience.
- **Design** is concerned with how things work, how they are controlled, and the nature of the interaction between people and technology.

Q.10 Explain Donald Norman's seven stages of interaction.

Ans. : Seven stages of action: one for goals, three for execution, and three for evaluation.

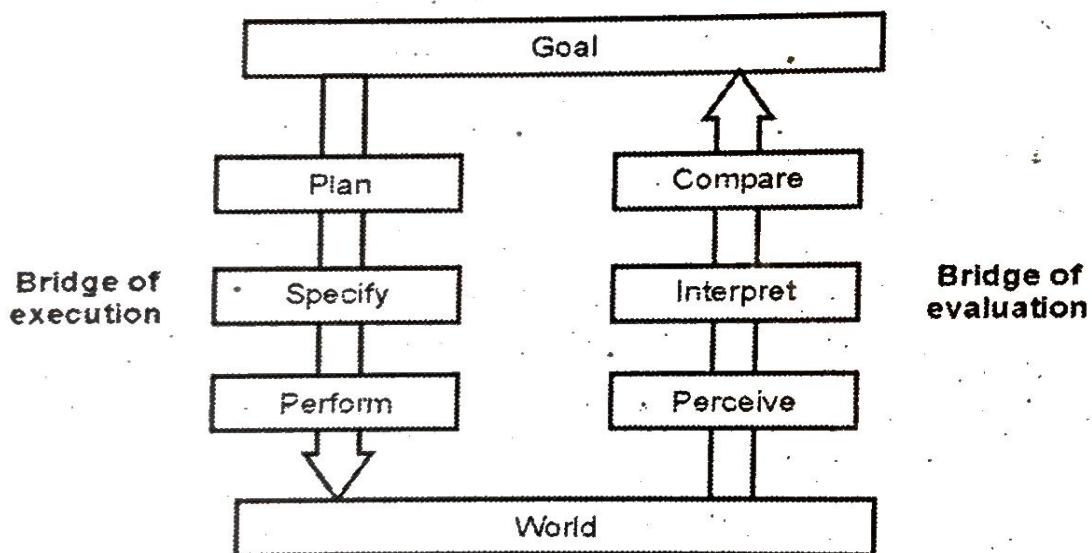


Fig. Q.10.1

Donald Norman's seven stage of interaction are as follows :

1. Establishing the goal.
2. Forming the intention.
3. Specifying the action sequence.

4. Executing the action.
5. Perceiving the system state.
6. Interpreting the system state.
7. Evaluating the system state with respect to the goals and intentions

• **Stage 1 is Forming a Goal.** This is what you want. As an example, I might want a place that I can relax outside that will not get muddy and that I do not have to move my outdoor furniture around to mow.

• **Stage 2 is Forming the Intention.** This is what would satisfy the goal. A deck would satisfy my goal of place to relax outdoors that will not get muddy or be in the way of mowing.

• **Stage 3 is Specifying an Action.** What do I have to do to achieve the intention ? I would need to build a deck to meet the requirement set in my goal.

• **Stage 4 is Executing the Action.** Here I would do the steps of the action. I would build the deck.

• **Stage 5 is Perceiving the State of the World.** Using the senses to gather information. My finished deck would be off the ground and have my outdoor furniture on it.

• **Stage 6 is Interpreting the State of the World.** What has changed ? My furniture is off the ground away from the mud and no longer has to be moved to mow the lawn.

• **Stage 7 is Evaluating the Outcome.** Did I achieve my goal? I can relax outdoors now without worrying about mud or moving furniture. I achieved my goal.

Q.11 Define mistake and slips.

Ans. : • Mistakes are errors in choosing an objective or specifying a method of achieving it .

- Examples of mistakes include : Making a poor judgement when overtaking, leaving insufficient room to complete the manoeuvre in the face of oncoming traffic.
- Slips are errors in carrying out an intended method for reaching an objective.
- Examples of slips include : Performing an action too soon in a procedure, or leaving it too late, eg not putting your ear defenders on before starting the drill.

Q.12 How to reduce mistake and slip errors ?

Ans. : To reduce mistakes :

1. To avoid rule-based mistakes, increase worker situational awareness of high-risk tasks on site and provide procedures for predictable non-routine, high-risk tasks.
2. To avoid knowledge-based mistakes, ensure proper supervision for inexperienced workers and provide job aids and diagrams to explain procedures.

To reduce slips :

1. Make all workers aware that slips and lapses do happen;
2. Use checklists to help confirm that all actions have been completed;
3. Include in your procedures the setting out of equipment, site layout and methods of work to ensure there is a logical sequence;
4. Make sure checks are in place for complicated tasks; and
5. Try to ensure distractions and interruptions are minimized, eg mobile phone policy..

Q.13 Explain difference between slip and mistake.

Ans. :

Slip	Mistake
Slips are error in carrying out an intended method for reaching an objective.	Mistakes are errors in choosing an objective.
Error in executing action.	Error in formulating intention and action.
Slips is correct plan but incorrect action.	Mistake is incorrect plan.
Typically found in skilled behavior.	Typically found in rule-based behavior or problem-solving behavior.
Skilled behavior.	Incorrect mental model.
Example : Omitting a step or series of steps from a task.	Example : Making a poor judgments when overtaking.
To reduce slip : Use checklists to help confirm that all actions have been completed.	To reduce mistake : Increase situational awareness of high-risk tasks on site.
Slips occur when :	Mistakes occurs :
1. The task is very familiar and requires little thought; 2. People confuse two similar tasks;	1. Doing too many things at the same time. 2. Doing too many complex tasks at once. 3. Time pressures.

Q.14 Explain different kinds of slips.

Ans. : • Slips are of three types : capture, description, mode

1. **Capture error** : A type of slip where a more frequent and more practiced behavior takes place when a similar, but less familiar, action was intended.

- Examples include telling someone your home phone number when you intended to give your work number or typing your name when you intended to type another word that begins with the same few letters.
2. **Description error** : Performing the right action for the wrong object, e.g. pouring your juice on your cereal in the morning instead of the milk.
 3. **Mode error** : A type of slip where a user performs an action appropriate to one situation in another situation, common in software with multiple modes.
- Examples include drawing software, where a user tries to use one drawing tool as if it were another (e.g. brushing with the Fill tool), or text editors with both a command mode and an insert mode, where a user accidentally types commands and ends up inserting text.

Q.15 Explain classification of mistake.

Ans. : • Classification of mistakes are skill-based, rule-based, and knowledge-based

1. **Skill based behavior** : Skill-based behavior occurs when workers are extremely expert at their jobs, so they can do the everyday, routine tasks with little or no thought or conscious attention. The most common form of errors in skill-based behavior is slips.
2. **Rule based behavior** : Rule-based behavior occurs when the normal routine is no longer applicable but the new situation is one that is known, so there is already a well-prescribed course of action: a rule.
3. **Knowledge based behavior** : Knowledge-based procedures occur when unfamiliar events occur, where neither existing skills nor rules apply. In this case, there must be considerable reasoning and problem-solving. Plans might be developed, tested, and then used or modified.

Q.16 Explain design principles for dealing with error.

Ans. : 1. Put the knowledge required to operate the technology in the world

2. Use the power of natural and artificial constraints : physical, logical, semantic, and cultural
3. Bridge the two gulfs, the Gulf of Execution and the Gulf of Evaluation.
4. Make things visible, both for execution and evaluation

6.3 Design Dialogs Notations

Q.17 Draw a state chart diagram of a machine that dispenses bottles on inserting coins.

Ans. : State chart diagram for machine that dispenses bottles on inserting coins :

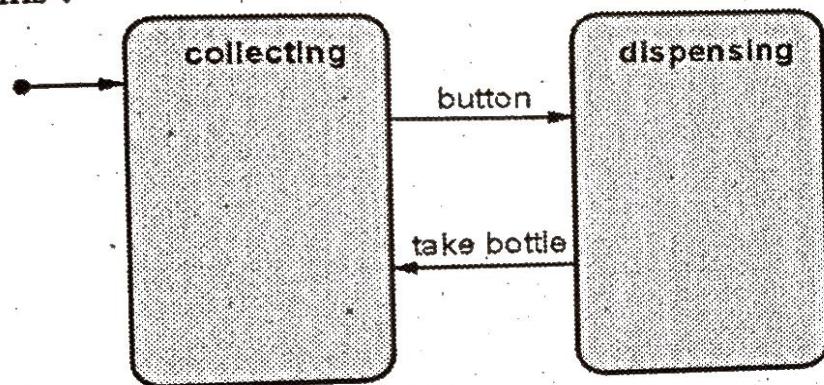


Fig. Q.17.1

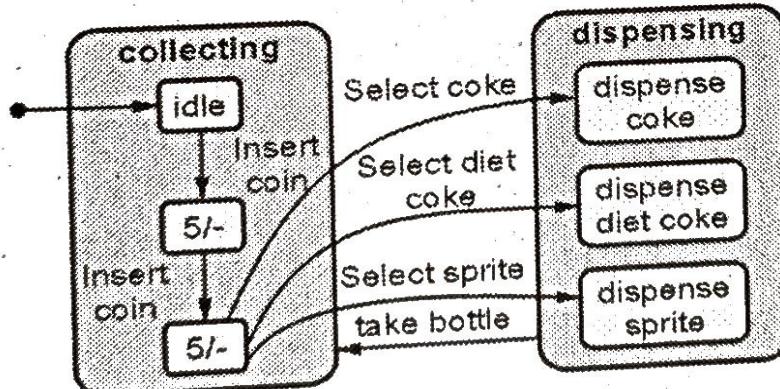


Fig. Q.17.2

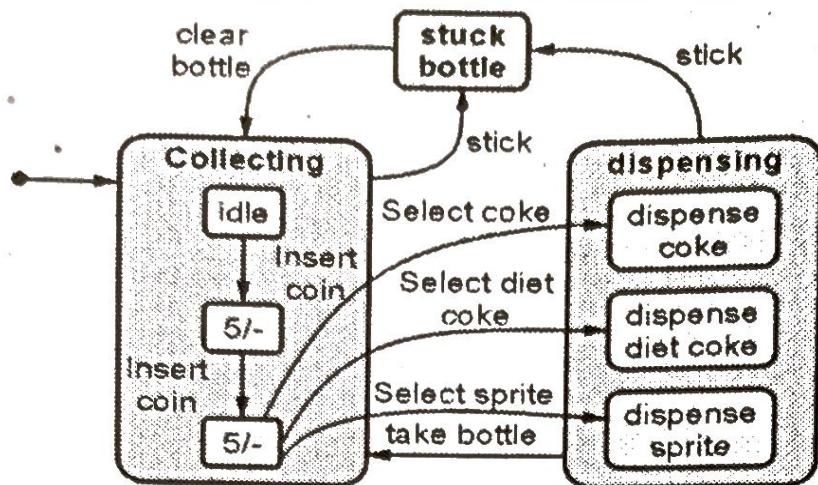


Fig. Q.17.3

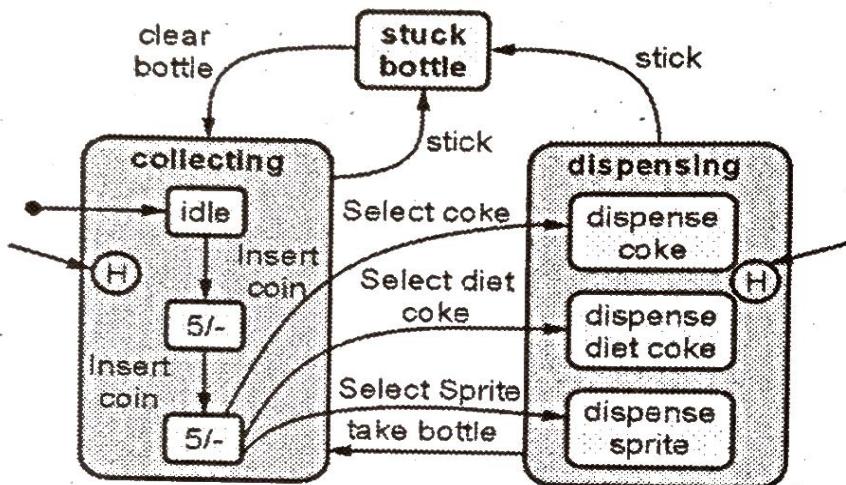


Fig. Q.17.4

Q.18 What is dialog ? How it is represent in computer language ?

Ans. : • Dialog is a conversation between two or more parties.

- The dialog has a more specific meaning, namely the structure of the conversation between the user and the computer system.

Computer language at three levels :

- **Lexical** : lowest level and the shape of icons on the screen and the actual keys pressed. In human language, the sounds and spellings of words.
- **Syntactic** : The order and structure of inputs and outputs. In human language, the grammar of sentence construction.

- **Semantic :** The meaning of the conversation in terms of its effect on the computer's internal data structures and/or the external world. In human language, the meaning ascribed by the different participants to the conversation.

Q.19 Explain State Transition Networks (STNs) ? How it is used for dialog description ?

Ans. : • State Transition Network (STN)s are the most spontaneous, which knows that a dialog fundamentally denotes to a progression from one state of the system to the next.

- The syntax of an STN consists of the following two entities :
 1. Circles : A circle refers to a state of the system, which is branded by giving a name to the state.
 2. Arcs : The circles are connected with arcs that refers to the action/event resulting in the transition from the state where the arc initiates, to the state where it ends.
- State transition networks have long been used for dialog description. Between the states are arrows, the transitions.
- These are labeled with the user actions that triggered the particular transition and the response the system makes.
- Fig. Q.19.1 shows state transition network for menu-driven drawing tool.

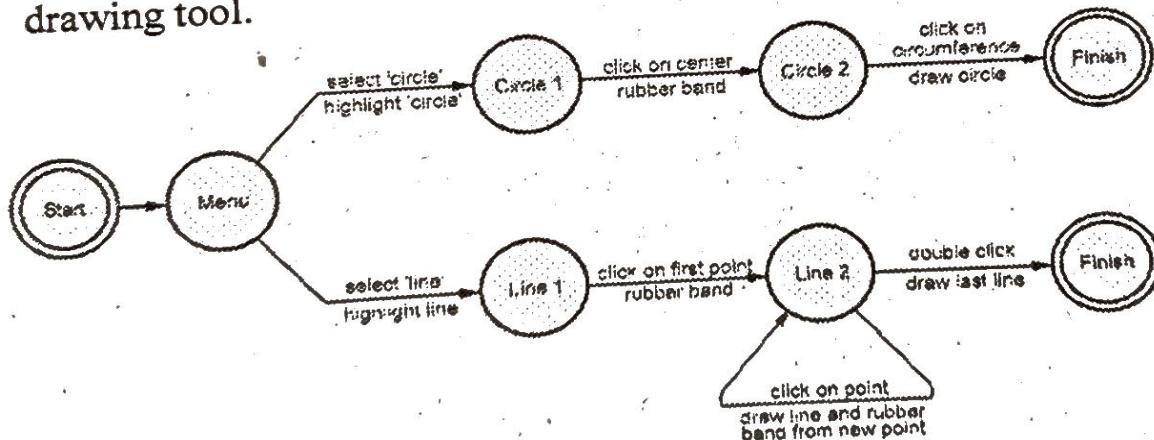


Fig. Q.19.1 State transition network for menu-driven drawing tool

- We shall have a "start" state. From this "start" state, we shall go to a "menu" state, where we are shown the menu options.
- If we select the circle option, we go to a "circle" state. Otherwise, we select the "line" option and go to the "line" state.
- While at the "circle" state, we select a point as the circle center, which takes us to the "center" state. In the "center" state, we select the circle periphery and double click to indicate the end of input (the "finish" state). At this stage, the circle is displayed.
- While at the "line" state, we select a point as the beginning of the line. Then, we select another point to denote the last point on the line and transit to "point 2". At this stage, a line is displayed between the two points.
- We can select another point, while at "point 2" to draw another line segment between this point and the point last selected. We can actually repeat this as many times as we want, to draw line of arbitrary shape and size
- When we perform a double click, it indicates the end of input and the dialog comes to the "finish" stage.

Q.20 Write short note on petri nets model.

Ans. : • Petri net is a simple model of active behavior, which has four behavior elements such as – places, transitions, arcs and tokens.

- Petri nets provide a graphical explanation for easy understanding.
 1. **Place** : This element is used to symbolize passive elements of the reactive system. A place is represented by a circle.
 2. **Transition** : This element is used to symbolize active elements of the reactive system. Transitions are represented by squares/rectangles.
 3. **Arc** : This element is used to represent causal relations. Arc is represented by arrows.

- 4. **Token** : This element is subject to change. Tokens are represented by small filled circles.
Tokens can play the following roles :
 1. A physical object, for example a product, a part, a drug, a person.
 2. An information object, for example a message, a signal, a report.
 3. A collection of objects, for example a truck with products, a warehouse with parts, or an address file.
 4. An indicator of a state, for example the indicator of the state in which a process is, or the state of an object.
 5. An indicator of a condition: the presence of a token indicates whether a certain condition is fulfilled.

Fig. Q.20.1 shows Petri nets model.

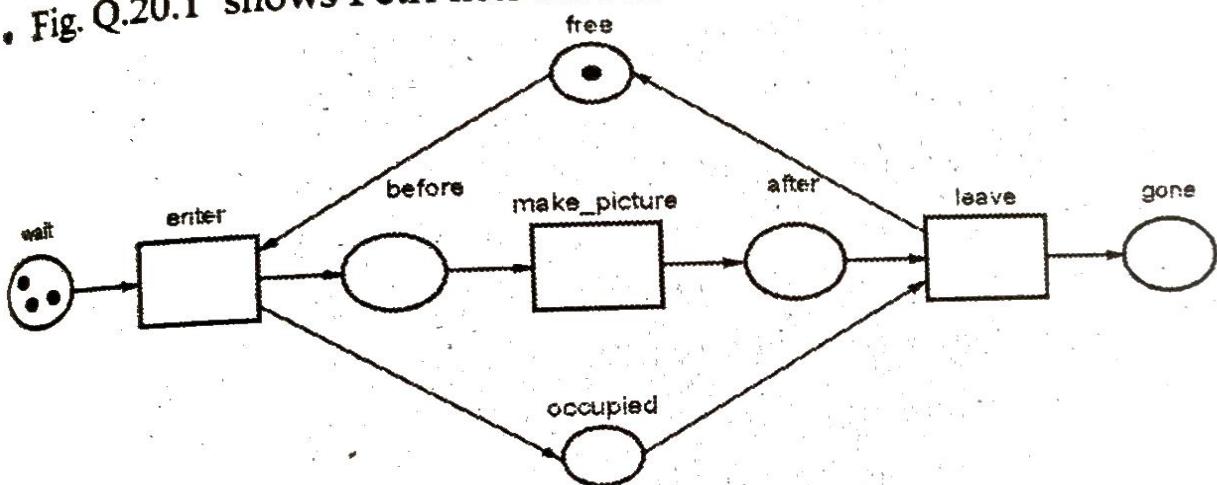


Fig. Q.20.1

- A transition can be used to represent things such as
 1. An event (e.g., starting an operation, the switching of a traffic light from red to green)
 2. A transformation of an object, like adapting a product, updating a database, or updating a document
 3. A transport of an object : for example, transporting goods, or sending a file

6.4 Model-based Evaluation User Testing

Q.21 Explain usability testing.

Ans. : • Usability means making products and systems easier to use, and matching them more closely to user needs and requirements.

- Usability testing focuses on user needs, uses empirical measurement, and iterative design.
- Historically usability tests are conducted in usability laboratories that are staffed by people who are experts in user-interface design and testing.
- Usability testing achieve the following five goals :
 1. improve the product's usability
 2. involve real users in the testing
 3. give the users real tasks to accomplish
 4. enable testers to observe and record the actions of the participants
 5. enable testers analyze the data obtained and make changes accordingly
- Before product implementation, paper mock-ups of screen displays can be tested in order to assess the wording and layout.
- Many techniques are employed in usability testing, including :
 1. Think aloud techniques in which the user is asked to articulate all the steps of his / her actions.
 2. Videotaping is valuable to review what the participants did, and to show designers where the problems are in their designs
- Interviews and user satisfaction questionnaires enable designers to evaluate the users likes and dislikes about the design and to gain a deeper understanding of any problems.

Q.22 What is User Acceptance Testing (UAT) ? Explain with Examples

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Ans. : • User Acceptance is defined as a type of testing performed by the Client to certify the system with respect to the requirements that was agreed upon. This testing happens in the final phase of testing before moving the software application to the Market or Production environment.

- The main purpose of this testing is to validate the end to end business flow. It does NOT focus on cosmetic errors, Spelling mistakes or System testing.
- This testing is carried out in a separate testing environment with production like data setup. It is a kind of black box testing where two or more end users will be involved.
- User acceptance testing dealt with functionality and showed us that there was a critical error with the game.
- User acceptance testing is done near the end of the design process. It is generally used for the developers to prove to the client that the project is complete.

Q.23 List usability testing myths.

Ans. : • Usability testing is so easy that anyone can do it.

- Usability testing is only about usability.
- Usability testing is artificial.
- You must have a usability lab.
- You should use the same participants you used for earlier user research.

END ... 