CS243 Software Engineering
Course Project

Team No. 3
Project No. 4
Immersive Virtual Tour

Cognitive Walkthrough

Abhishek Suryavanshi (160101009)
Ameya Daigavane (160101082)
Nitesh Jindal (160101084)

Table of Contents

Introduction

Purpose

The cognitive walkthrough is performed to evaluate the usability of the design of the Interactive Virtual Tour application of CSE Department.

Process Overview

Before the walkthrough, we identify and select the:

- User Profiles
- Representative Tasks
- Interfaces to be evaluated

During the walkthrough, we:

- Present the task, through a representation of the interface.
- Ask the user to perform task.
- Observe the user's sequence of actions.
- Record success stories, failure stories, design suggestions, and problems that were not the direct output of the walkthrough, assumptions about users, comments about the tasks, and other information that may be useful in design.

After the walkthrough:

- Analyze observations
- Make interface changes
- Plan the next evaluation

Representative Tasks

1. Go to the front of the main staircase of the CSE Department.
2. Go to the door of Professor Chandan Karfa's room on the ground floor.
3. Look towards Professor Chandan Karfa's room on the ground floor, while standing in front of the seminar room (indicated by a yellow arrow).
4. Go to the entrance of the second year B.Tech Laboratory on the second floor.

At every stage of the sequence of actions performed by the evaluating group for each representative task, we will answer four key questions:

- Will the user try and achieve the right outcome?
- Will the user notice that the correct action is available to them?
- Will the user associate the correct action with the outcome they expect to achieve?
- If the correct action is performed; will the user see that progress is being made towards their intended outcome?

Prototype

Shown below are screenshots of the high-fidelity prototype used in the cognitive walkthrough.

1. **Department Entrance**

2. **Main Lobby**

3. **Main Staircase**

4. **B.Tech Second Year Lab**

5. **Department Garden**

User Profiling

Characteristics:

Age	:	17 to 20 years (Average: 19 years)
Gender	:	No restrictions
Education	:	High school to B.Tech 1st year (Typical: IIT Guwahati)
Language	:	English

Technological Background :
Basic familiarity with Android smartphones (know how to switch on the phone and open applications) and Virtual Reality headsets (know how to start the headset).

Disabilities :
Should be able to move head and neck freely to use the VR Headset.

Location : Predominantly IIT Guwahati

Action Sequences and Records

(UA - User Action, SR - System Response)

Task 1

Main Goal: Go to the front of the main staircase of the CSE Department.

Subgoal: Start moving
UA1. Tilts head downward.
SR1. Virtual user starts moving in the direction he/she is facing.

Subgoal: Identify main staircase.
UA2. Keeps head tilted downward until staircase is reached.
SR2. Virtual user continues to move in the same direction.
UA3. On reaching the staircase, lifts head and looks straight.
SR2. Virtual user stops moving.

End Task

Task 1 Record Sheet

Step Description	Did the user try and achieve the right outcome?	Did the user notice that the correct action is available to them?	Did the user associate the correct action with the outcome they expect to achieve?	If the correct action is performed; did the user see that progress is being made towards their intended outcome?	Comments and Suggestions
Evaluator 1					
UA1. Tilt head downward.	Yes - user moved head and neck as soon as test started.	Partly - user did not move head downward initially.	Yes - once the user figured out how to move forward, he continued to.	Yes - virtual world motion started as soon as head movement was detected.	User did not immediately identify that tilting head downward corresponded to virtual world movement.
UA2. Keep head tilted until staircase reached.	Partly.	Yes.	Yes.	Yes.	Head was kept tilted only for a few seconds, then lifted to find that virtual movement had stopped.
UA3. Lift head and look straight.	Yes.	Yes.	Yes.	Yes.	User identified stopping motion correctly.
Evaluator 2					
UA1.	Yes.	Yes.	Yes.	Yes.	User correctly identified movement motion.
UA2.	No.	Yes.	Yes.	Yes.	Users might not know to keep head tilted all the time.
UA3.	Yes.	Yes.	Yes.	Yes.	User had already learnt that head-lifting corresponded to stopping.
Evaluator 3					
UA1.	Yes	Partly.	Yes.	Yes.	User did not tilt head downward at first.
UA2.	Yes.	Yes	Yes.	Yes.	User kept head tilted as required.
UA3.	Yes.	No	Partly	No.	User did not notice the staircase and went ahead.

Evaluator 4					
UA1.	Yes.	Yes.	Yes.	Yes.	
UA2.	Yes.	Yes.	Yes.	Yes.	User tilted head a little too much.
UA3.	No.	No.	No.	No.	User could not see staircase when head was tilted down.
Evaluator 5					
UA1.	Yes.	Yes.	Partly.	Yes.	User initially tilted head too much and moved very fast initially, then corrected his tilt angle.
UA2.	Yes.	Yes.	Yes.	Yes.	
UA3.	Yes	Yes.	Yes.	Yes.	

Task 2

Main Goal: Go to the door of Professor Chandan Karfa's room on the ground floor.

Subgoal: Start moving.
UA1. Tilts head downward, until door is reached.
SR1. Virtual user starts moving in the direction he/she is facing.

Subgoal: Find the correct door.
UA2. Once door is reached, lifts head.
SR2. Virtual user stops moving.
UA3. Turns head right by 90 degrees to face the door.
SR3. Virtual user turns right to face door. If this is Professor Chandan Karfa's room, then end task, else repeat action sequence.

End Task

Task 2 Record Sheet

Step Description	Did the user try and achieve the right outcome?	Did the user notice that the correct action is available to them?	Did the user associate the correct action with the outcome they expect to achieve?	If the correct action is performed; did the user see that progress is being made towards their intended outcome?	Comments and Suggestions
Evaluator 1					
UA1. Tilts head downward, until door is reached.	Partly - user tilted head for too long.	Partly - user walked past door.	Yes - once the user figured out how to move forward, he continued to.	Yes - virtual user started moving as soon as head was tilted.	User went a few steps ahead of the first door.
UA2. Once correct door is reached, lifts head.	Partly.	Yes.	Yes.	Yes.	Head was lifted late. Some indication that a door is near might be good.
UA3. Turns head right by 90°.	Yes.	Yes.	Partly.	Yes.	Head was turned too less, so it took time to turn.
Evaluator 2					
UA1.	Yes.	Yes.	Yes.	Yes.	User correctly identified movement motion.
UA2.	Yes.	Yes.	Yes.	Yes.	User identified door location correctly.
UA3.	Yes.	Yes.	Yes.	Yes.	Head was turned too less, so it took time to turn.
Evaluator 3					
UA1.	Yes	Yes.	Yes.	Yes.	User kept head tilted as required.
UA2.	Yes.	Yes	Yes.	Yes.	User identified correct door.
UA3.	Yes.	No	Partly	No.	Head was turned too much, so user had to reorient.

Evaluator 4					
UA1.	Yes.	Yes.	Yes.	Yes.	
UA2.	Yes.	Yes.	Yes.	Yes.	User identified correct door, but went ahead of the target.
UA3.	Yes.	Partly.	No.	No.	User tilted head sideways instead of turning.
Evaluator 5					
UA1.	Yes.	Yes.	Yes.	Yes.	
UA2.	Yes.	Yes.	No.	No.	User identified the wrong door.
UA3.	Yes	Partly.	Yes.	Yes.	User did not turn enough initially.

Task 3

Main Goal: Look towards the yellow arrow while standing in front of the seminar room on the ground floor.

UA1. Turns head left by 90 degrees, until main garden is visible.
SR1. Virtual user starts turning left.
UA2. Tilt head upward to see the yellow arrow.
SR2. Virtual user looks up so that arrow is in the centre of the screen.

End Task

Task 3 Record Sheet

Step Description	Did the user try and achieve the right outcome?	Did the user notice that the correct action is available to them?	Did the user associate the correct action with the outcome they expect to achieve?	If the correct action is performed; did the user see that progress is being made towards their intended outcome?	Comments and Suggestions
Evaluator 1					
UA1. Turns head left by 90°, until main garden is visible.	Yes	Yes	Yes	Yes	User turned correctly.
UA2. Tilt head upward to see the yellow arrow.	Partly.	Yes.	Yes.	Yes.	User did not see arrow at first.
Evaluator 2					
UA1.	Partly.	Yes.	Yes.	Yes.	User turned head for too long.
UA2.	Yes.	Yes.	Yes.	Yes.	
Evaluator 3					
UA1..	Partly.	Yes.	Yes.	Yes.	User turned head for too long.
UA2.	Yes.	Yes	Yes.	Yes.	
Evaluator 4					
UA1.	Yes.	Yes.	.Yes.	Partly.	User turned head very little, so turning took time.
UA2.	Yes.	Yes.	Yes.	Yes.	
Evaluator 5					
UA1.	Yes.	Yes.	Yes.	Yes.	
UA2.	No.	No.	No.	No.	User did not see arrow.

Task 4

Main Goal: Climb the main staircase.

UA1. Tilt head downwards.
SR1. Virtual user starts walking up the stairs.
UA2. At the corner, turn head 90 degrees to the right, to make a 180 degree turn.
SR2. Virtual user turns along with the stairs.

End Task

Task 4 Record Sheet

Step Description	Did the user try and achieve the right outcome?	Did the user notice that the correct action is available to them?	Did the user associate the correct action with the outcome they expect to achieve?	If the correct action is performed; did the user see that progress is being made towards their intended outcome?	Comments and Suggestions
Evaluator 1					
UA1. Tilt head downwards till the wall is reached.	Yes - user correctly identified the downward head movement.	Yes - virtual user started moving as soon as head movement detected.	Yes - virtual user started moving as soon as head movement detected.	Yes - virtual user started moving as soon as head movement was detected.	User tilted head downward for the appropriate duration.
UA2. Make 180° turn.	Partly.	Partly.	Yes.	Yes.	User turned body instead of neck, initially.
Evaluator 2					
UA1.	Partly.	Partly.	No.	No.	User bumped into wall.
UA2.	Yes.	Yes.	Yes.	Yes.	
Evaluator 3					
UA1.	Yes.	Yes.	Yes.	Yes.	User performed task appropriately.
UA2.	Yes.	Yes	Yes.	Yes.	User performed task appropriately.

Evaluator 4					
UA1.	Yes.	Yes.	.Yes.	Partly.	User bumped into wall.
UA2.	Yes.	Yes.	Partly.	Partly.	User turned head very little, so turning took time.
Evaluator 5					
UA1.	Yes.	Yes.	Yes.	Yes.	User performed task appropriately.
UA2.	No.	No.	Partly.	Partly.	User turned head very little, so turning took time.

Analysis and Inference

We analyse every action sequence according to four key questions.

Action in Sequence	Key Mismatch Question	Problems and Design Solution	Approximate Mismatch Percentage to Ideal Situation
Task 1			
UA1 Tilt head downward.	Is it clear to the user that the system has taken input?	Yes Virtual user starts moving exactly when head movement detected.	80%
	Can the user resume control for the next action?	Yes User can always lift head to stop.	
	Are the systems response visible & interpretable?	Yes User is shown movement on screen.	
	Is the end of the system action clear?	Yes When head lifted, movement stops instantly.	
UA2 Keep head tilted until staircase reached.	Is it clear to the user that the system has taken input?	Partly User only stopped if head is not kept tilted.	40%
	Can the user resume control for the next action?	Yes	
	Are the systems response visible &	Yes	

	interpretable?		
	Is the end of the system action clear?	Yes User motion stopped completely.	
UA3 Lift head and look straight.	Is it clear to the user that the system has taken input?	Yes Virtual user stops moving forward.	80%
	Can the user resume control for the next action?	Yes	
	Are the systems response visible & interpretable?	Yes	
	Is the end of the system action clear?	Yes	
Task 2			
UA1. Tilts head downward, until door is reached.	Is it clear to the user that the system has taken input?	Yes	70%
	Can the user resume control for the next action?	Yes	
	Are the systems response visible & interpretable?	Yes	
	Is the end of the system action clear?	Yes	
UA2. Once correct door is reached, lifts head.	Is it clear to the user that the system has taken input?	Partly Virtual user stops moving once head lifted.	60%
	Can the user resume control for the next action?	Yes	
	Are the systems response visible & interpretable?	No Correct door is not indicated.	
	Is the end of the system action clear?	Yes	
UA3. Turns head right by 90°.	Is it clear to the user that the system has taken input?	Yes	95%
	Can the user resume control for the next action?	Yes	
	Are the systems response visible & interpretable?	Yes	
	Is the end of the system action clear?	Partly Rotation stops once user looks ahead.	
Task 3			
UA1.	Is it clear to the user that the system has taken input?	Yes Virtual user starts to turn towards the	95%

Turns head left by 90 degrees, until main garden is visible.		left.	
	Can the user resume control for the next action?	Yes	
	Are the systems response visible & interpretable?	Yes	
	Is the end of the system action clear?	Yes Rotation stops once user looks ahead.	
UA2. Tilt head upward to face arrow.	Is it clear to the user that the system has taken input?	Yes	80%
	Can the user resume control for the next action?	Yes	
	Are the systems response visible & interpretable?	Yes	
	Is the end of the system action clear?	Partly	
Task 4			
UA1. Tilt head downwards till the wall is reached.	Is it clear to the user that the system has taken input?	Yes Virtual user continues to move while head is tilted.	95%
	Can the user resume control for the next action?	Yes	
	Are the systems response visible & interpretable?	Yes	
	Is the end of the system action clear?	Partly User has to tilt head before the wall is reached.	
UA2. Turn head to the right to make a 180° turn.	Is it clear to the user that the system has taken input?	Yes Virtual user turns to the left.	90%
	Can the user resume control for the next action?	Yes User can stop the turning by looking ahead.	
	Are the systems response visible & interpretable?	Yes All movement is shown on screen.	
	Is the end of the system action clear?	Partly User has to turn head correctly and for the correct duration.	

Conclusion

Our design has been evaluated through a cognitive walkthrough that has suggested the following improvements:

- Clearer instructions to move forward. Users did not immediately identify how to move.
- Decreasing the threshold for the angle to turn, making it easier for users to turn in the virtual world. Users often turned slowly.
- Clearer demarcation of text for the user to read. Users did not notice text on signs.
- Some indication when objects such as doors are nearby. Users often missed these on the tasks.