Software Engineering Project

Usability Evaluation Report (Gesture)

Smart-glass based Remote Guidance System

Table 1. Document Change Control

Version	Date	Authors	Summary of Changes
1.00	14/10/2018	Dineth Gunawardena	Added Introduction, Procedure and Participant sections
1.10	18/10/2018	Dineth Gunawardena	Added Results, Discussion and Conclusion sections

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1) Introduction

The usability evaluation held on the 12th of October from 4:30PM to 6:00PM in AD 101. The aim of this usability evaluation is to test the usability of the gesture feature of the application we developed. The evaluation was conducted using the smart glasses paired with the instructor loaded on the computer. This report will analyze the results of 3 participants who participated in the Usability evaluation.

2) Participants

The participants that were chosen for the usability evaluation belonged of the target demographic that we see using the product. This was validated by the demographic questionnaires they filled out before the usability evaluation. We expect the target customers who are familiar with technology similar to smart phones to quickly adapt to the smart glasses and use the product with ease. All of our participants were university students who use smartphones daily.

3) Procedure

The evaluation is split into three tasks where the participant takes on the role of the operator in the first two tasks, and acts as the instructor in the last task. In the first two task the participant, should follow the instructor's instructions to make a shape by aligning dominoes with the aid of the instructor's hand gestures. In the last task, the participant must give instructions to an operator with hand gestures.
While the evaluation was conducted, the supervisor was setting up the devices with each task, the facilitator was with the participant, and the observer was taking the records of the evaluation.

4) Results

The results of the evaluation were extracted from the observation sheets and satisfaction questionnaires for each participant.

4.1) Observations

Participant #1 **Task #1**	Session Date: 12/10/2018	Session Time: 6:30PM – 7:30PM	Supervisor: Lyndon Prado
Description: Pick the domino			
Completed (Y/N):	Y		
Time spent on task:	2 mins		
No. of assists:	0		
Action Sequence		User Comments	Observer Comments
(1)	Pick up the domino the instructor is pointing at		User was able to pick the domino with ease
General Comments			

User commented that there should be a strap holding the glasses in place, which is flaw in the hardware design.

Participant #1 **Task #2**	Session Date: 12/10/2018	Session Time: 6:30PM – 7:30PM	Supervisor: Lyndon Prado
Description: Follow the instructor			
Completed (Y/N):	N		
Time spent on task:	4 mins		
No. of assists:	1		
Action Sequence		User Comments	Observer Comments
(1)	Arrange dominoes in orientation of instructor's instructions.	User's feed froze after a few minutes and was unable to see the gestures moving	This is due to the issue of the glasses not being powerful enough to handle the overlay computations
General Comments			

This issue could be solved by all the computations being done on the server instead of the glasses

Participant #1 **Task #3**	Session Date: 12/10/2018	Session Time: 6:30PM – 7:30PM	Supervisor: Lyndon Prado
Description: Get the operator to pick up 4 dominoes and arrange them in a square			
Completed (Y/N):	Y		
Time spent on task:	3 mins		
No. of assists:	0		
Action Sequence		User Comments	Observer Comments

(1)	Gesture operator to place domino in orientation of user's choice	Operator's feed has low frame rates	Background affected calibration
General Comments			
The background calibration problems can be kept to a minimum with the instructor's hands kept close to the camera			

Participant #1 **Task #4**	Session Date: 12/10/2018	Session Time: 6:30PM – 7:30PM	Supervisor: Lyndon Prado
Description: Stack dominoes			
Completed (Y/N):	N		
Time spent on task:	5 mins		

No. of assists:	1

Action Sequence		User Comments	Observer Comments
(1)	Get operator to stack 4 dominoes on top of each other	Operator's feed froze	
General Comments			
Overlay computations of instructors hands over operator's feed is processed on the smart glasses which has limited processing power instead of the server			

Participant #2 Task #1	Session Date: 12/10/2018	Session Time: 6:30PM – 7:30PM	Supervisor: Lyndon Prado
Description: Pick the domino			

Completed (Y/N):	Y
Time spent on task:	1 mins
No. of assists:	0

Action Sequence		User Comments	Observer Comments
(1)	Pick up the domino the instructor is pointing at		User was able to pick the domino

General Comments
User commented that the glasses were about to fall off, which is design flaw of the Smart Glasses

Participant #2 **Task #2**	Session Date: 12/10/2018	Session Time: 6:30PM – 7:30PM	Supervisor: Lyndon Prado
Description: Follow the instructor			
Completed (Y/N):	N		
Time spent on task:	3 mins		
No. of assists:	0		
Action Sequence		User Comments	Observer Comments
(1)	Arrange dominoes in orientation of instructor's instructions.	User's feed of hand gestures froze	This is due to the issue of the glasses not being powerful enough to handle the overlay computations
General Comments			
This issue could be solved by all the computations being done on the server instead of the glasses			

Participant #2 **Task #3**	Session Date: 12/10/2018	Session Time: 6:30PM – 7:30PM	Supervisor: Lyndon Prado
Description: Get the operator to pick up 4 dominoes and arrange them in a square			
Completed (Y/N):	Y		
Time spent on task:	5 mins		
No. of assists:	0		
Action Sequence		User Comments	Observer Comments
(1)	Gesture operator to place domino in orientation of user's choice		User was able to get operator to complete the task
General Comments			

Participant #2 **Task #4**	Session Date: 12/10/2018	Session Time: 6:30PM – 7:30PM	Supervisor: Lyndon Prado
Description: Stack dominoes			
Completed (Y/N):	N		
Time spent on task:	4 mins		
No. of assists:	0		
Action Sequence		User Comments	Observer Comments
(1)	Get operator to stack 4 dominoes on top of each other	Operator's feed froze	
General Comments			
Overlay computations of instructors hands over operator's feed is processed on the smart glasses which has limited processing power instead of the server			

Participant #3 **Task #1**	Session Date: 12/10/2018	Session Time: 6:30PM – 7:30PM	Supervisor: Lyndon Prado
Description: Pick the domino			
Completed (Y/N):	Y		
Time spent on task:	2 mins		
No. of assists:	0		
Action Sequence		User Comments	Observer Comments
(1)	Pick up the domino the instructor is pointing at		User was able to pick the domino

General Comments

Participant #3 **Task #2**	Session Date: 12/10/2018	Session Time: 6:30PM – 7:30PM	Supervisor: Lyndon Prado
Description: Follow the instructor			
Completed (Y/N):	N		
Time spent on task:	5 mins		
No. of assists:	2		
Action Sequence		User Comments	Observer Comments

(1)	Arrange dominoes in orientation of instructor's instructions.	Hand gestures stopped moving	This is due to the issue of the glasses not being powerful enough to handle the overlay computations
General Comments			
This issue could be solved by all the computations being done on the server instead of the glasses			

Participant #3 **Task #3**	Session Date: 12/10/2018	Session Time: 6:30PM – 7:30PM	Supervisor: Lyndon Prado
Description: Get the operator to pick up 4 dominoes and arrange them in a square			
Completed (Y/N):	Y		
Time spent on task:	4 mins		
No. of assists:	0		

Action Sequence		User Comments	Observer Comments
(1)	Gesture operator to place domino in orientation of user's choice	User explained that it was a bit confusing as the instructor view was not reversed horizontally	User was able to get operator to complete the task
General Comments			
This issue can be fixed by reversing the instructor's view horizontally			

Participant #3 **Task #4**	Session Date: 12/10/2018	Session Time: 6:30PM – 7:30PM	Supervisor: Lyndon Prado
Description: Stack dominoes			
Completed (Y/N):	N		
Time spent on task:	5 mins		

No. of assists:	2		
Action Sequence		User Comments	Observer Comments
(1)	Get operator to stack 4 dominoes on top of each other	Operator's feed froze	
General Comments			
Overlay computations of instructors hands over operator's feed is processed on the smart glasses which has limited processing power instead of the server			

4.2) Effectiveness

The effectiveness metric is measured by the proportion of tasks completed by each participant.

Participant #	Effectiveness
1	50%
2	50%
3	50%

4.3 Efficiency

Efficiency is measured by minutes, and define the number of minutes each participant takes to complete each task. The target was for each participant to take a maximum of 5 minutes for each task.

Average time spent on each task: (Total time spent on all tasks)/ (Number of tasks)

Participant #	Average time spent on each task/minutes
1	3.5
2	3.25
3	4

4.4) Satisfaction

Satisfaction is measured by the SUS score calculated from the Satisfaction questionnaires.

Participant #	SUS score
1	72.5
2	70.0
3	70.0

5) Discussion

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Effectiveness- Each participant was expected to be able to complete all of the tasks in the evaluation. However, all of the participants weren't able to complete 2 of the 4 tasks when the hardware failed to support the gesture computation, when the feature was used for too long.

Efficiency- Each participant was allocated a time of half an hour, and with each participant taking an average time of less than 5 minutes per task, the target was reached.

Satisfaction- All of the participants reached the target System Usability Score of 70 as the app was practicable and usable despite the hardware failing to support the software computations.

6) Conclusion

The main fatal error discovered by all the participants was the limited capability of the Smart Glasses of being able to merge gestures into the operator's feed for a certain period of time. A more powerful device like a Smartphone might be able to handle these computations which could bring the possible solution of handling the computations on a more powerful device and streaming the result to the Smart glasses. Other usability problems brought up were low frame rates which were also due to the limited power of the Smart Glasses, that could be solved through optimisation and the instructor view being confusing to follow which could be solved by reversing the view. This usability evaluation successfully allowed us to recognize potential problems with the system, which might have been overlooked.