Human Computer Interaction

CSE4015

HAND GESTURE BASED METRO TICKET BOOKING SYSTEM

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Last but not least, we would like to express our thankfulness to Vellore Institute of Technology for giving us the opportunity to conduct this project in our coursework. Finally, an honourable mention goes to our friends and respondents for the support and willingness to spendsome time with us to fill in the surveys and questionnaires.

ABSTRACT

Hand gestures are a form of nonverbal communication that can be used in several fields such ascommunication between deaf-mute people, robot control, human–computer interaction (HCI), homeautomation and medical applications.

We plan to build a metro ticket booking system and we can operate it using hand gestures to be more specific we will use a camera to track our finger through which we can control the cursor onthe screen and select the tickets using hand gesture (for example raising 2 fingers is same as clicking on the mouse).

Our aim is mainly to reduce the physical contact with the screen and to make a user friendly systemto easily use hand gestures to interact.

INTRODUCTION

Metro has become a habit for us, taking over all other forms of public transport and becoming trulyindispensable and essential. But is it convenient enough?

We believe metro smart cards were an innovation that added substantially to the convenience of thismode of transport. However, the factors such as the time lost for waiting in line to buy/recharge ametro card, contacting a filthy machine to proceed, and the potential chances of losing the metro card, among others leave much to be desired from the user experience of this utility.

Thus, since the inception of this functionality provided by metro cards, the technology has progressed a lot, we believe now is the time we can focus on improving the user experience ofboarding a metro by adding convenience significantly.

As we all know, vision-based technology for hand gesture detection is an important aspect of human-computer interaction (HCI). In recent decades, keyboard and mouse have played an important role in human-computer interaction. However, because to the fast growth of technologyand software, new types of HCI solutions have been necessary. Speech recognition and gesture recognition, in particular, have received a lot of interest in the field of HCI.

Gesture is a sign of physical conduct or emotional expression. It consists of both body and hand gestures. Gestures can be used as a tool of communication between computer and human. It is greatly different from the traditional hardware based methods and can accomplish human-computerinteraction through gesture recognition. Gesture recognition determines the user intent through the recognition of the gesture or movement of the body or body parts. Thus we started small and developed only a hand gesture software where with just recognising a few hand signs we can click and move the cursor along.

PROBLEM STATEMENT

The process of buying tokens from the Metro Token Vending Machines is very confusing, lengthy, and very frustrating for users due to multiple screens & bad UI. This results in people then going to teller counters to buy their tokens. Long lines are often found at these counters because of both, thetoken buying customers, as well as the metro card users which thus ends up in congested metro stations.

Sno	User Characteristics	
1)	Age	Will range in age from about 12-70 years
2)	Sex	Both male and female
3)	Physical Limitations	May be fully able-bodied or may have some physical limitations in relation to hearing, sight, mobility, use of hands, or wheelchair use Will be of varying heights
4)	Educational Background	May have only minimal education qualifications and possess limited literacy and numeracy skills
5)	Computer/IT use	May have little or no prior experience of computer or IT use
6)	Motivation	Maybe very motivated to use the Token Vending Machine, particularly if they can purchase the token quickly and avoid waiting in long lines at the teller counter
7)	Attitude	Attitudes to use may vary, depending on the reliability of the technology itself, and the attitude of the users towards computers.
8)	Ethnicity	Indian
9)	Profession	Students, Working Professionals, Labour class, Unemployed
10)	Frequency of Travel	Once to 7 times per week
11)	Analytical Understanding	Basic to Advanced

USER STUDY AND ANALYSIS

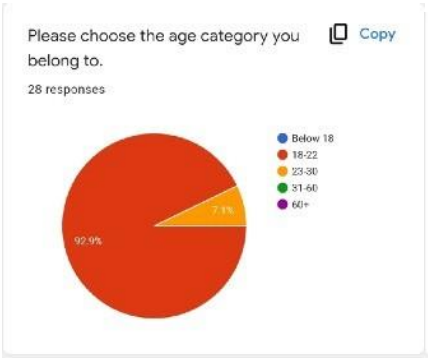
SURVEY

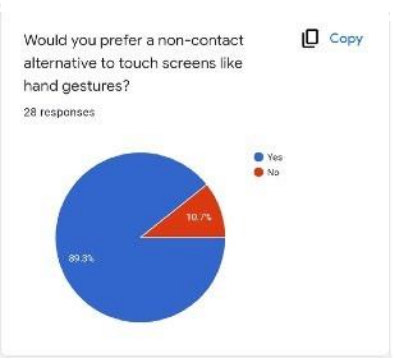
NUMBER of RESPONSES: 28

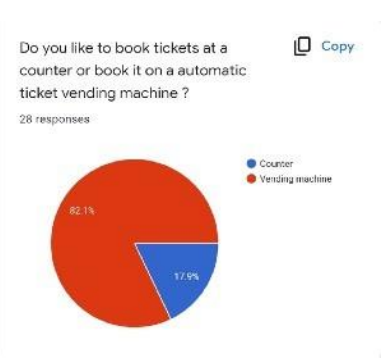
QUESTIONS ASKED

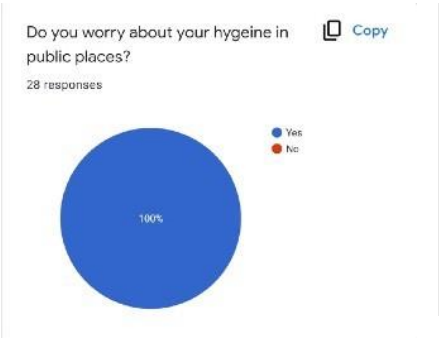
1. Please choose the age category you belong to.
2. Would you prefer a non-contact alternative to touch screens like hand gestures?
3. Do you like to book tickets at a counter or book it on a automatic ticket vending machine ?
4. Do you worry about your hygiene in public places?
5. Has the covid pandemic improved your hygiene standards?
6. According to you, what advantages do you think hand gesture based cursor control has?
7. According to you what are the disadvantages of hand gesture based cursor control?

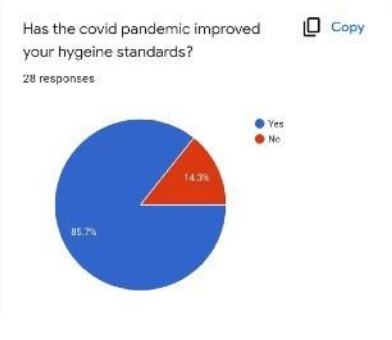
RESULTS











INTERVIEW

NUMBER OF PEOPLE INTERVIEWED: 6

QUESTIONS ASKED

1. According to you, what advantages do you think hand gesture based cursor control has?
2. According to you what are the disadvantages of hand gesture based cursor control?

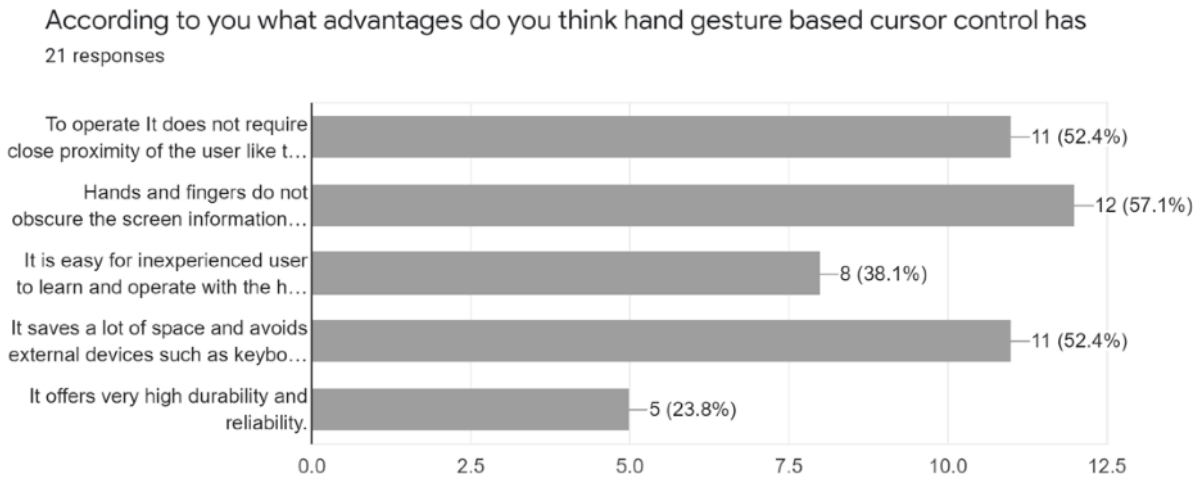
RESULTS

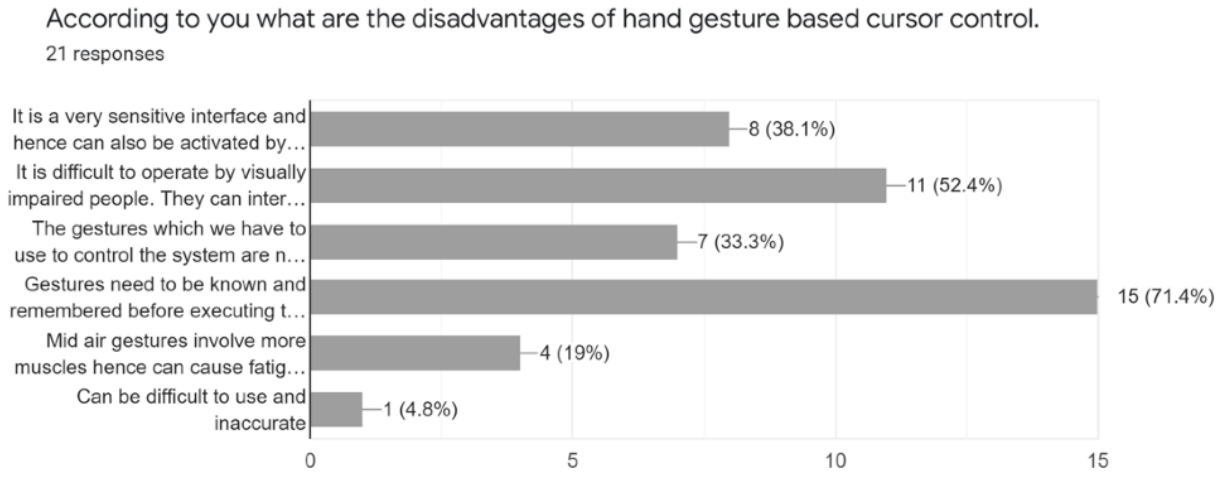
Advantages:

- The presenters were able to make eye contact more often and to use their body language toconvey information.
- Hands and fingers do not obscure the screen information while selecting the desired options.
- More enjoyable and natural to move the cursor.

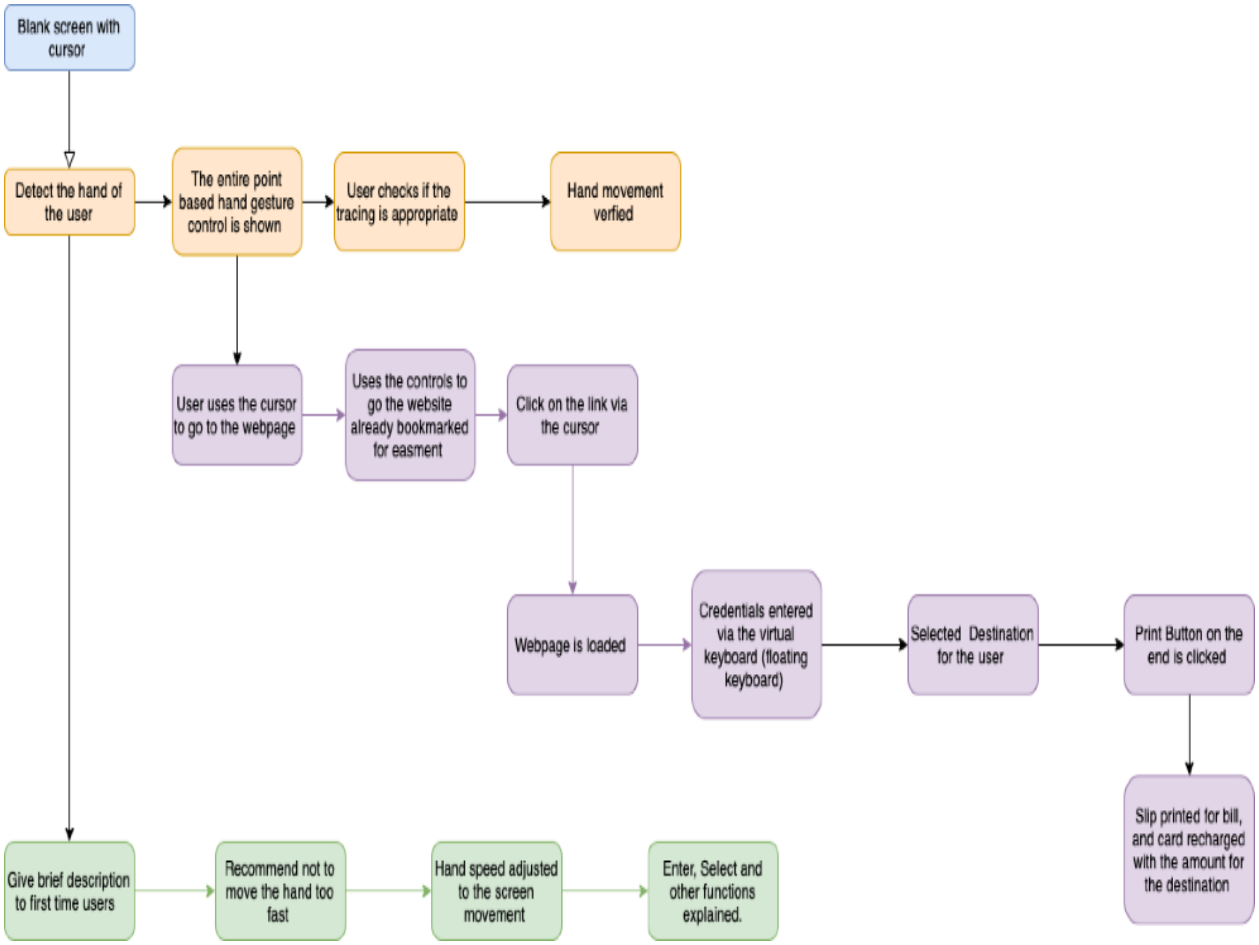
Disadvantages:

- The gestures are not self explanatory, gestures need to be known and remembered beforeexecuting them.
- Not possible to make the gestures self-revealing.
- Users felt suspending their hands in mid air to be more exhausting therefore quick and tinygestures are required


According to you what advantages do you think hand gesture based cursor control has
21 responses
To operate It does not require close proximity of the user like t…
Hands and fingers do not obscure the screen information…
It is easy for inexperienced user to learn and operate with the h…
It saves a lot of space and avoids external devices such as keybo…
It offers very high durability and reliability.
11 (52.4%)
12 (57.1%)
8 (38.1%)
11 (52.4%)
5 (23.8%)
0.0
2.5
5.0
7.5
10.0
12.5


According to you what are the disadvantages of hand gesture based cursor control.
21 responses
It is a very sensitive interface and hence can also be activated by…
It is difficult to operate by visually impaired people. They can inter…
The gestures which we have to use to control the system are n…
Gestures need to be known and remembered before executing t…
Mid air gestures involve more muscles hence can cause fatig…
Can be difficult to use and inaccurate
8 (38.1%)
11 (52.4%)
7 (33.3%)
15 (71.4%)
4 (19%)
1 (4.8%)
0
5
10
15

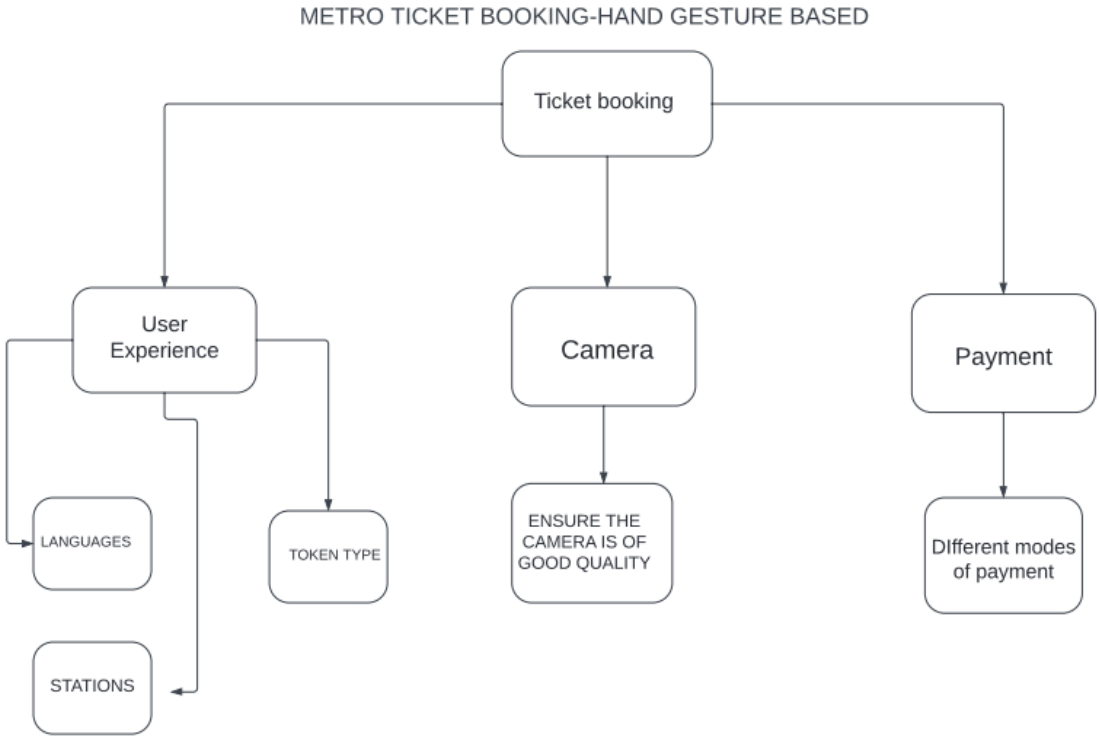
DATA FLOW DIAGRAMS



HUMAN COMPUTER INTERACTION MODEL

1) Module 1: Text Entry device
   Pointing devices (hand)

2) Module 2: HTA analysis



3) Module 3:

KLM ANALYSIS

STEPS

1) Mental Preparation
2) Pointing the interface
3) Clicking the option

Calculations:

1.language
2.From location
3.Destination location
4.Trip
5.Payment method
6. Confirm

Mental Preparation: 1.25 sec

Pointing ON each: 1.1

Clicking : 0.2

Total : 1.25*6+1.1*6+0.2*6= 15.3 sec

So in around 15 seconds the passenger can generate their tokens

4) Module 4: Normans 7 principles

Imagine you want to travel from one place to another. You decide you need a ticket to travel to yourdestination; that is you establish the goal to get a ticket. From there you form an intention to book aticket, and you specify the actions required. When you have executed the action you perceive the result, either the ticket is booked or not and you interpret this, based on your knowledge of the world.

1) Goal: What do I want to accomplish and why?

I want to book a metro ticket to travel from my place to my friend's place in the city.

2) Plan: How can I do it?

I can do this by understanding how to operate the hand gesture-based metro ticket booking systeminstalled in the metro station.

3) Specify: What options do I have?

Raise your hand and use two fingers to select the following actions - choose a language,destination, and payment type. Finally, insert the required amount of money.

4) Perform: What can I do now?

Physically execute the specified action sequence, review the booking details. If satisfied, confirm thebooking and make the final transaction. Finally print the ticket.

5) Perceive: What just happened?

Observe the feedback message on the digital screen and the printed ticket.

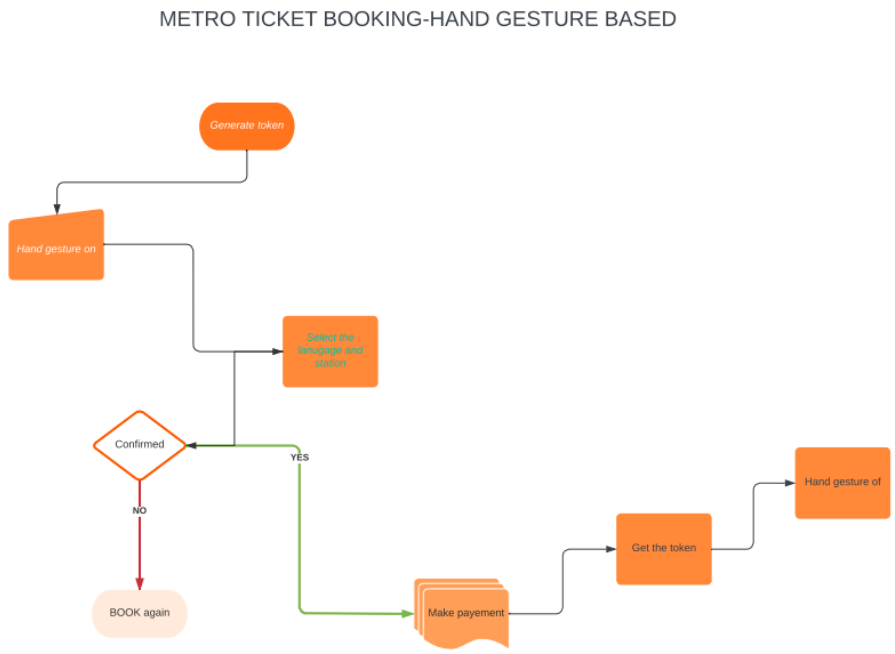
6) Interpret: What does it mean?

The booking is confirmed and the transaction was successful.

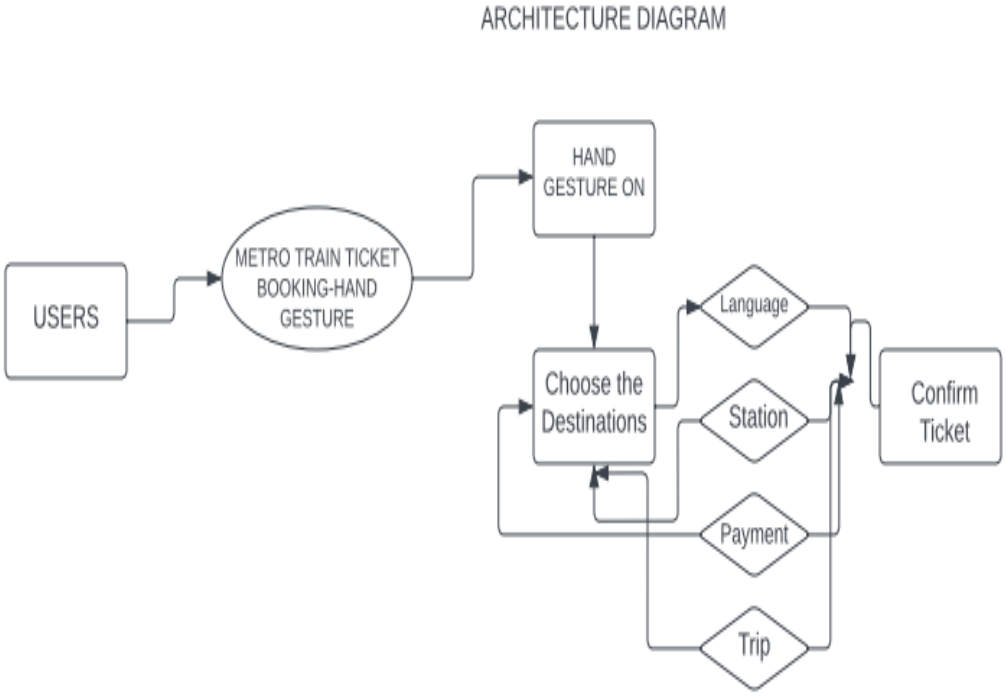
7) Compare: Is this okay? Have I accomplished my goal?

Yes! The printed ticket led to my goal.

5) MODULE 5: STATE TRANSITION DIAGRAM



6) Module 6: Architecture



7) Module 7: Testing

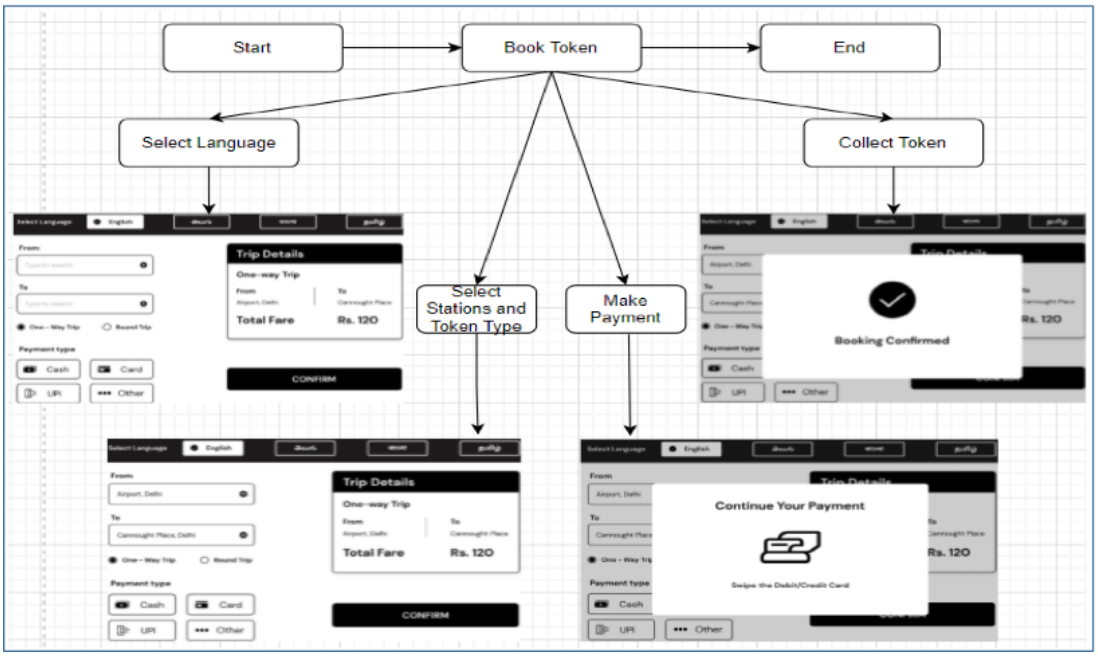
ID	Test Scenario	Pre-Condition	Test Steps	Test Data	Expected Results	Actual Results	Pass / Fail
1	Web-app openingwith all its contents and integrations	Need a valid hosting serverand internet connection	1. Open Website link 2. Hover to the database module	<Valid flask andfront end integration>	Successfully Opening	SuccessfullyOpening	Pass
2	Animations working when hovered to.	Need a valid animation scheme	1. Hower different web app sections 2. Have interactive buttons	<Valid css code>	Animations performing correctly	Animations performing correctly	Pass
3	Required Fields	Need valid information aboutthe destinations	1. Enter the fields marked with * 2. Click Submit	<Valid field information>	Data is accepted Successfully	Data is accepted Successfully	Pass
4	Error Message popups	Need a valid reason to popup	1. Enter any invaliddata 2. Click Submit	<Invalid data field>	An error messageis shown	An error message isshown	Pass
5	On moving your finger as a cursorall the options get highlighted	Need valid highlighting scheme	1. Move your fingerover the options	<Valid gesture>	Highlighted icon	Highlight edicon	Pass

Test Case ID	Test Scenario	Test Steps	Test Data	Expected Results	Actual Results	Pass / Fail
1	Valid Payment	Scan the QR Code	Valid amount entered	Payment Successful	Payment Successful	Pass
2	Valid Payment	Scan the QR Code	Invalid Amount entered	Payment failed	Payment failed	Pass
3	Valid Payment	Swipe the credit or debit card	Valid Credit Card	Payment Successful	Payment Successful	Pass
4	Selection of Stations	1. Move your finger over the the vending machine to move the cursor 2. Select To Destination 3. Select From Destination	Different To and From destinations	Fare Price according to the distance	Fare Price according to the distance	Pass
5	Selection of Stations	1. Move your finger over the the vending machine to move the cursor 2. Select To Destination 3. Select From Destination	Same To and From Destinations	Fare price must be Zero	Fare Price is not Zero	Fail

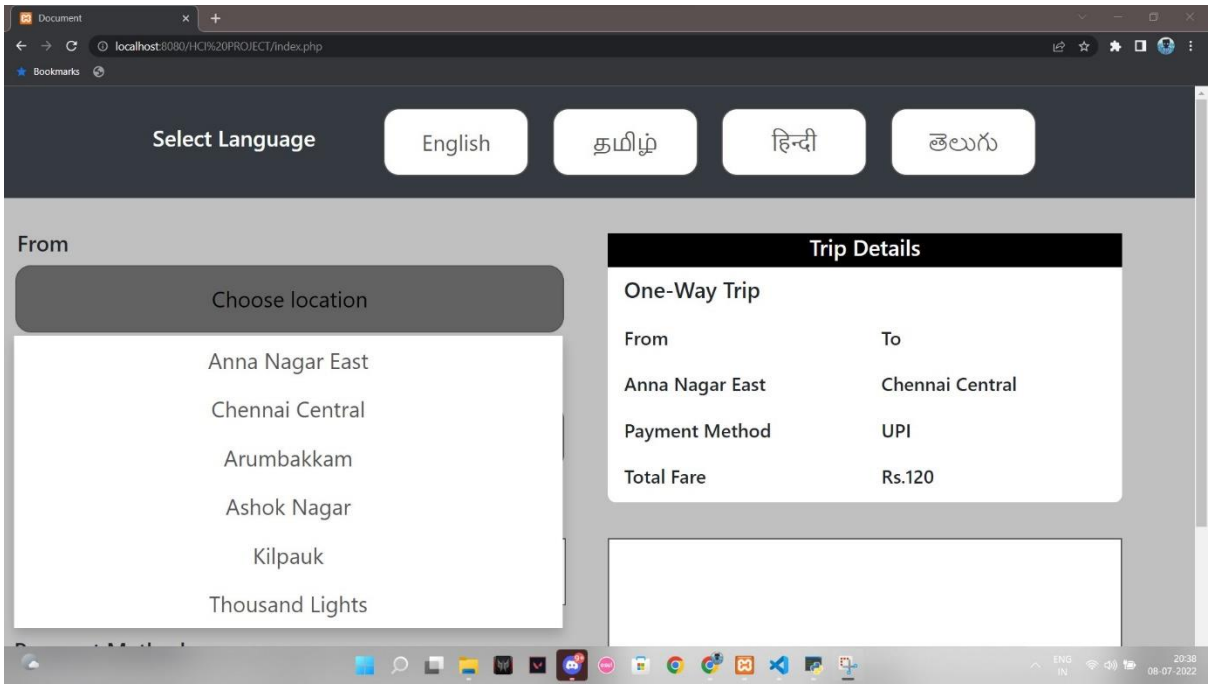
Task 1	Selection of Stations
Goal/Output	To successfully select the to and from stations from the ones available in thedrop down menus.
Inputs	The hand gestures on the vending machine that the user selects the station onthrough touch
Assumptions	• Users know how to use a hand gesture based device • User knows the to and from station
Steps	1. Press the drop down menu of from station 2. Select station from the options 3. Press the drop down menu of to station 4. Select station from the options
Time for Experts	~ 10 seconds
Instructions for Users	Make sure the hand gestures are working and you know the to and from stations
Notes	Make sure the correct stations are selected.
TASK 2	**Payment**
Goal/Output	To successfully make the payment for the selected token
Inputs	The gestures on the vending machine that the user selects the payment method on through touch
Assumptions	• Users know how to use a hand gesture device • User know the methods of payment they are offered.
Steps	1. Select the stations and generate amount to pay 2. Select payment method from the options 3. Follow the process to pay through the method selected. 4. Confirm payment and collect token
Time for Experts	~ 30 seconds
Instructions for Users	Make sure the touchscreen is working and you how to go about the paymentmethod that you choose
Notes	Make sure the correct token is being paid for.

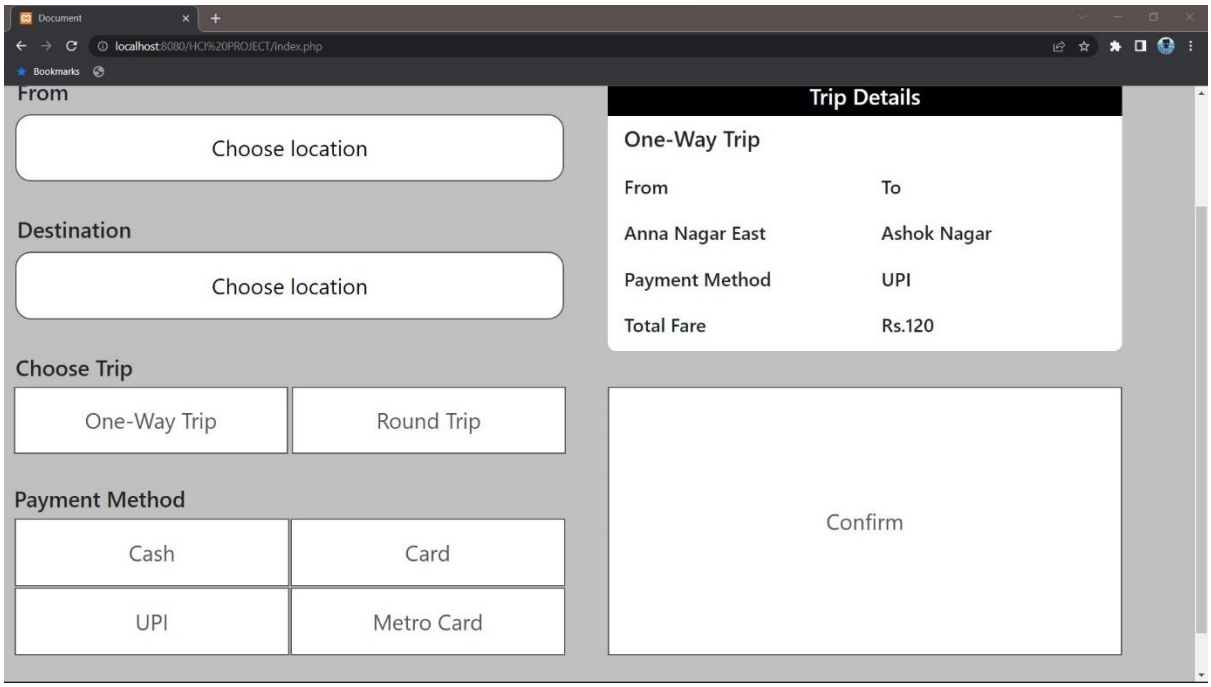
DESIGN

NAVIGATION MAP:



UI

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Bookmarks
From
Choose location
Destination
Choose location
Choose Trip
One-Way Trip
Round Trip
Payment Method
Cash
Card
UPI
Metro Card
Trip Details
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To
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Ashok Nagar
Payment Method
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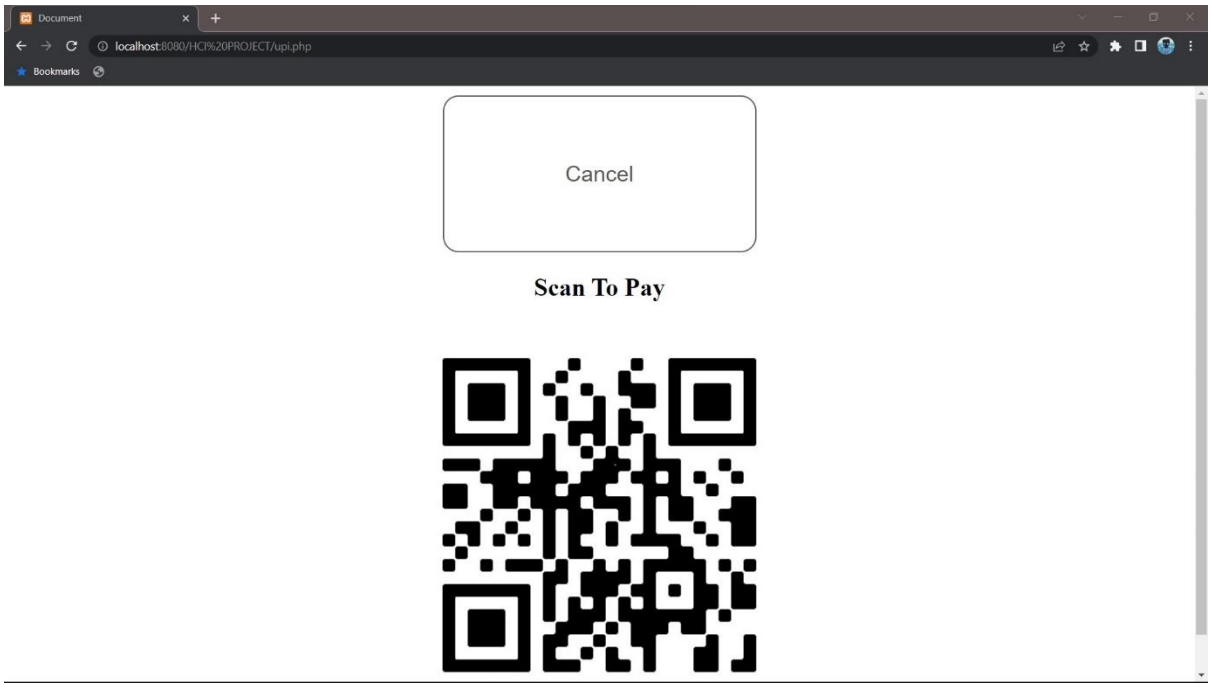
Total Fare
Rs.120
Confirm

Scan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Cancel
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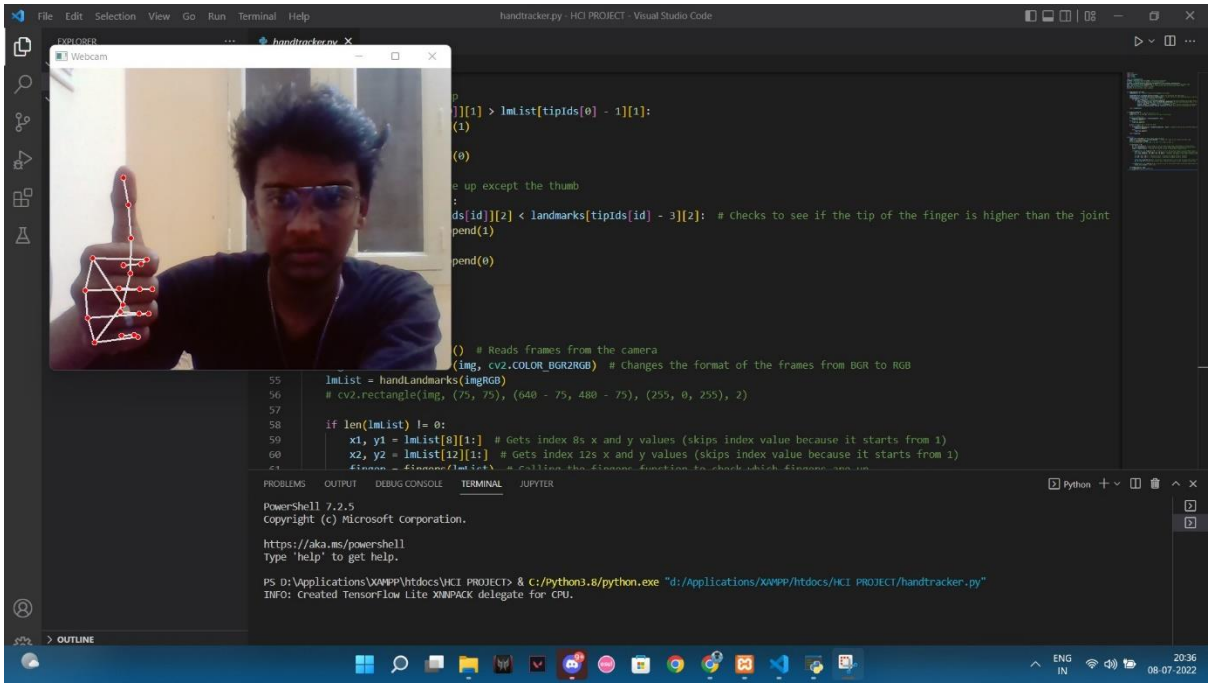
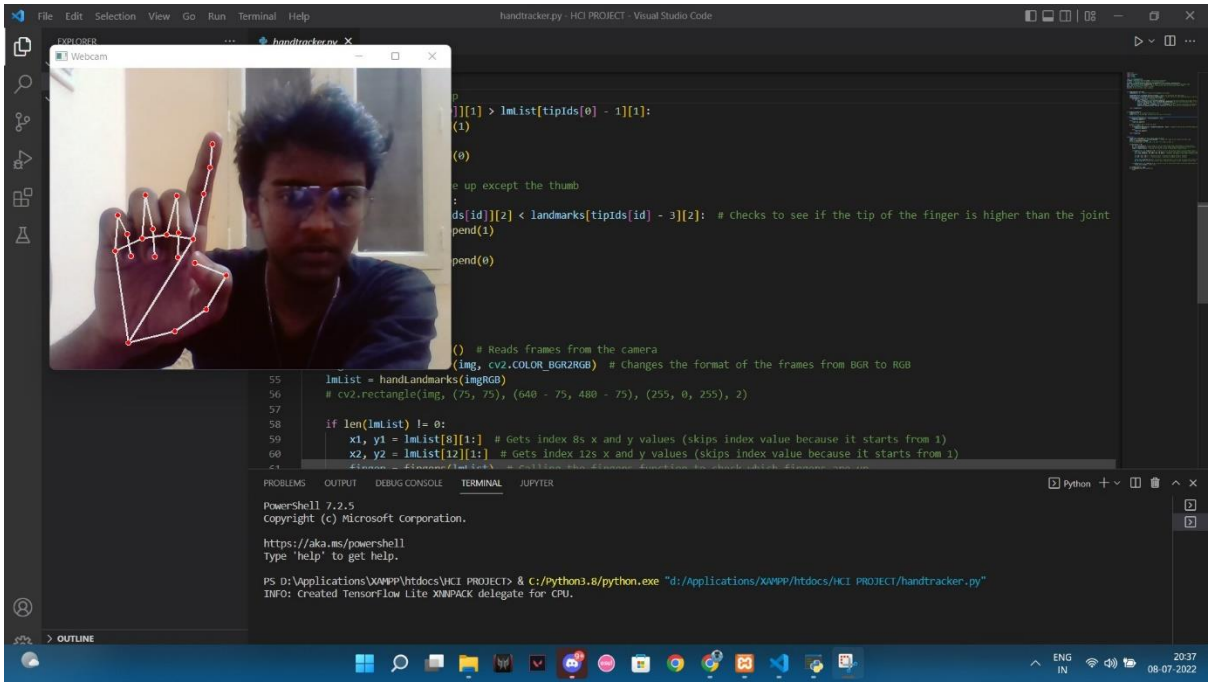
CODE

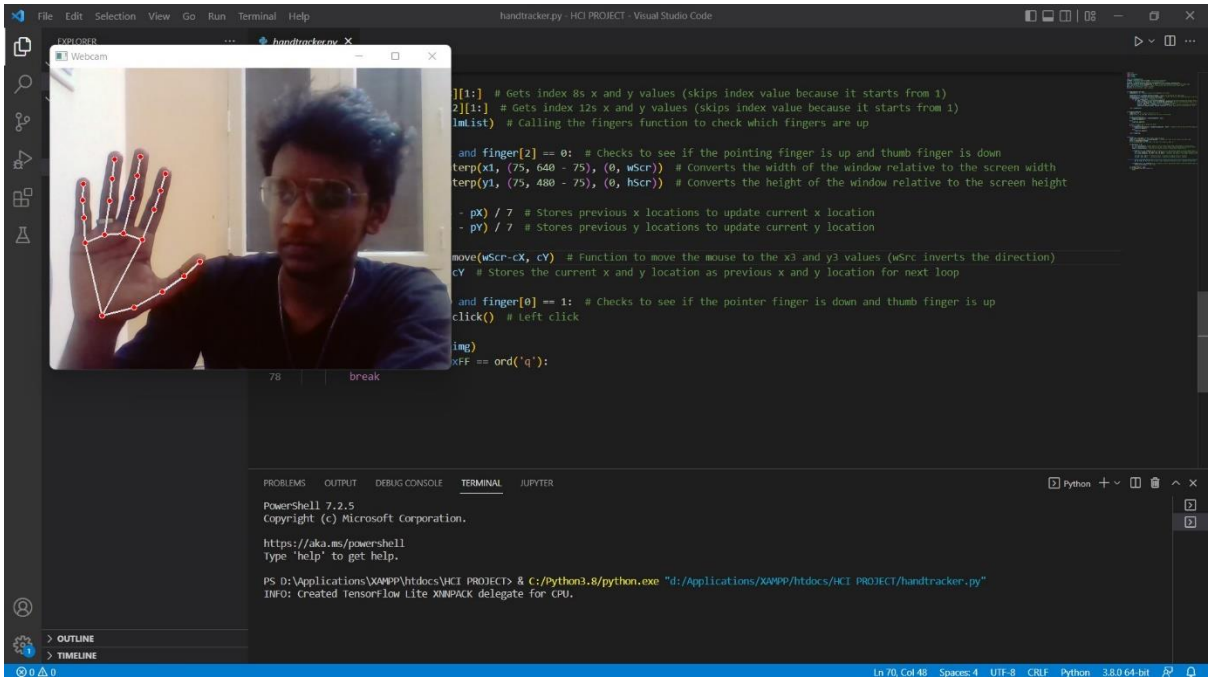
Okay Signal



Pointer



Hand recognization



CONCLUSION AND FUTURE WORK

Using this system we eradicated the hassles of day to day traveling. There is now no need to carry physical tickets / tokens or any other UID card/documents for the sake of traveling. With this proposed methodology,the user will be ensured a more comfortable and convenient travel experience.

A major future prospect of this project is to implement the same application in the form of a mobile application,through which the user can book tickets directly from their mobiles and there is no need for a separate kiosk for that purpose.

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