An Interactive Design using Human Computer Interaction for Autonomous Vehicles

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Abstract : *Human-Computer Interaction (HCI) techniques are gaining popularity in the automotive industry. The primary objective is this paper to discover ways how a User Interface (UI) in the vehicle can improve the driver's safety when using cell phones, and other electronic devices while driving. In this paper, we present a conceptual design that can be divided into three phases. The first phase 'Analysis' focuses on information retrieval and structuring. The second phase 'Design' gives a concrete interface implementation based on our results in phase 'Analysis'. The third phase 'Evaluation' performs a usability test on the implementation. In the 'Analysis' we develop a PACT analysis. In the 'Design' we explain the elements of our interface and give pictures to illustrate them. In the 'Evaluation' we execute a usability test in an imaginary driving situation using a paper prototype.*

Keywords — *HCI Design; Interactive Framework, Driver's Safety Model, PACT Analysis.*

I. INTRODUCTION

A few years ago, when the cell phone was launched, just a couple of individuals utilized it. Today even 10 years of age youngster carries one around constantly [1]. As per a survey conducted by Nokia, 80% of the European population keeps a cell phone in their pocket [2]. In any case, this is not the only electronic device people keep it, but they also carry smartphones with cameras, PDAs, and electronic pads. Due to the excessive usage of these electronic devices, the need in modern life will increase day by day.

From one perspective such as the availability of electronic devices can be helpful, yet then again likewise dangerous in certain circumstances. Utilizing cell phones while driving a vehicle can intensely occupy the driver from his genuine task which is driving. This is particularly the situation if the driver needs to utilize a hand to control the electronic device or much more terrible needs to take a device for instance when composing instant messages. Most of accidents and death ratio has occurred due to the usage of mobile and phones and text writing while deriving and as well walking [3,4].

We know a few people who know about that issue and continue utilizing cell phones while driving. We expect that individuals would prefer not to miss the functionalities offered by the electronic devices and have no option in contrast to the use of risks as described. We think that the incorporation of the control of the electronic devices into the vehicle controls can lessen the degree of interruption and in this way increase the security altogether [5]. A driving assistance system can help drivers to control the behavior while deriving in certain circumstances.

In this paper, we present an interactive design framework using HCI techniques. The design is based on the structure of a vehicle worked in UI limiting the degree of interruption. It should enable drivers to control all the required functions of their cell phones. We likewise need to state how a driving help framework must be acknowledged from the UI perspective to help the derivers best in his activities.

We consider that the cell phones are associated with the vehicle somehow and give the specialized capacities to be constrained by the vehicle controls. The connectivity of the cell phone controls is technical and we assume that the connection is established automatically once the driver entered into the vehicle

To achieve the goal of framework design we consider three major steps; (1) analysis, (2) design, and (3) evaluation. In the analysis phase, we investigate the current technologies available in the market and discover the potential user's requirements through questionnaires. Afterward, we present the PACT framework for findings.

In the design phase, we present a physical design based on the findings along with task analysis.

Finally, in the evaluation phase, we test the prototype with the help of a usability test and also highlight the problems with our thoughts.

The rest of the paper is structured as follows. Section 2 presents the data about the user. Section 3 focuses on the PACT analysis while Section \ref{sec:4} explores the transformation and verification of XOR constraints. Section 4 presents the requirement section while section 5 discusses usability factors. Section 6 describes the conceptual design and section 7 explores task analysis. Section 8 elaborates related work Finally; Section 9 provides conclusions and future directions.

II. ABOUT THE USER

One important input we need before we can start to design a user interface is the experience and opinion of the potential users this system will be made for.

A. Questionnaire 1

a) Contents

We need to find out which devices and functionalities our interface should be able to deal with and which of them are most important. Therefore, we created a questionnaire that asks first which devices and functionalities people are using, second which they could consider using in the future, and third which they currently do not use for safety reasons. Also, some questions focus on the personality to present the character of the questioned group.

We distributed the questionnaire among random people we knew. The questionnaire was sent by email and we accepted answers within a week. We chose to let people answer in free text because we did not want limited choices but allow ideas beyond our expectations. The answers were evaluated manually by generating a table containing the core opinions and according to the number of persons. The results of this evaluation can be seen in the following charts. Where it makes sense there were several answers per person possible.

b)Results

In this section, the perspective questions and answers are discussed. These questionaries' shows detailed answer that will help to develop a conceptual design for derivers safety while deriving. Figure 1-9 shows different questions and answers.

1. What is your age, home country, gender?

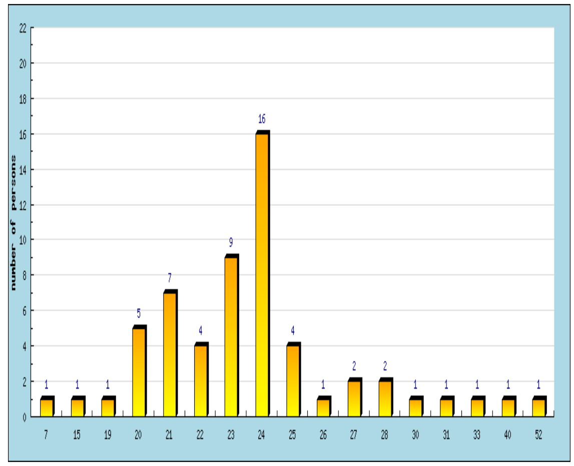

Figure 1: Results of age.

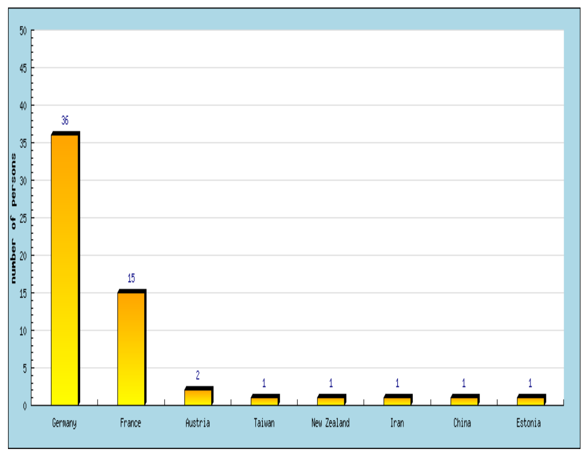

Figure 2: Results of the home country.

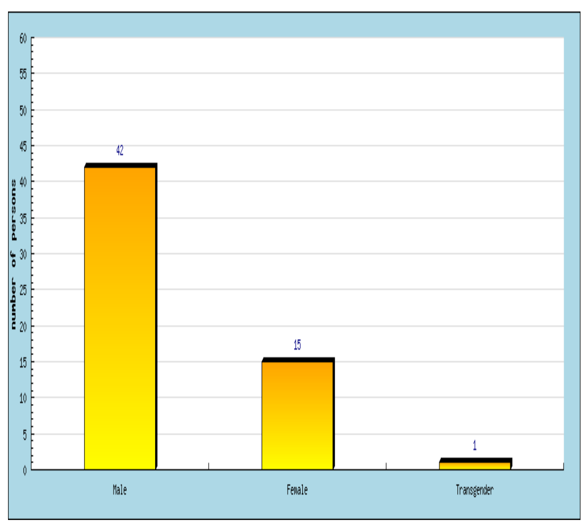

Figure 3: Results of the gender.

2. Which mobile devices (eg. mobile phone, mp3 player ...) do you use while driving?

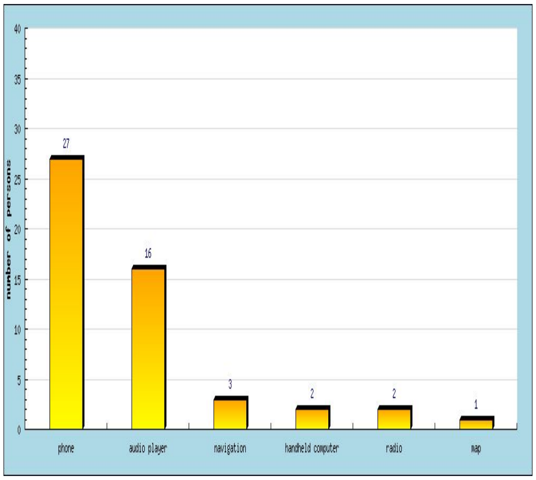

Figure 4: Results of the electronic devices.

3. Which of their functionalities do you use while driving (eg. calling, SMS, listening to music...)? How often do you use each one of them (often, occasionally)?

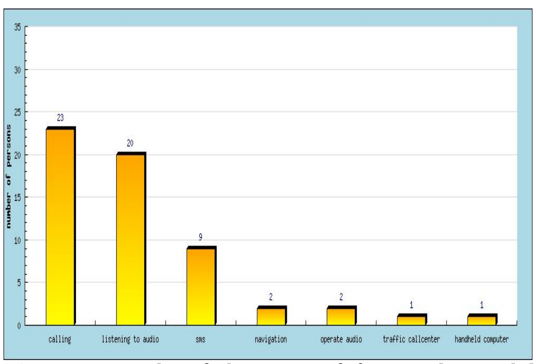

Figure 5: Results of the usage of functionalities while deriving.

4. Are there other devices/functionalities you do use in normal life but you do not use it in the car? Which ones and why?

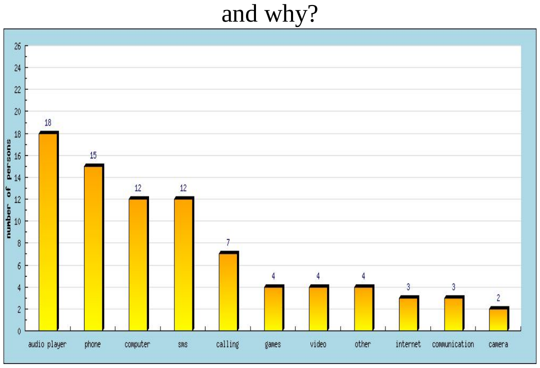

Figure 6: Results of the usage of other devices/ functionalities in normal life.

5. Which other devices/functionalities (eg. email, internet) could you think of using in the car in the future (if they were cheap and safe to use)?

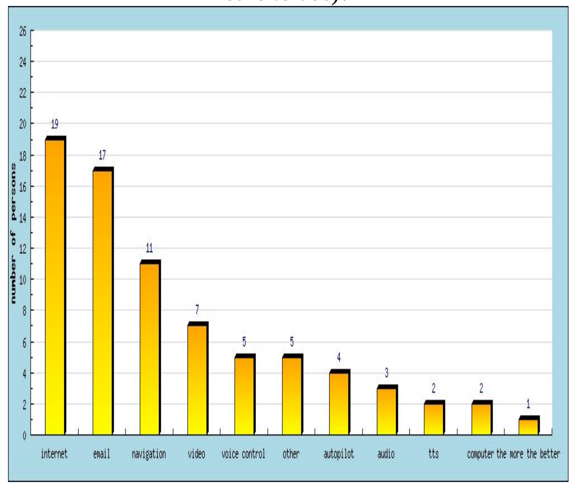

Figure 7: Results of the usage of other devices/functionalities in the car.

6. Imagine you phone somebody while driving and notice that you come into a dangerous traffic situation. What would you do?

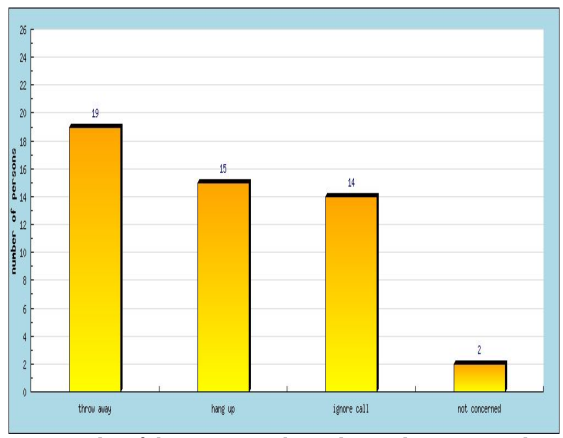

Figure 8: Results of the receiving phone during deriving in a dangerous situation.

7. Would you like to get informed by the car in such a situation? Would you even like to get assistance?

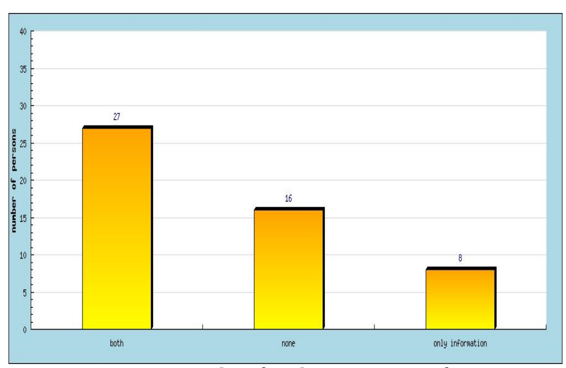

Figure 9: Results of seeking assistance from the car.

The following conclusions are not only influenced by the charts, but also by the information that was lost during the abstraction from the free text. The questioned persons are mostly from Germany and France and the age ranges mainly from 20 to 25.

Already today about half of them use their mobile phone while driving, primarily for initiating and accepting phone calls but also for reading and writing SMS. Only very few people use hands-free sets. Furthermore, they use audio players. All of these devices require interaction with at least one hand and also occasional visual contact with the device. Consequently, people certainly experience a lot of distractions.

Among the people who avoid the usage of such devices in the car for safety reasons, still about half uses the same devices outside the car. So there is a potential need for the in-car usage if it could be performed safely. Another device people mentioned here is a computer.

In the future people about fourth to third of the people could imagine also using the internet and email. A sixth also wants to use navigation (but since we had open answers maybe apart just did not come up with that idea but would use it).

Interesting is also that a third of all people would through away their phones or hang up in a case of emergency to get back more control over the car. If the time needed for that would be eliminated by the use of a system that allows full control anyway this could be a serious gain.

In the question about driving assistance systems, we see a clear separation into people who love the idea of being assisted and other people who deny any electronic assistance.

B. Questionnaire 2

a) Contents

As a further step, it is of interest to what users think of driving assistance systems. There are already such systems in use like ABS or ESP but they do not very obviously affect the driving behavior. Future systems that might break automatically or keep the car in the track are much more interfering and we want to find out the driver's view on this. Especially we want to find out to what extent and in what correlation to mobile devices such systems are possibly favored.

A final question focuses on notifications about the interface and should give us a little guidance on that for the physical design of our user interface proposal. Finally, we allowed free-text comments.

This time, we distributed the questions to a little extended group than the first one. Again we sent the request to via email, but this time the actual questionnaire was realized as a web page. The last question allowed several answers, but all others only one. The result table was this time automatically generated by a software program. Thus, the evaluation was very straight forward and the results are completely presented by the charts.

b) Results

In this section, the perspective questions and answers are discussed. Figure 10-19 shows different results for certain questionnaires to understand the requirement from different age groups.

1. Personality (Age, Home country, Gender)

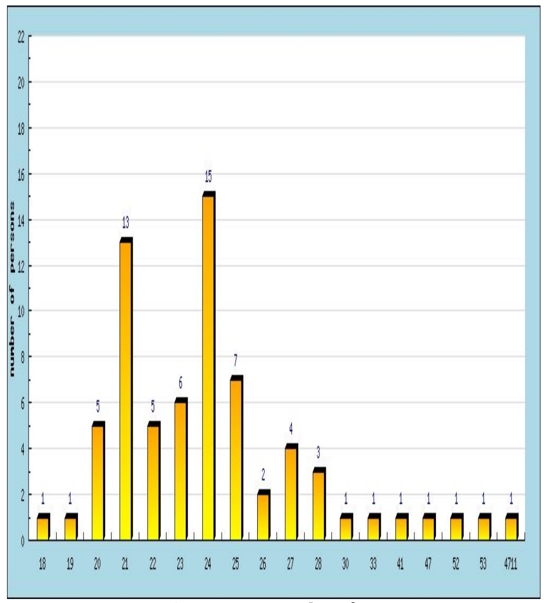

Figure 10: Results of age.

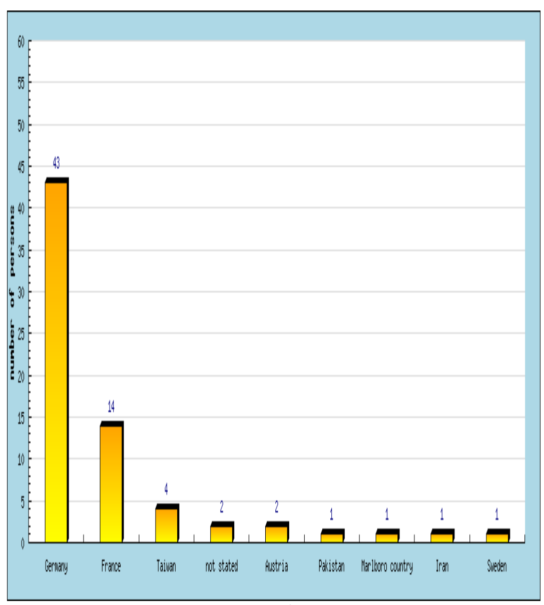

Figure 11: Results of the home country.

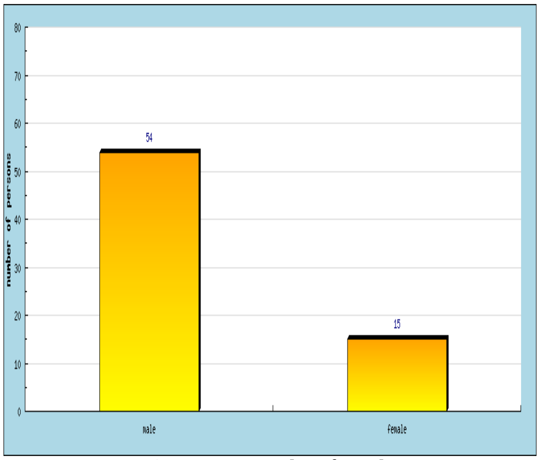

Figure 12: Results of gender.

2. Did you answer questionnaire 1?

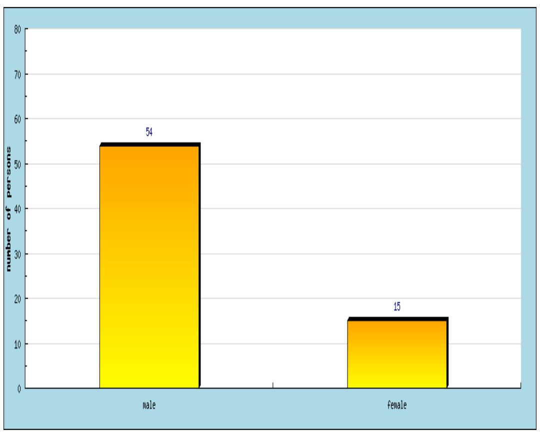

Figure 13: Results of given answers in the form of yes or no.

3. You are driving a car in a high traffic time and you are speaking with someone over the hands-free phone. Suddenly the car in front of you breaks very hard. What would you want a driving assistance system to do?

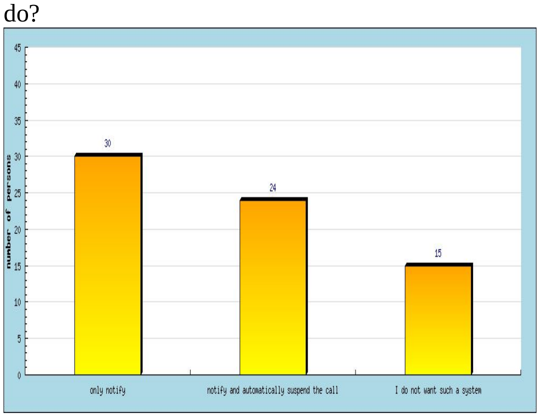

Figure 14: Results of seeking assistance from the vehicle.

4. In the same situation: Instead of suspending your call, would you like the system to automatically keep enough distance to the car in front of you?

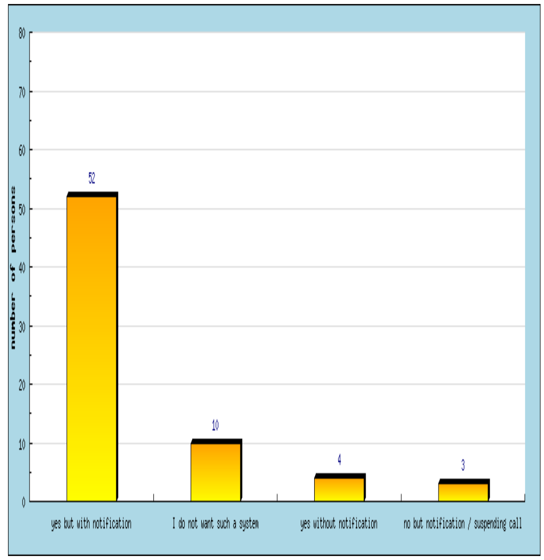

Figure 15: Results of seeking assistance from the vehicle while phone call.

5. When would you like the driving assistance system to give lateral control support (automatically keep a distance from cars driving right and left of you)?

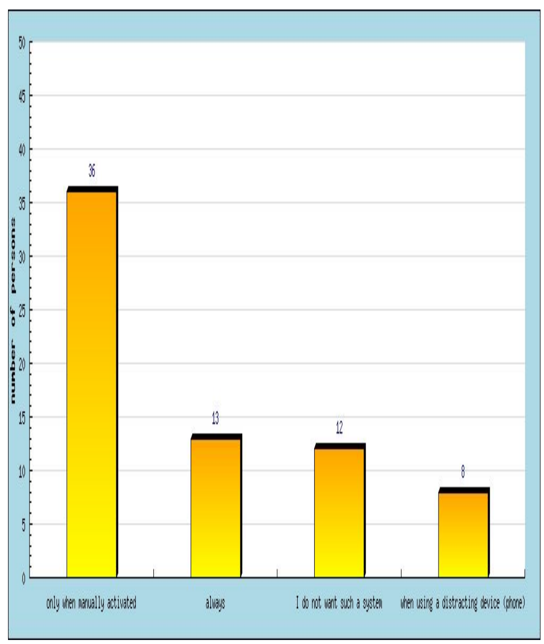

Figure 16: Results of seeking assistance from the vehicle while phone call keeping a distance.

6. What would you like a pedestrian protection system to do to prevent a collision?

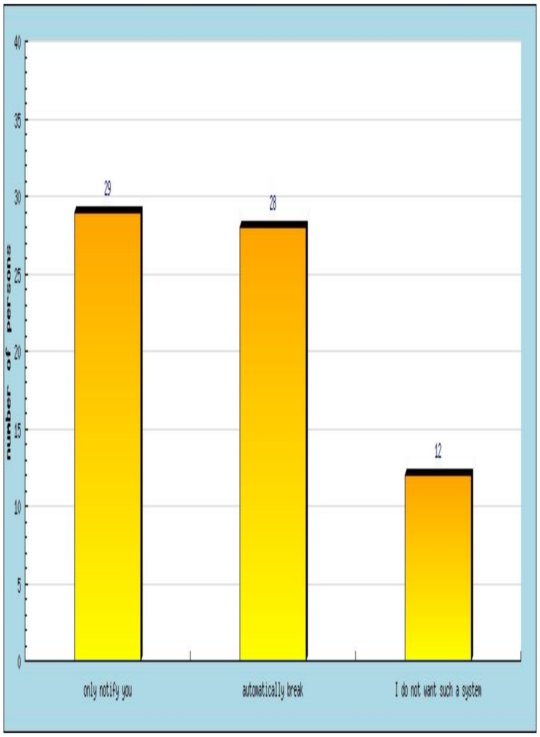

Figure 17: Results of seeking prevention for pedestrian protection system.

7. At what speed do you want the system to be active?

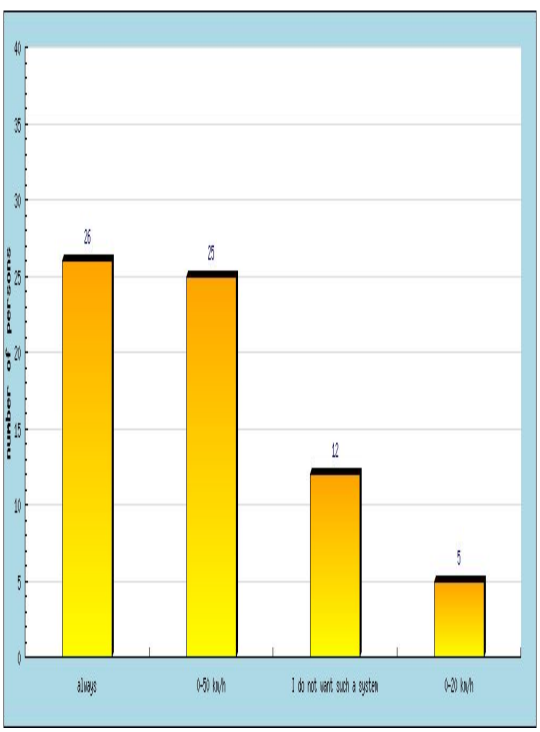

Figure 18: Results of speed activation.

8. What kinds of notifications would you like in general?

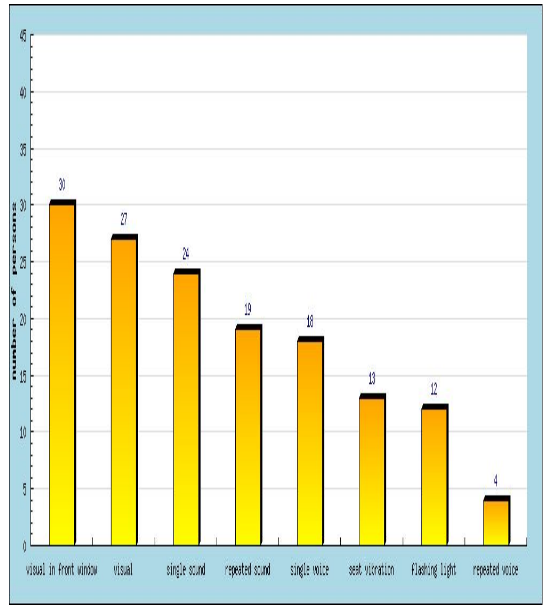

Figure 19: Results of notification.

The change of the group can be noticed in the slight changes of the personal factors of the questioned group. Two thirds already answered the first questionnaire.

One thing that can be seen from the results is that opinions spread. Many people want the active interference of a driving assistance system in certain situations to prevent accidents. But they also want feedback, that when the system reacted. A mentionable part only wants feedback. However, we cannot identify that people see a correlation in the use of mobile devices and the activation of the driving assistance system.

Concerning the activation of such a system, most people split up into three groups: People who want the system to be active all the time, people who want to manually activate and deactivate the system on demand, people who want the system deactivated all the time. Manual activation and deactivation would therefore fit most people’s demands.

The chart about different notification clearly shows clear preferences, headed by visual notifications followed by non-verbal sound notifications.

In the comments, quite a few people express concerns that they do not trust electronic systems in this context. Some demand that a system has to be extremely mature until they would like to use it

Table 1: Functionalities the user

Interface	Functionalities	Audio control	Physical control	Usage frequency (low/medium/high)
Mobile Phone	Make a call	x	x	medium
	Make a dialed, answered or missed call	-	x	low
	Answer a call (automatic answer mode)	(x)	x	high
	Reject a call	(x)	x	high
	Listen voice mail	x	x	medium
	Write a sms	x	-	medium
	Read a sms	x	x	medium
	Adjust the volume of the ring tone	-	x	low
Mp3 player	Listen a song	x	x	medium
	Listen to an album	x	x	medium
	Listen to an artist	x	x	medium
	Listen to a play list	x	x	medium
	Stop the music	x	x	high
	Next song	x	x	high
	Last song	x	x	high
	Make pause	x	x	high
	Select repeat mode	x	x	low
	select shuffle mode	x	x	low
	Adjust the volume of the music	-	x	high
	Mute the sound of the music	-	x	high
bluetooth	Turn on/off the bluetooth	-	x	low
Voice Recognition	Mute the microphone on/off	-	x	
	Turn on/off the voice recognition	-	x	high
	Set the voice language	-	x	low
ADAS	Turn on/off the safe following system	-	x	high
	Turn on/off the lateral control support	-	x	high
	Turn on/off the pedestrian control	-	x	high

III.THE ANALYSIS OF PACT

One factor is designing the user interface according to user criteria: to accomplish this task pre-investigation study was planned, which gave the

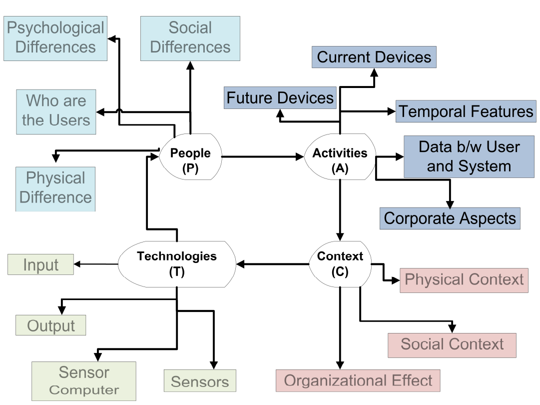

Figure 20: PACT analysis.

crystal clear idea of the current functionalities and missing functionalities. With that identification of users was also essential. To achieve that a PACT analysis was carried out accompanied by several user requirements, usability factors, and guidelines. The PACT analysis gave us an obvious scene about users, activities, contexts, and technology. Requirements have a very vital role in designing the interface, all the requirements were intended by consideration of the user's need. Figure 20 shows the detailed aspects of the PACT analysis.

IV.REQUIREMENTS

In our design, we have to consider three kinds of technologies, the commands on the steering wheel, the voice recognition with the text-to-speech system, and the display on the monitor screen and the windscreen.

Table 1 lists the functionalities the user should be able to control with the car built-in interface. In association, we present two associated estimations. One is about the usage frequency which tells us which functions should be more easily reachable in the final interface. The other one shows which driver's controls are possible for each functionality due to logical reasons and distraction. However, all these functions should be controllable by a co-driver.

A cross means the way of control is possible, and a dash means that it's not possible. A blue cross symbolizes that the function is new, it doesn't exist on the market, and a green-colored stands for an already available control function. There are three frequency levels: low, medium, and high. All the high-level functions should be very quickly accessible over the user interface.

V. USABILITY FACTORS

There are several usability factors to consider [6,7] but we have listed the most important ones that are listed below.

a) Fit of use

The car should allow the user to carry out his task. In our project, we cannot develop all the available tasks of the devices, first because we don't know all the devices and because it could be too complicated and too dangerous for the user to use all of them. With the first questionnaire, we know what kind of task the user would like to do, so we will develop only the most important tasks. Anyway, the user can still use his device to achieve the task.

b) Ease of learning

Ease of learning is one of the most important factors for this project. The user should be able to learn how to do, what to say, which button press without reading the manual or looking at the interface. The user needs to keep his concentration on the road and not on the interface that's why for any task the system should help the user to carry out the task without losing his concentration.

c) Task efficiency

The frequent user could be more demanding and have different expectations. We need to consider carefully all the situations the frequent user could encounter. And in all these situations, the interface should be efficient.

d) Ease of remembering

Ease of remembering is also very important in this project. The user should remember which button press and what to say without looking at the steering wheel or the menu. The more the user will remember easily more he will concentrate on the road. The voice command should be easy to remember and it should not have too much button on the steering wheel.

e) Subjective satisfaction

Subjective satisfaction is important because if the user doesn't like the system, he will not use it and use his device instead. And in this case, it will be dangerous for the user and the other drivers.

f) Understandability

The user should understand what the system is doing, it's important to notify the user which action is undertaken like calling someone or sending text messages.

g) Robustness

Robustness is the resilience of the system when confronted with invalid input. Drivers under stress or distracted by something may misuse the user interface. This must not cause harm in any case. What is more, the driver should be able to easily leave an unintended, annoying state of the system (eg. much too loud music).

h) Cooperative aspects

The driver should be able to give complete devices control to the co-driver when one is available.

VI. CONCEPTUAL DESIGN

We need to propose the plan of a vehicle worked in UI limiting the percentage of interruption. It should enable drivers to control all the required functions of their cell phones. We additionally need to state how a driving help framework must be acknowledged from the UI perspective to help the deriver best in his activities.

We expect that cell phones are associated with the vehicle somehow or another and give the specialized capacities to be constrained by the vehicle controls. The acknowledgment of such an association and control is doubtlessly specialized and not part of this task. Figure 21 shows the conceptual design of the system.

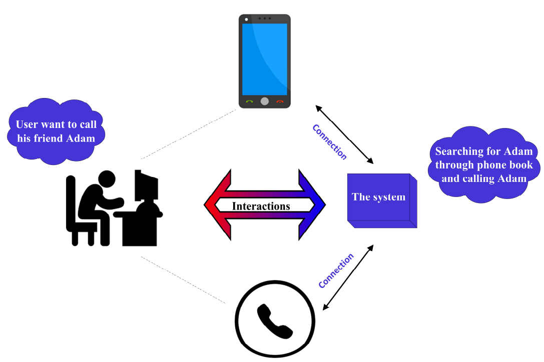

Figure 21: Conceptual design of an interactive system using HCI techniques.

To have a simple learning interface, our structure model must be an incredible same as the deriver's psychological model. Furthermore, the driver will likely attempt to associate with the system a similar way he is connecting with his cell phones. Yet, the framework must be faster and simpler to utilize. So we need to locate the correct model between the one from the device and a simpler one.

Seppelt et al. [8] mentioned some fascinating objective facts about mental models that we should consider.

Above all else, mental models are inadequate and individuals overlook subtleties. So we can forget about certain means without going out of the psychological model.

Individuals' capacities to run or give a shot are seriously restricted, if the model doesn't coordinate, individuals will have a few challenges to discover another way.

Mental models don't have firm limits, comparable devices and activities get mistaken for another.

Mental models are closefisted. Individuals are happy to limit blunders and start again instead of attempting to recoup structure a mistake. Criticism, drop, and restart is very important.

As we said previously, the user will attempt to discover a similarity between the devices and the interface. The structure model must have a specific intelligence, shared trait, and utilize a similar jargon than the device.

We expect that the driver's cell phones are associated with the vehicle somehow or another and give the specialized capacities to be constrained by the vehicle controls. We propose a remote connection between the device and the vehicle as this offers comfort to the user. Moreover, we recommend standardization of the specialized control interface so every device works with each vehicle. The control interface must have the option to control every one of these elements of a cell phone that are required by the driver while driving. The capacities gave by such a control interface are straightforwardly incorporated into our interface. Figure 22 shows the interactive design.

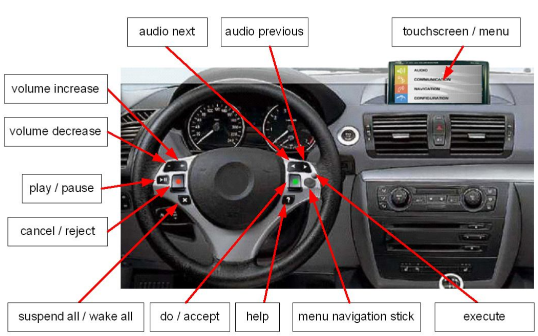

Figure 22: Interactive design using a modern control system.

Close to the UI components appeared there are a few switches to control the driving help frameworks. What is more, the vehicle is furnished with a two way sound framework. The speaker framework is utilized to play sound and give sound input or data. The receiver framework is utilized to record the user's voice which will be interpreted at specific focuses.

a) Operational Design

Graphical menus are common for mobile devices. Our graphical display is like many menus on the market and should therefore be easy to learn. The devices connected to the car are automatically integrated into the menu – one entry for each device. The display is a touch screen and device names can be pressed to enter the device menu. The items in the device menu represent the functions controllable through the interface. Everything can be controlled through the graphical menu.

The menu always only displays the menu showing all devices or a device's menu or submenu. The actual path in the hierarchy is also shown and touchable to always show the user where he is on the menu and give a way to get higher in the hierarchy.

The structure of the menu gives the user the possibility to build up a mental model and will be used in other parts of the interface, too. The possibility to control everything over the touch screen enables the driver to make use of a co-driver and giving away the task to control the devices.

Besides touching the screen the driver can navigate through the menu using the joystick attached to the steering. The usage represents a left-to-right hierarchy. The vertical axis changes the menu item. The right direction enters a submenu, while the left direction goes back to a higher menu. To support the robustness of the system no action can be executed with the stick itself. This means that nothing can happen accidentally while navigating the menu. To finally execute a menu item that can be executed the additional button "execute" is available. This can be for example a person selected from the phone's address book to call her.

However, the driver is not intended to look at the menu while driving. Therefore every menu item is read through the speaker system so the driver does not need to look at the interface once he has a mental model of the menu.

b) Representational Design

The menu as presented in this paper can only be considered as an outline.

We only made use of non-intensive colors as the driver should not be attracted to them as he is not intended to look at the display.

While navigating the menu with the stick, the selected menu item is highlighted. Different colors of the font of the item help the distinction of the different devices. Though, it is important to assure a sufficient contrast with the background. The display may automatically adapt the contrast and intensity to the lightness of the environment.

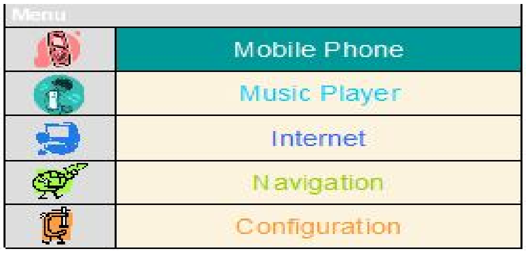

Figure 23: Navigation menu for mobile phone.

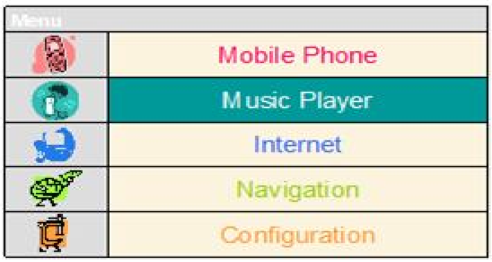

Figure 24: Navigation menu for music player.

Figure 23, 24 and 25 shows the menu for mobile phone, music player, and dialed number. After entering a device's submenu, the symbol representing the device is highlighted. The font color of the menu items corresponds to the font color of the device entry in the main menu. Also, notice the hierarchy path displayed at the top. To let the user, know that there are more items than displayed in the phonebook, arrows are displayed at the top and the bottom.

Figure 25: Navigation menu for dialed numbers.

When a certain action is performed, the display of the status informs the user about the current situation.

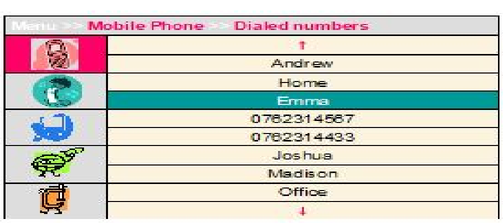

Figure 26: Sample dialed number.

Figure 27: Sample contact.

Figure 28: Calling sample contact.

Figures 26 to 28 show the menu to call a contact. The development of the menu is left at that state as it is mainly used for the co-driver and to give the driver a mental model of the menu hierarchy that he can use to handle the control without visual contact to the menu. It can also serve as a fallback solution for the driver if he forgets how to operate the other parts of the interface for example. It is an assured and generally easy way to operate all functions.

The screen itself is situated in the middle of the car's dashboard.

c) Operational Design for Voice Command

Instead of using the menu, there is a shortcut offered to the driver. This enhances the task efficiency and gives more advanced users a more satisfying alternative to the long way through the menu. The "do/accept" button has two functionalities. First, we focus on the "do". Any time he wants to act he can press the "do/accept" button. Then the volume of playing audio is automatically temporarily reduced and he can speak a voice command. This can be for example "Call Andrew". The system repeats the command is understood and if the command was recognized correctly, thus driver agrees he can press the "do" button again. If he disagrees he can press the cancel button.

Each execution of a menu item is associated with a voice command, e.g. "Call Andrew". This one is the short voice command. Several devices may have equal short voice commands, especially multiple devices of the same type (two mp3 players) which our system supports. Therefore, there is an additional long voice command which is unique. It equals the path in the menu hierarchy seen in the graphical menu plus the short voice command, e.g. "Mobile Phone - Dialed Numbers – Andrew – Call Andrew". The long voice command can be rather seen as vocal menu navigation. To make the user learn and remember the short voice it is always spoken by the system when the corresponding action is executed. This can be done by using the touch screen, navigation with the stick, or as described above using a voice command.

When the driver tries to perform an action using a short voice command which is ambiguous then the system tells him the long voice commands available matching the possible actions of the short voice commands.

It is not always the case the driver comes up with the idea of action. It can also be the case that there is an incoming message or incoming call or the navigation system offers to re-route the car due to upcoming traffic jams on the planned route. This may require the person to immediately react to the situation. An accept/reject choice fits the most practical situations we could think of. So the button "do/accept" is now used to accept an incoming call or make the system read an incoming message via the microphone over a text-to-speech synthesizer. The button "cancel / reject" reject the call or stores the message on the mobile phone without reading it.

As the "do/accept" button induces a positive action it is colored with a green dot whereas the "cancel / rejects" button causes a negative action and is therefore colored with a red dot. These colors are typically used with this meaning so it should help the user to intuitively learn or recall the functions of the buttons.

As the two buttons have opposite meanings they should not be confused by the user. To avoid that, we placed them on different sides of the steering. It should be easy to learn and remember to subconsciously associate each of the two hands with the negative respectively the positive outcome of an action.

Because these buttons are more important than most of the others they are bigger. Because of their association, they are of equal shape.

VII. TASK ANALYSIS

To illustrate the driver's intended interaction with the system we perform a task analysis covering important actions. Like the design, this section does not claim to be complete in terms of the description of every possible action. It rather helps to imagine the usage and develop other activities consistently.

Task analysis for the phone:

0. Make a call using voice recognition

1.1 Press the button to *accept/do* (audio player volume decreases automatically)

1.2 choose 1.2.1 or 1.2.2

- 1.2.1 Say "Call" + name of the contact
- 1.2.2 Say "Call" + the phone number

1.3 Wait for confirmation (System repeats "Call" + target)

1.4 Press the button to *accept/do*

1.5 Perform common phone call

1.6 Press the button to *reject/cancel* (audio player volume resets automatically)

0. Answer a call

1. Press the button to *accept/do* (audio player volume decreases automatically)
2. Perform common phone call
3. Press the button to *reject/cancel* (audio player volume resets automatically)

0. Reject a call

1. Press the button to *reject/cancel*

0. Read a new SMS

1. Press the button to *accept/do*
2. Listen

0. Send an SMS (no false-recognition correction implemented)

1. Press the button *to accept/do*
2. Enter Phone Number
   - 2.1. Say "Create SMS"
   - 2.2. Wait for confirmation
   - 2.3. Press the button *to accept/do*
3. Speak the content of the SMS
4. Press the button *to accept/do*
5. Say "Send to" + name of the contact
6. Wait for confirmation
7. Press the button to *reject/cancel*

Task analysis for an mp3 player:

0. Play music (Plan do 1 or 2)

1. using voice recognition
   - 1.1. Press the button to *accept/do*
   - 1.2. Say "MP3 player"
   - 1.3. Say "Play" + name of the title or the artist or the album or the genre or nothing (play last song)
   - 1.4. Wait for confirmation
   - 1.5. Press the button to *accept/do*
2. using steering wheel buttons (do 2.1 or 2.2)
   - 2.1. Press the button *play/pause* (play last song)
   - 2.2. Select the song with the audio next/audio previous buttons

0. Stop music (Plan do 1 or 2)

1. using voice recognition
   - 1.1. Press the button to *accept/do*

1.2. Say "MP3 player"
1.3. Say "stop"
1.4. Wait for confirmation
1.5. Press the button to *accept/do*

2. using steering wheel buttons
   2.1. Press the button *play/pause*

0. Next song (Plan do 1 or 2)

1. using voice recognition
   2.1. Press the button to *accept/do*
   2.2. Say "MP3 player"
   2.3. Say "Next"
   2.4. Wait for confirmation
   2.5. Press the button to *accept/do*
2. using steering wheel commands
   2.1. Press the button *next to/last*

0. Repeat music using voice recognition

1. Press the button to *accept/do*
2. Say "MP3 player"
3. Say "Repeat song" or "Repeat all"
4. Wait for confirmation
5. Press the button to *accept/do*

0. Adjust the volume of the music

1. Press the buttons +/-

0. Turn on the voice recognition (turn off automatically)

1. Press the button to *accept/do*

VIII. RELATED WORK

The present vehicles have countless user interfaces, from those identified with the occasion to-second control of the vehicle to those that permit the utilization of data and diversion. The majority of the exploration in this area is identified with manual driving. With ongoing advances in robotized vehicles, there is an expanded consideration regarding user connections as they identify with computerized vehicles. In investigating human-machine connection for both manual and robotized driving, a central point of contention has been how to make safe in-vehicle associations that help the driver in finishing the driving assignment, just as to permit drivers to achieve different non-driving errands. In computerized vehicles, human-machine associations will progressively permit clients to recover their time, with the goal that they can invest energy in non-driving assignments. Given that it is far-fetched that most vehicles will be fully automated rather than later, there are additionally critical endeavors to see how to enable the driver to switch between various methods of computerization [9].

With the growing era of computer technology, human-computer interaction technology innovation has experienced the improvement cycle of "order line interface", "graphical UI" and "common UI". This work investigates the utilization of minimal effort Kinect body sensor, in near the reason of individuals' habits, let users collaborate with the virtual scene roaming framework characteristically. Utilizing the Kinect skeleton following innovation, the human stance is perceived through the relative situation between joint focuses, and four sorts of self-characterized stances are utilized to control the difference in camera's view edge to acknowledge virtual scene roaming. The calculation of this strategy is basic, it understands the regular communication among human and computer, and gives reference to the development of related frameworks [10].

Advances in Artificial Intelligence (AI) outline opportunities and difficulties for UI structure. Standards for the human-AI association have been discussed in the human-PC collaboration network for more than twenty years, yet more investigation and development are required considering propels in AI and the developing employments of AI advancements in human-confronting applications. The work investigates 18 for the most part appropriate rules for human-AI collaboration. These rules are approved through numerous rounds of assessment incorporating a client concentrate with 49 plan experts who tried the rules against 20 well known AI-injected items. The outcomes confirm the importance of the rules over a range of cooperation situations and uncover holes in our insight, featuring open doors for additional examination [11].

Drone Chi is a Tai Chi propelled human-drone connection experience. As a plan design research venture, arranged inside somaesthetic association structure, where a focal theme is developing real and tangible gratefulness to improve one's satisfaction. Drone Chi explores the capability of self-governing micro quadcopters as a planned material for somaesthetic HCI. Through a semi ordered record of the structure cycle. Taking a moderate and open-finished structure research approach, authors iteratively built up the undertaking through somaesthetic, item plan, and building points of view and drew vigorously on plan analogies and symbolism for motivation. This raised the impact of the soma among limited designing boundaries and ease of use necessities [12].

Interactive Machine Learning (IML) looks to supplement human recognition and knowledge by firmly incorporating these qualities with the computational force and speed of PCs. The intuitive cycle is intended to include a contribution from the user however doesn't need the foundation information or experience that may be important to work with more customary AI procedures. Under the IML cycle, non-specialists can apply their space information and understanding over in any case inconvenient datasets to discover examples of intrigue or create complex information-driven applications. This cycle is co-adaptive and depends on the cautious management of the collaboration among humans and machines. UI configuration is central to the accomplishment of this methodology, yet there is an absence of solidified standards on how such an interface must be executed. This work presents an itemized audit and characterization of Interactive Machine Learning from an intelligent frameworks viewpoint. Authors proposed and depict a basic and conduct model of a summed up IML framework and distinguish arrangement standards for building powerful interfaces for IML. Where conceivable, these rising arrangement standards are contextualized by reference to the more extensive human-PC association writing [13].

IX. CONCLUSIONS

In this paper, we presented the conceptual design and physical design using a human-computer interaction technique to protect the driver to use mobile devices through a supporting user interface. It will help the driver to remove his fear while driving because this kind of interface provides a degree of safety. We also discussed the usability issue that includes the usage of the system with task analysis. Here the usability is dependent on conceptual design and physical design. The conceptual design was carried out to capture the model of the user's communication with the interface. The user's model and our design model could be the same. Similarly, the physical design model told the user about the visualization of the interface. As future work, we will present a second round of the iterative development needed for this project. Several other rounds of analysis, requirements, and design should be developed.

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