Human Computer Interaction

Term Report

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Transforming Visual Experiences
Using
Emotion Recognition- EMOLYSIS TOOL

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ABSTRACT

This report examines the factors that initiate emotions both positive and negative in users when interacting with any interface and explores the effects of these emotions on the cognitive learning of the users. One of the challenges confronted today in the field, human computer interaction (HCI), is to build interfaces that accomplish ease of use objectives, but at the same time pleasing to the users.The primary target of this research is to improve comprehension of the emotions and intuition incorporated in an interface that supports user state of mind and cognitive learning to design better layouts. In this study, an experiment was conducted which centered around three perceptual features namely background colour, text font, and text style of an interface. The experiment investigated that how change in colour, text font, and text style induces different emotions in an user like happiness, satisfaction, confused, sad, and boredom and what impact they have on the learning attainment of the user. The creativity of this investigation lays in the way that we utilize objective and subjective dimensions to check the influence of background shades, font, and text style, analysing not only the judgements of user but also the pieces of information they were able to gain in initial interaction with an interface. The findings of this experiment showed that the three perceptual features used in this experiment are determining factors in the manner in which users collaborated with the interface and their effect was additionally seen when they were solicited to exploit items from data which they were able to glean from the interface. This report further describes the development process of the tool EMOLYSIS which was proposed as a solution. This tool help the users to tag their emotions with different elements of the interfaces to express their feeling about the design with respect to the colour, font size, and font style of an layout. Moreover, this tool will provide insights about the interface elements that elicit five different emotions of the user. The results achieved from this tool will be of practical use to the interface designers.

INTRODUCTION

In human computer interaction, the significance of visual design of an interface has long been acknowledged. Over the past, the interfaces were intended to improve efficiency, but not the pleasure. The goal of the interface designs was not to enhance what they felt while interacting with the interface, but instead focused more on the user's perceptual-motor and cognitive abilities. However, nowadays the design of the system focuses on user's cognitive ability as well as how they feel when interacting with a system. The design solutions for developing interfaces and products today should be adaptable and innovative to the users. The challenge of HCI is not only to upgrade ease of use, but also improve aesthetics in the design of systems.

Everything in our life from the essential procedures to the most profound ones, sentiments plays a huge role. This does not imply to real world only, but also in the digital/technology world. Feelings can have a wide scope of consequences for forming correspondence about the interaction, its evaluation and cognition. User's evaluation of interaction as well as the judgement about the world are depicted by their emotions. Emotions can be positive or negative. The positive feelings are states, such as, joy, fulfilled, and delight while negative feelings are states, such as, confounded, dismal, and exhaustion. Emotions can be induced in the users by the type of design of an interface they are interacting with, so to encourage learning, it is important to plan an interface that would prompt positive feeling in the user.

This report analyzes the understanding of the features namely colour, font size and text style, of an interface that favours the user's learning attainment and emotion. For this purpose it also describes the development process of the tool EMOLYSIS. Prime idea of this tool is to tag user's emotions on to the interface to improve the designs which can maximize the engagement of the users with interfaces, induce positive emotions in the user, and surge learning attainment.

EMOLYSIS consists of five commonly used emojis that express emotions. This tool can be used by the user during interaction with any interface and allows them to select different elements of the interface and elicit their feeling by selecting an emotion from the emotion pallet.

LITERATURE REVIEW

Over the past years there has been increasing enthusiasm in emotional aspects of user conduct. Graphical interfaces, for example, sites, mobile, and working framework can stimulate feelings from numerous points of view**.**

Pekrun, Götz, Titz, & Perry (2002) said students' experience an assortment of feelings running from positive to negative feelings. **Mahlke, S., and Minge, M (2008),** talked about an excessively perplexing and vague arrangement of visual components of an interface can prompt uplifted incitement and more negative assessments of that interface, actuating negative feelings.**Sonderegger, A., and Sauer, J (2010),** said a good visual structure can possibly invalidate existing convenience issues, bringing about increasingly positive assessments of the interface preferred by the clients. **Zhou, H., and Fu, X (2007),** also supported the stance that the response to the visual intrigue of an interface can have a preparing impact which can impact assessments of that interface. **Knautz (2012)** examined that in e-learning, feelings can be actuated through sight and sound when a user is viewing the screen.**Martinez (2002),** claims that e-learning apparatus configuration impacts clients' inspiration and fulfillment. **Dong (2010)** clarified that the interface design of an e-learning site can produce feelings and actuate psychological exercises. **Dong (2010)** proposed that the utilization of sight and sound style, for example, hues, designs, content, sound, and video plays a significant job in actuating positive feeling in e-learning. **Norman (2004),** discussed that emotions and cognition are closely correlated in emotion design that's why multimedia learning seeks to redefine this relationship. **Mustafa, Haron, and Alias (2010),** asserted that emotions are distinctive between male and female. **Plass, Heidig, Hayward, Homer, & Um (2013)** explained that in e-learning, the difference between genders has an impact of how they see hues or visual improvements is physiological and accepted to be molded by one's way of life. **Efklides & Petkaki (2005)** said students' metacognitive encounters during adapting, for example, their sentiment of trouble,certainty and confidence are identified with positive and negative emotions. Positive feelings bring about higher eagerness of students to put mental exertion in the learning task. **D'Mello and Graesser (2012)** composed that if students who are in a condition of commitment and face obstructions in their learning, may encounter disappointment and, in the event that they are not ready to reestablish their stream or they are unable to overcome the obstacle, can eventually result in boredom and will reduced the learning letting the users close the application or website.
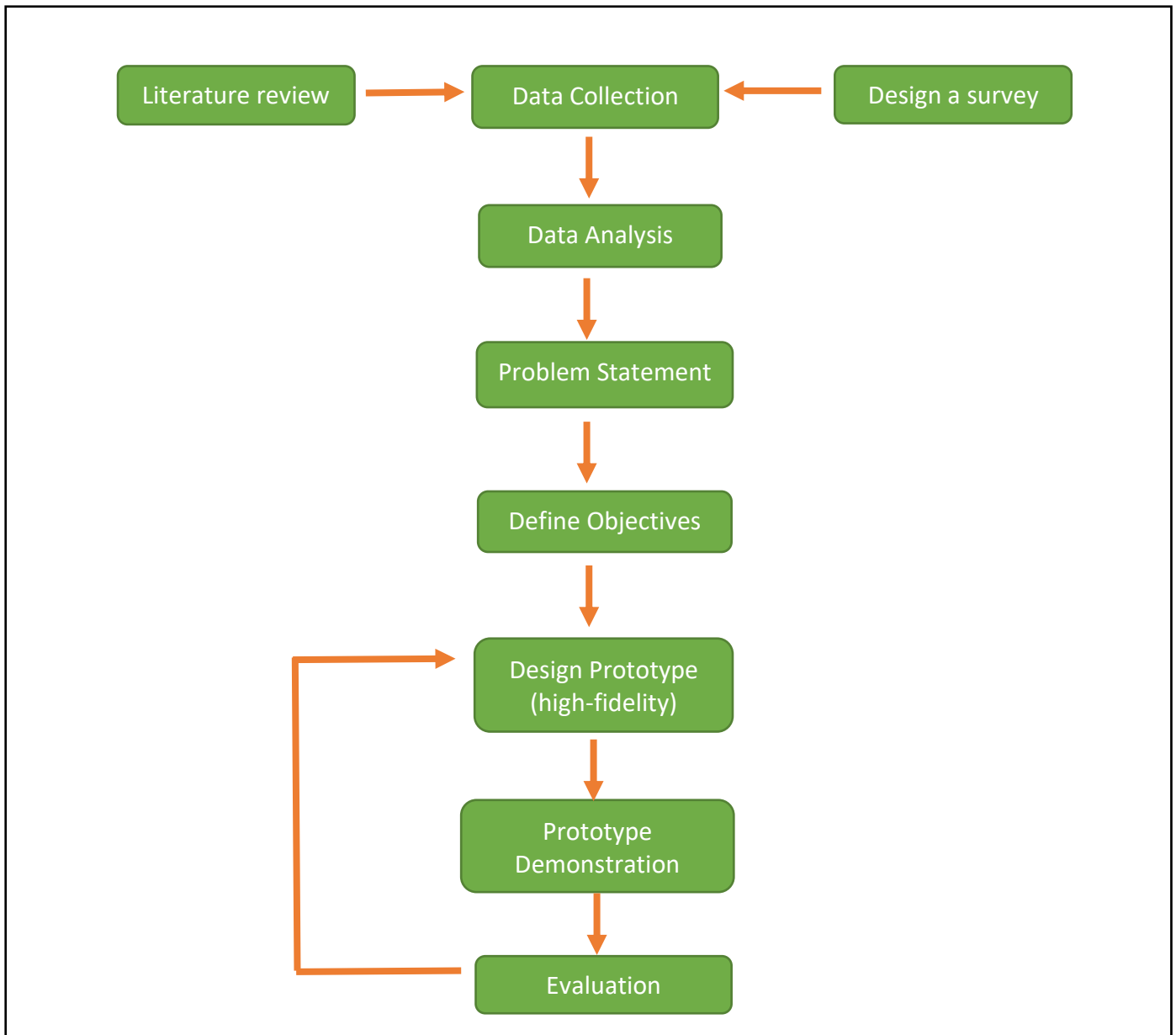
METHODOLOGY

Figure 1

Figure 1 defines the workflow of this report. It starts from data collection, where data is collected through literature review and a survey, opening a path for extensive data analysis which helps to identify and state the problem; emotion transforms visual experience. Stating a problem make objectives clear showing a direction to follow and helps to provide a solution. As a solution to this problem a tool named EMOLYSIS is suggested and a high fidelity prototype is designed. Once the prototype is designed, testing is done and the tool is evaluated. Further changes are done as per user suggestions. Each task of this workflow is explained in detailed in the upcoming sections.

METHODS TO ASSESS EMOTIONS

Measuring emotions incorporate activation of the nervous system, motor expressions, behavioural feelings. The most used methods include survey, questionnaires and interviews.It records user's perception and provides an insight into the person's feelings and choices. Other possibilities are observational techniques and video analysis, there are ways to program expression recognition of speech, faces and gestures. This is called sentimental analysis. These techniques can help to detect broader spectrum of emotions supporting the development phase that can be applied on prototypes. The application of UX evaluation methods can increase the user satisfaction level by understanding their feelings which will enhance the performance by increasing the user engagement.

PILOT STUDY

Pilot study was conducted to build the base for EMOLYSIS Tool A questionnaire was designed for this purpose.

OBJECTIVE

The motivation behind this research is to investigate influence of moods on students' performance when exposed to visual interfaces.

Research Questions were related to:

1. Gender
2. Educational Level
3. Environment
4. Effect of color on user's mood
5. Effect of font size on user's mood
6. Effect of font style on user's mood
7. Small activities to test Students' cognitive power

DATA ANALYSIS

Participants and Procedure

A total of 64 students with different academic backgrounds participated in this preliminary study. Where 60.9 % belonged to Bachelor background, 20.3 % belonged to Masters or higher, 14.3% were College students while the rest were high school students. Amongst the 64 participants, 65.6% were females and 34.4 % were males who successfully completed the survey. It was also observed that 64.1% chose to answer this survey in a quite place while rest answered in a noisy place. Participants were shown some interfaces and were asked to answer few questions related to their experiences, after every interface students' cognitive power was tested. The study revolved around the impact of font size, background color and font style has on user's mood and cognitive load.

Findings

Students were first exposed to a layout with light background and dark font color as shown below in Figure 2
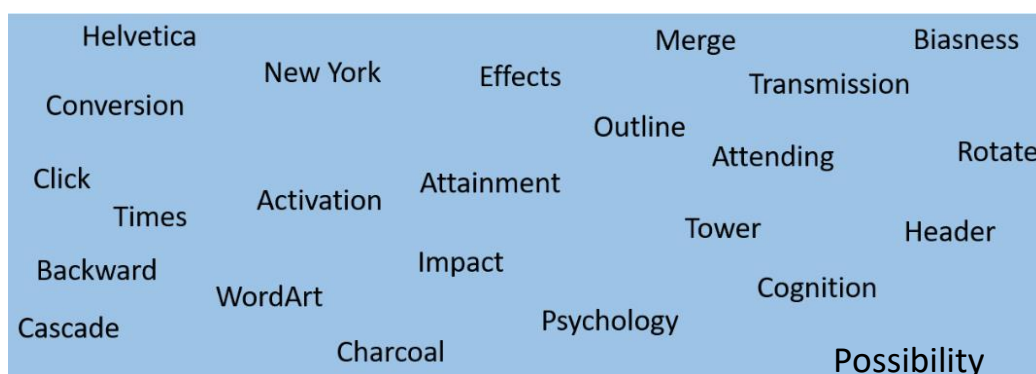

Figure 2: Layout with light background and dark font color

Noisy place	
Boredom	9
Happy	4
Sad	2
Satisfied	12
Confused	4
Quite place	
Boredom	5
Confused	0
Happy	7
Sad	1
Satisfied	20
Grand Total	**64**

Table 1: Participants' mood when exposed to layout in figure 2.

Table 1 shows that majority of students were satisfied with the color of the layout in Figure 2 despite attempting this questionnaire in a noisy or quite place.
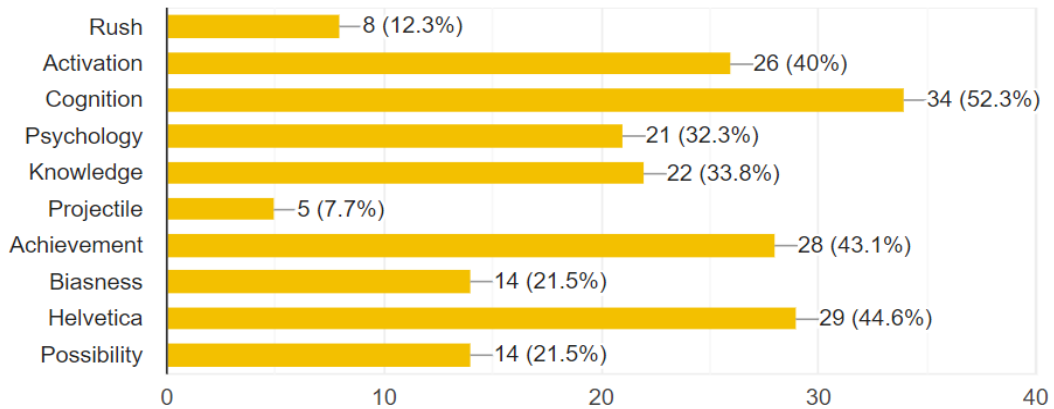
Figure 3: Result of Cognitive activity for layout in figure 2

Above Bar chart shows that layout in Figure 2 with a visible writing and light background contrasted the text color which helped the user to retain the words in their memory. Respondent who answered in a quite place remembered more words. The word 'Achievement' was chosen by 28 out of 64 participants however, this word was not present in the word bank, but users noticed that a lot of words starting with 'A' were present in the bank and students retained this in their knowledge and chose 'Achievement' as one of the words from the list.

Next layout shown below in Figure 4 consist a dark background not complimenting with the text

Figure 4: Dark background with dark font color

Noisy place	
Boredom	2
Confused	11
Happy	2
Sad	5
Satisfied	3
Quite place	
Boredom	6
Confused	20
Happy	2
Sad	9
Satisfied	4
Grand Total	**64**

Table 2: Participants 'mood when exposed to layout in figure 4

Due to the change of color, a change in users' mood was noticed in Table 2. There was a change of emotions from satisfaction to sadness and confusion. This changed was observed due to dark interface with dark text in Figure 4, putting strain to users' eye initiating a feeling of irritation among the users, forcing them to quickly switch the page.
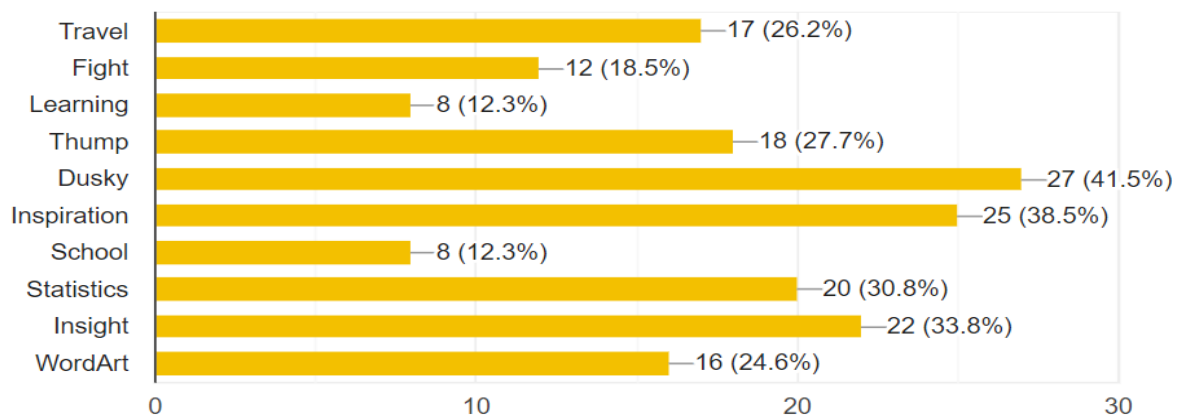

Figure 5: Result of Cognitive activity for layout in figure 4

Due to the rise of negative emotions like boredom, sad and confusion because of layout in Figure 4, users performance was poor. Just to surpass the question they randomly picked words from the bank that did not belonged to the layout which is shown by the bar chat above in figure 5. This shows that colours has an impact on users' mood.

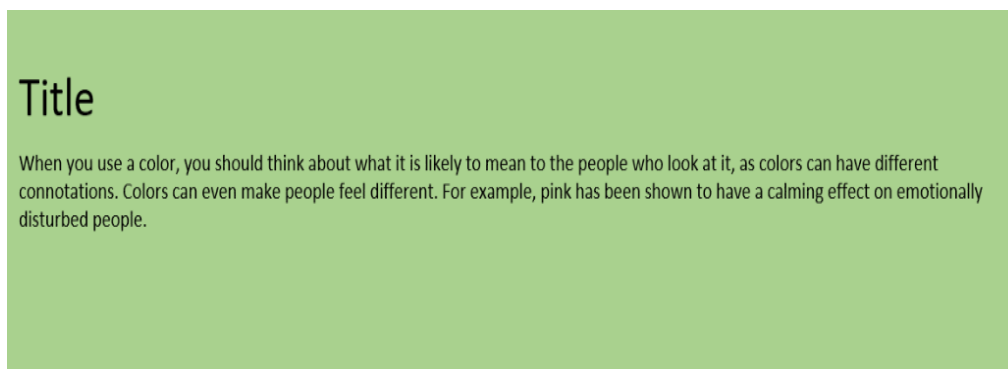Following layouts in figure 6 and figure 7 shows change of font sizes

Figure 6: Light color background with small font size
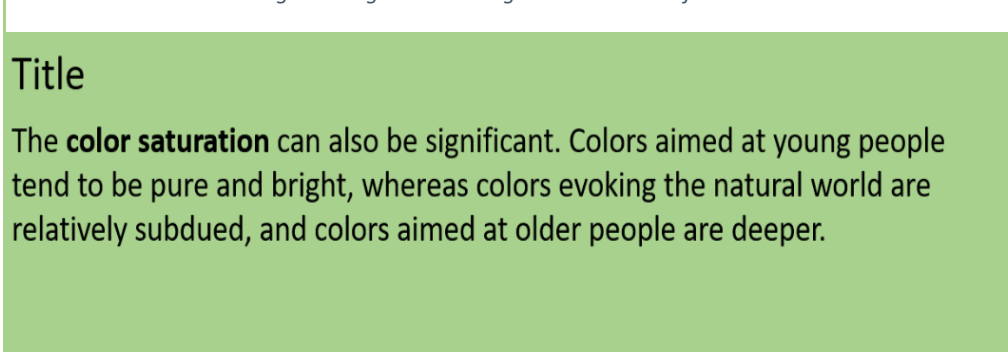

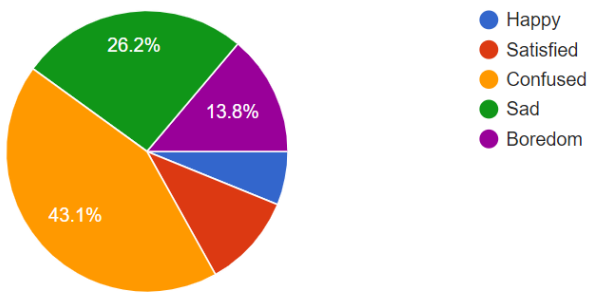*Figure 7: Light color background with larger font size*

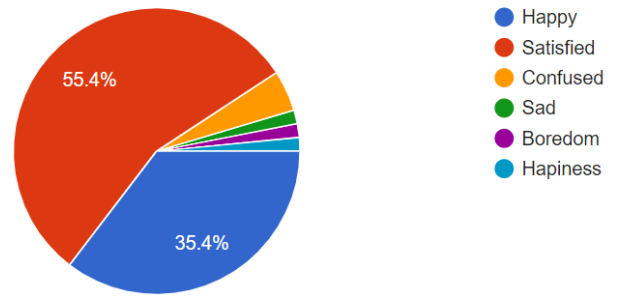Figure 8: Pie Chart for layout in figure 6

Figure 9: Pie Chart for layout in figure 7

Above pie charts in figure 8 and 9 depicts change of emotions for layouts in figure 6 and figure 7 respectively. When the text was clearer and visible to the user in figure 7, emotions shifted towards satisfaction. It shows that font size also plays an important role in affecting users' mood and thus, should be consider while designing UX.

Noisy place	
No	17
Yes	6
Quite place	
No	29
Yes	12
Grand Total	**64**

Table 3: Result of cognitive activity for figure 6 & 7

Table 3 is the representation of how many students answered the question 'The Count of the word 'Colour' is same in figure 6 and 7?'.Many respondents answered it correctly by saying 'No'. Results show that how cognitive power is not just affected by studying in a noisy or quiet place, but it also depends upon other external factors like seriousness or willingness of the student to solve a query.

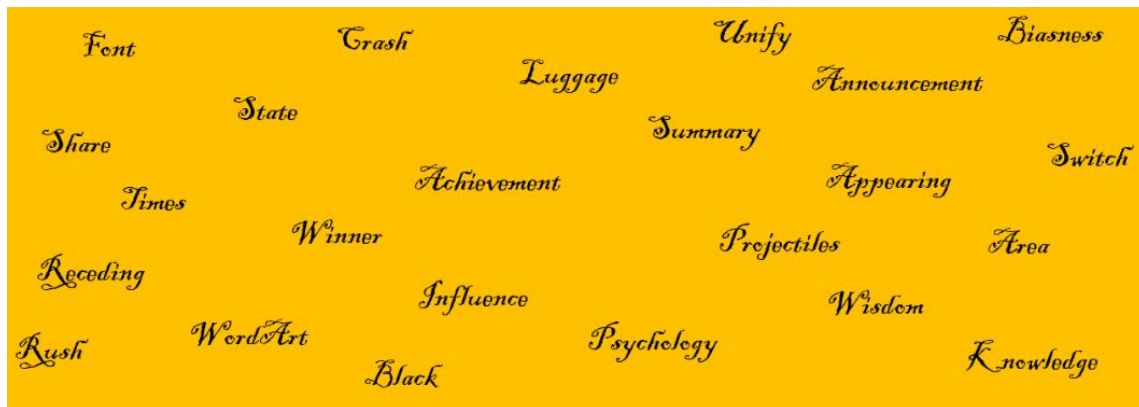Last section of the questionnaire was related to font style of the layout.

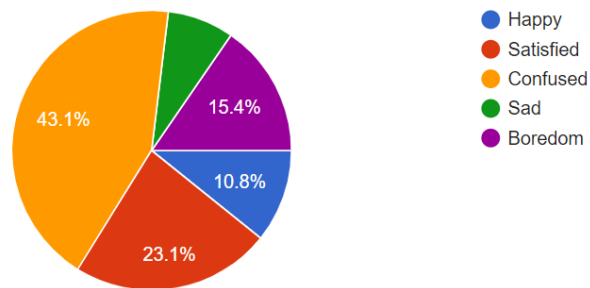*Figure 10: Layout with 'Blackadder ITC' font style*

Figure 11: Participants mood when exposed to layout in figure 10

Pie chart in figure 11 for layout in Figure 10 shows that, 43.1% of the students were confused about this interface. 23.1 % were satisfied with the writing as it was visible or maybe the text was short or they though its okay to use this writing for short time period. It was also notice that, for 15.4 % this interface generated boredom feeling. The font style didn't appeal them to concentrate on the content affecting their cognitive power when they were asked a question whether the word 'Summary' appeared in the word bank or not

Boredom	
No	6
Yes	4
Confused	
No	15
Yes	13
Happy	
No	3
Yes	3
Sad	
No	2
Yes	3
Satisfied	
No	8
Yes	7
Grand Total	**64**

Table 4: Partcipants' mood for layout in figure 10

Table 4 shows how emotions create an important role in decision making. Above table shows a detailed analysis of yes or no under each emotion category. The answer for this question was 'Yes', the word 'Summary' was present in the layout shown in figure 10.

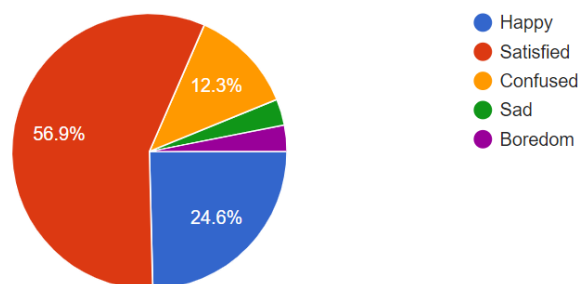*Figure 12: Layout with 'Calibri' font style*

Figure 13: Participants mood when exposed to layout in figure 12

Results show majority of the students were satisfied (56.9%) with the font style and 24.6% were happy with the layout in Figure 12. Overall this writing style liberated positive feelings.

To test the recalling power of students for Figure 12, here the question was tricked that the word 'Receding' DOESNOT appears in the text. Few students got tricked and failed to understand, but those who concentrated successfully said 'No'.
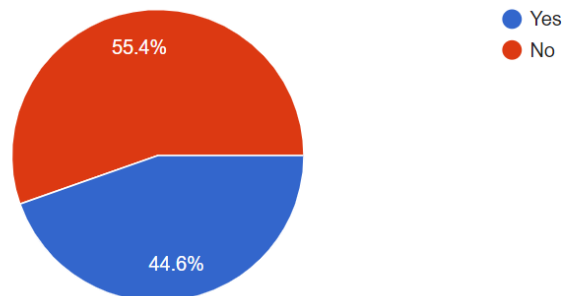

Figure 14: Result of cognitive activity for layout in figure 12

Pie chart in figure 14 is the proof of how students reacted to the tricked question asked for layout in figure 12.55.4% said 'No' and 44.6% said 'Yes'.

The results of this exercise shows that feelings can have a wide scope of impact on molding communication about interaction, evaluation of the product and cognitive load. This report suggests a tool that can tag emotions onto any academic sites, prototype, presentation or visual concept to improve students' performance by allowing them to generate real time reviews.
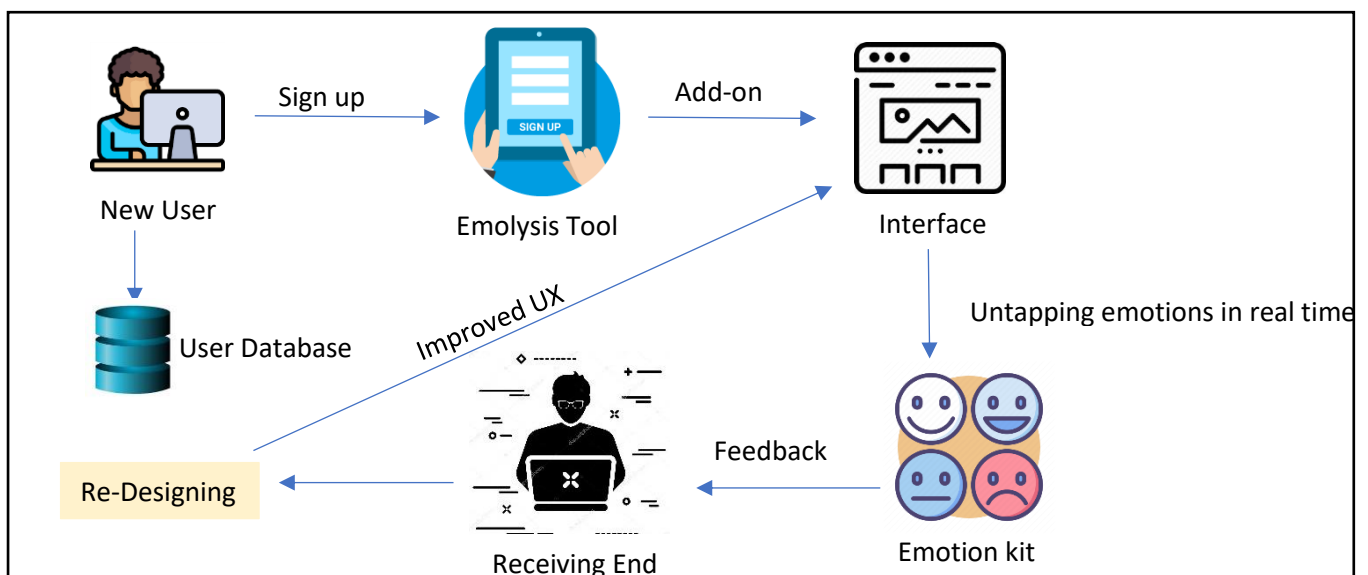
WORKFLOW FOR EMOLYSIS TOOL

Figure 15: Workflow of the tool

Figure 15 shows the workflow of EMOLYSIS tool. The new user will register themselves, after signing up the tool will be added as an extension to all academia websites, wire frames or any

visual content. The signed in user will be able to express his/her emotions related to aesthetics of the interface. These comments will be received by the UX team or the owner of the interface in real-time, helping them improve the interface and increase user engagement.

THE DESIGN OF EMOLYSIS TOOL

Comparative Analysis

The tool aims to gauge sentiments during communication with academic graphical interfaces to enhance students' performance and help UX designers to improve the visual experience. The EMOLYSIS tool (Emotion analysis tool) is created with a target that it ought to be versatile and effectively deployable during connection with a visual interface, it should be easy to use and should have the possibility to be used amongst all level of students i.e. Masters or higher, Bachelors, college and High school. Taking motivation from PrEmo and Lemtool, EMOLYSIS introduces 5 basic emotion observed in students during e-learning. Lemtool uses cartoons to represent different kind of emotions while PrEmo uses moving pictures(animations), which takes some time to move or show animation and can be a cause of distraction while interacting with visual interface. EMOLYSIS tool chose that expressions or feelings should be done via emojis which are easier to understand and are commonly used by all the classes of users. The tool is limited to academia purposes only.

The structure of the EMOLYSIS tool is based on the idea that individuals can recognize explicit appearances of feeling. The EMOLYSIS emojis were selected after an in-depth research and discussions. Most common emojis were selected that was easily understood and frequently used by users in expressing their emotions on social platforms.

Emolysis Manual

EMOLYSIS asks user to snip the part of the interface that the user desires to review, and also allows the user to take multiple snips until satisfied. Then, saving the finalized snip would redirect the user to the next page on to which they would be required to select an emotion from the emotion pallet for each feature colour, text font, and text style of the snipped element. Lastly, user is also provided with an opportunity to give suggestions or comments related to the interface.

The manner in which EMOLYSIS is utilized during communication with a websites or applications, is portrayed in the images below step wise:
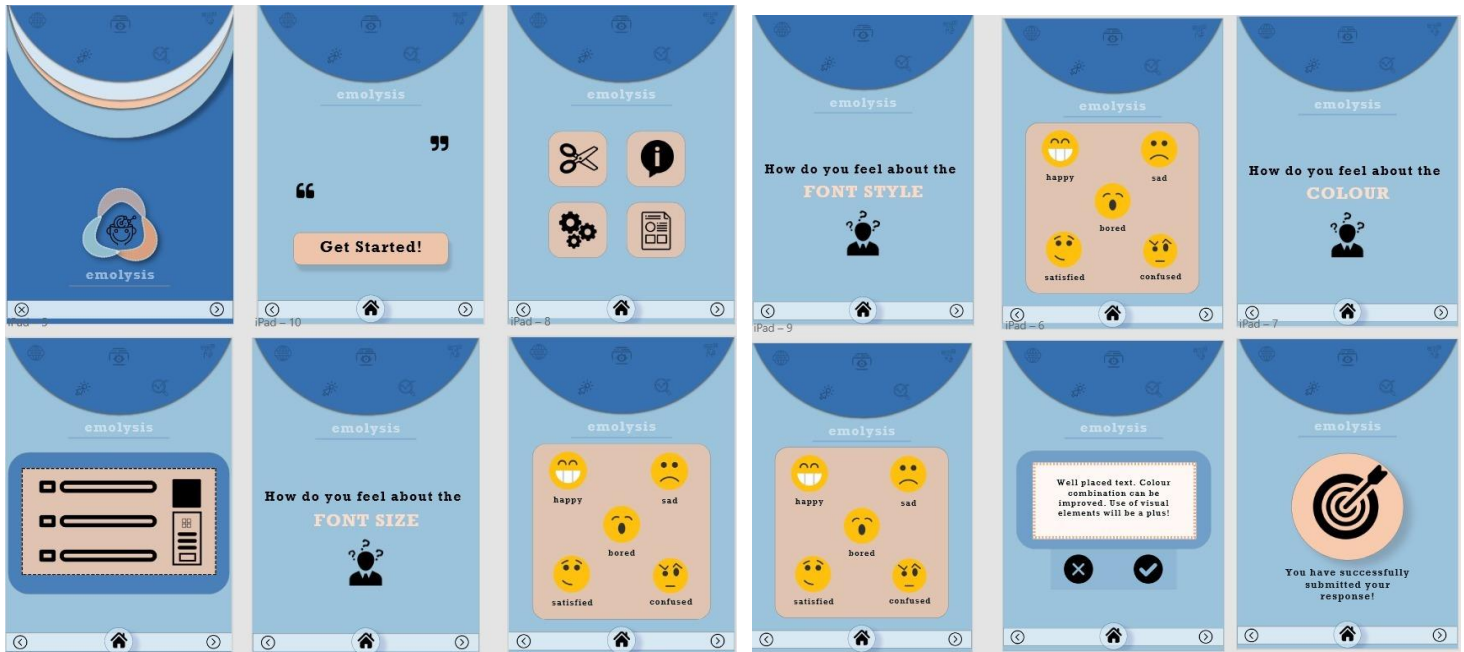

Figure 16: The steps required to show a feeling for a specific area of a visual interface for example a site page.

DEMONSTRATION -TESTING PHASE

After the development of prototype, students were asked to use this tool. The testing phase was extended over a week's time.

EVALUATION

System Usability Scale (SUS)

It was made by John Brooke in 1986. It evaluates a variety of facilities like websites, mobile , applications and software. SUS is a tool for estimating the usability and convenience of users. It contains 10 inquiries with five options from Strongly agree to Strongly disagree. Users were asked to answer the following 10 questions on the basis of their experience with the tool.

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.

9. I felt very confident using the system.

10. I needed to learn a lot of things before I could get going with this system.

Interpreting Scores

The participant's scores for each question was changed to another number, each number was added together and then multiplied by 2.5 separately to change the scores of 0-40 (original) to 0-100. This is a percentile ranking. Researches say that, a total that is higher than 68 is considered to be 'above average' and a score lower than 68 is said to be 'below average'.

Users	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	SUS Raw Score	SUS Final Score
user1	5	2	4	2	4	2	4	2	3	1	31	77.5
user2	5	1	4	1	4	1	4	1	4	1	36	90
user3	4	2	4	2	3	2	4	2	3	2	28	70
user4	5	1	4	1	4	1	4	1	4	1	36	90
										Average	32.75	81.875

Table 5: Calculation of SUS for EMOLYSIS Tool

Table 5 shows that, EMOLYSIS Tool usability measure with SUS was calculated as 81.875 percentile, which lies in the above average percentile ranking area. Result shows that this tool has good usability.

CONCLUSION

The aim of this paper was to show that the EMOLYSIS tool can be utilized to differentiate among high and low visual engaging interfaces with respect to three perceptual features colour, text style, and text font and how these features impact the learning attainment of the user while interacting with the interface. The first part of the study demonstrates that the participants of the experiment carried out had sensed different emotions when in contact with interfaces and experienced different learning outcomes each time when encountered interfaces with little modifications in these three perceptual features. Secondly, this paper demonstrates how the tool EMOLYSIS can be used to select different elements of an interface and allow the users to elicit their feeling by selecting an emotion from the emotion pallet which displays five cartoon figures each expressing a different emotion and then take a cognitive test to check the effect of those perceptual features on their learning attainment. Furthermore, the tool EMOLYSIS can be used for multiple purposes but the major motivation behind its development was to improve students' performance and hence, this tool can be of great use to the students, teachers and all to gather for the entire educational domain. Students can tag their emotions onto any academic sites and provide their feedback to the designers of those interface, and in return the designers

can design better interfaces according to the users (in this case students) requirements. In case of teachers using this tool can allow their students to tag their emotions and provide feedback onto the presentations or any other sources that are used for teaching and help teachers to improve visual appearances in a way that would enhance students' learning attainment. In conclusion, the analysis of interfaces using EMOLYSIS can assist in revealing elements that are accountable for outcome of a particular judgment of aesthetics of an interface.

REFERENCES

[1]. Adams, F. M., & Osgood, C. E. (1973). A cross-cultural study of the affective meanings of color. Journal of Cross-Cultural Psychology, 4(2), 135e156. http://dx.doi.org/ 10.1177/002202217300400201.

[2]. Alley, T. R. (1981). Head shape and the perception of cuteness. Developmental Psychology, 17, 650e654. http://dx.doi.org/10.1037/0012-1649.17.5.650. Ashby, F. G., Isen, A. M., & Turken, A. U. (1999).

[3]. A neuropsychological theory of positive affect and its influence on cognition. Psychological Review, 106(3), 529e 550. http://dx.doi.org/10.1037/0033-295X.106.3.529. Baddeley, A. D. (1986). Working memory. Oxford, UK: Oxford University Press.

[4]. Bellizzi, R., & Hite, E. (1992). Environmental color, consumer feelings, and purchase likelihood. Psychology and Marketing, 9(5), 347e363. http://dx.doi.org/10.1002/ mar.4220090502.

[5]. Berlyne, D. E. (1970). Novelty, complexity, and hedonic value. Perception and Psychology, 8, 279e286. http://dx.doi.org/10.3758/BF03212593

[6]. SUS: A Quick and Dirty Usability Scale by John Brooke

[7]. Measuring Usability with the System Usability Scale (SUS) by Jeff Sauro

[8]. SUS: A Retrospective by John Brooke

[9]. Determining What Individual SUS Scores Mean: Adding an Adjective Rating Scale by Kortum Bangor and Miller May

[10]. Gijs Huisman, Marco van Hout, Elisabeth van Dijk, Thea van der Geest, Dirk Heylen (2013), LEMtool - Measuring Emotions in Visual Interfaces, Proceedings of the SIGCHI Conference on Human Factors in Computing Systems - CHI '13