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Experimental Research with Neuroscience Tool in Maritime Education and Training (MET)

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ABSTRACT: The paper argues for the necessity to combine MMR methods (questionnaire, interview), gaze tracking as neuroscience tool and sentiment/opinion techniques for personal satisfaction analysis at the maritime and training education (MET) and proposes a practical research approach for this purpose. The purpose of this paper is to compare the results from gaze tracker (Face analysis tool) of three experiments & sentiment analysis of two experiments for satisfaction evaluation of the students-users' (subjective) satisfaction of the maritime education via user interface evaluation of several types of educational software (i.e. engine simulator, ECDIS, MATLAB). The experimental procedure presented here is a primary effort to research the emotion analysis (satisfaction) of the users-students in MET. The gaze tracking & sentiment analysis methodology appears to be one sufficient as evaluation tool. Finally, the ultimate goal of this research is to find and test the critical factors that influence the educational practice and user's satisfaction of MET modern educational tools (simulators, ECDIS etc.).

1 INTRODUCTION

In the shipping industry, the need for excellent education and on other hand, the usability evaluation of ship manipulation systems and engine management, leads to the use of new technologies in educational practice. Specifically, the Marine Education & Training (MET), the use of simulators (engine or ship's bridge) is fact. Various maritime educational standards (i.e. STCW, 95, Manila 2011) allow the simulators and other educational tools (i.e. educational software, MATLAB) use in educational practice.

The aim for the application of new technology (simulators, games etc.), in MET is the transport of capacity, i.e. to adapt the dexterities learned within the vessel operating training framework. We assume that the dexterities and the knowledge learned in the classroom can be applied effectively in real life similar situations (Tsoumas et al., 2004).

MET follows certain education standards (STCW'95/Manila 2011) for each specialty (Captain, Engineer) and for each level (A', B', C'). Its scope is the acquisition of basic scientific knowledge, dexterities on execution (navigation, route plotting, engineering etc.) as well as protecting the ship and crew (safety issues and environment protection issues)(IMO, 2003, Papachristos et al., 2012, Tsoukalas et al., 2008).

In MET, in particular, the user's satisfaction based on objective criteria poses an important research subject because via this we can determine the background explaining the satisfaction phenomena, recommending at the same time new considerations that will expand the up-to-date educational conclusions on the adult education in educational programs and software development (IMO, 2003, Papachristos, Nikitakos, 2010, 2011).

The paper argues for the necessity of a mixed approach to usability and educational evaluation at the engine room or Ship bridge simulation, and proposes a practical framework for this purpose. In particular, we use a multi-method approach for the usability and educational evaluation of maritime simulators and other educational tools that combines physiological data generated from gaze tracking data (neuroscience tool), questionnaires and interviews and speech recording for measuring emotional user responses-lexical analysis. The combination of these methods aims at the generation of measurable results of user experience complementary assessments (Papachristos et al., 2012).

Gaze tracking involves detecting and following the direction in which a person looks. The direction of the eye gaze can express the user's interests; it is a potential porthole into the current cognitive processes. Communication through the direction of the eyes is faster than any other mode of human communication. Gaze Tracking has been applied: in Human Computer Interaction, Advertising, Communication for disabled, Virtual Reality, Improved image and video communication, Medical field and Human Behavior Study (Arpan, 2009).

Eye observation on handiness tests is a rather promising new field especially for system designers, as it may offer information on what may attract user attention and which are the problematic areas during system use. The research area on use of the optical recording tools is the quest for an exact interpretation of the optical measurements, their connection to the satisfaction and the learning effectiveness for users. Suggested research aims at this direction with the use of neuroscience methods in combination with the use of qualitative-quantitative researches aiming at the extraction of useful conclusion that will help simulator system designers to develop the systems (especially the interface, delivering & organizing education material), class designers to better organize material and modern tools use (better planed educational scenarios that thriftily develop the trainees abilities but also can offer a more objective evaluation of their abilities & function as future captains or mechanics) and finally the expansion of the adult education field by offering new conclusions regarding the use of e-learning (introduction modes, evaluation) and possible revision of maritime education models of the respective apposite organizations (IMO) (Dix et al., 2004, Papachristos, Nikitakos, 2010, 2011).

An important factor that can be investigated in relation to the emotional experience (specifically satisfaction phenomenon) is the *language process*. The psychological research in the language production, comprehension and development is developed mainly after 1960 as a result of linguist's N. Chomsky research on generative grammar. The psycholinguistic research showed that language comprehension and production is not influenced only from factors not related to their linguistic complexity but also from the speaker's/listener's existing knowledge for the world around him/her, as well as by the information included in the extra linguistic environment (Pinker and Jackendorff, 2005). Investigating the emotional gravity of words spoken by a speaker and defined its emotional state (current or past) constitutes a state of the art issue. Most of the emotional state categorization suggested concern the English language. In recent years many sentiment analysis and opinion mining applications have been developed to analyze opinions, feelings and attitudes about products, brands, and news, and the like (Maks and Vossen, 2012).

Generally, this approach is generic, in the sense that it can be the starting point for an integrated usability & educational evaluation of the interactive technologies during in-situ education, simulation and pragmatic ship operation management. Today, in total the application of neurosciences on education and especially gaze-tracking methods are an important research quest and expansion (Goswami, 2007, Papachristos, Nikitakos, 2010).

2 LITERATURE REVIEW AND SCOPE

As more information is integrated on board by implementing an e-navigation strategy plan in the future, graphic user interface (GUI) is likely to be more sophisticated. Such sophisticated equipment can enhance navigational safety if seafarers can operate equipment, access information and understand it properly. So, when seafarers misunderstand information, sophistication will not lead to navigational safety and rather may pose risks on the ship. Thus, it is important to establish a methodology for usability evaluation (with emphasis on user's satisfaction) navigational or engine management equipment (IMO, 2012).

Usability has been defined by ISO 9241 as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use". It is widely acknowledged that the efficiency and effectiveness can be measured in an objective manner, i.e. in specific contexts of use and with the participation of representative user groups. They are usually defined in terms of metrics like: task success, time-to-task, errors, learnability (in repetitive use tests), etc.; while personal satisfaction is subjective in nature and depends on the characteristics of the user groups addressed (Papachristos et al., 2012, Tullis and Albert, 2008, Kotzabasis, 2011). Usability testing procedures used in user-centered interaction are designed to evaluate a product by testing it on users. This can be seen as an irreplaceable usability practice, since it gives direct input on how real users use the system. Usability testing focuses on measuring a human-made product's capacity to meet its intended purpose (Dix et al., 2004, Nielsen, 1994). A number of usability methods have been developed and promoted by different researchers (Neilson and Mark, 1994, Norman, 2006, Ryu, 2005).

There is considerable work on the ergonomic & usability assessment of the human strain (Torner et al., 1994) and the design and arrangement of ship equipment. This work has few applications in shipping industry (Petersen et al., 2010) and has not yet resulted to well established evaluation methods and cases (Wang, 2001). More specifically, these studies tend to report on usage effects on health, safety and mental workload; however they offer little guidance on the evaluation methods and/or the design of the respective technology and equipment (devices) with respect to usability (Papachristos et al., 2012).

Research in Human-Computer Interaction (HCI) has created many methods for improving usability during the design process as well as at the evaluation of interactive products. The study of usability itself is extended to include other aspects of the user experience like accessibility, aesthetics, emotion and affect and ergonomics (Papachristos et al., 2012).

The area of computer simulation has been successfully applied to the study and modeling of processes, applications and real-world objects (Rutten et al., 2012). The simulators constitute a category of educational software and follow a methodology of application in instructive practice (Crook, 1994, Solomonidou, 2001). According to de Jong and van Joolingen (1998) a computer simulation is "a program that contains a model of a system (natural or artificial; e.g., equipment) or a process". Their use in the science or technology education has the potential to generate higher learning outcomes in ways not previously possible (Akpan, 2001). In comparison with textbooks and lectures, a learning environment with a computer simulation has the advantages that students can systematically explore hypothetical situations, interact with a simplified version of a process or system, change the time-scale of events, and practice tasks and solve problems in a realistic environment without stress (van Berkum and de Jong, 1991). A student's discovery that predictions are confirmed by subsequent events in a simulation, when the student understands how these events are caused, can lead to refinement of the conceptual understanding of a phenomenon (Windschitl and Andre, 1998). Possible reasons instigating teachers to use computer simulations include: the saving of time, allowing them to devote more time to the students rather than setting up and supervising experimental equipment; the ease with which experimental variables can be manipulated, allowing for stating and testing hypotheses; and provision of ways to support understanding with varying representations, such as diagrams and graphs (Blake and Scanlon, 2007).

Specifically, the Maritime Engine Simulation (MES) allows the creation of real, dynamic situations that take place on a ship at sea in a controlled surrounding where naval machine officers are able to (Kluj, 2002; Tsoumas et al., 2004):

1 practice new techniques and dexterities
2 shape opinions from teachers and colleagues
3 transport the theory of a real situations in a safe operation
4 face several problems simultaneously rather than successively, can learn by giving priority to multiple objectives under high pressure situations and change situations accordingly.

Gaze interaction through eye tracking is an interface technology that has great potential. Eye tracking is a technology that provides analytical insights for studying human behavior and visual attention (Duchowski, 2007). Moreover, it is an intuitive human–computer interface that especially enables users with disabilities to interact with a computer (Nacke et al., 2011). Infrared monitor eye gaze tracking Human-Computer Interaction (HCI), which is limited by restrictions of user's head movement and frequent calibrations etc, is an important HCI method (Cheng et al., 2010, Hansen and Qiang, 2010). This method measuring the effect of personalization could be the relationship of users' actual behavior in a hypermedia environment with theories that raise the issue of individual preferences and differences (Tsianos et al., 2009). The notion that there are individual differences in eye movement behavior in information processing has already been supported at a cultural level (Rayner et al., 2007), at the level of gender differences (Mueller et al., 2008), and even in relation to cognitive style (verbal-analytic versus spatial-holistic) (Galin and Ornstein, 1974).

International bibliography provides many sources on the Eye-tracking research in education (Conati and Merten 2007). In the field of learning and instruction, eye tracking used to be applied primarily in reading research with only a few exceptions in other areas such as text and picture comprehension and problem solving (Halsanova et al., 2009, Hannus and Hyona, 1999, Hagerty and Just, 1993, Hyona and Niemi, 1990, Just and Carpenter, 1980, Rayner, 1998, Van Cog and Scheiter, 2010, Verschaffel et al., 1992). However, this has changed over recent years, eye-tracking is starting to be applied more often, especially in studies on multimedia learning (Van Cog and Scheiter, 2010). Because eye tracking provides insights in the allocation of visual attention, it is highly suited for the study of differences in intentional processes evoked by different types of multimedia and multi-representational learning materials (Van Cog and Scheiter, 2010, Halsanova et al., 2009). For example, Qu and Johnson (2005), use eye-tracking for interaction adaptation within the Virtual Factory teaching systems (VFTS), an computer tutor for teaching engineering skills. Eye-tracking is used to discern the time the user spends reading something from the time the user spends thinking before taking action, with the goal of assessing and adapting to the motivational states of student effort and confusion.

Also, the international bibliography contains various approaches – techniques (sorting algorithms) concerning linguistic emotional analyses, which are followed and are based mainly in the existence of word lists or dictionaries with labels of emotional gravity along with applications in marketing, cinema, internet, political discourse etc. There are studies also concerning sorting English verbs and French verbs that state emotions based on conceptual and structural-syntactical characteristics. For the Greek language there is a study on verbs of Greek that state emotions based on the theoretical framework "Lexicon-Grammar" that is quite old and doesn't contain data from real language use; there are also some studies concerning Greek adjectives and verbs that state emotions and comparison with other languages (French – Turkish) under the viewpoint: Structural-syntactical + conceptual characteristics. More recent studies in Greek conducted systematically the noun structures based on the theoretical framework of "Lexicon-Grammar" and the establishment of conceptual & syntactical criteria for the distinction and sorting of nouns based on conceptual-syntactical characteristics of the structures in which they appear (Lambov et al., 2011; Shanahan et al., 2006; Fotopoulou et al., 2009).

The major idea of this paper is to compare the results from the gaze tracker (face analysis tool) of three experiments and sentiment/opinion techniques of two experiments of the students-users' (subjective) satisfaction of the maritime education via user interface evaluation of several types of educational software (i.e. engine simulator, ECDIS, MATLAB). We use a combination of qualitative – quantitative methodology, on one hand, and the use of a neuroscience tool (use biometric tool –face analysis/gaze tracker) and language techniques, on the other hand. This aims at the combination of the positive aspects of the corresponding methodologies: aiming at countable results & variable check (quantitative, questionnaire use), interpretative, explanatory (qualitative, interview use) and more objective measurements by "observation" of the user's physiological data (gaze tracking use, language process).

3 METHOD

The optical perception includes the stimulant's natural reception from the external world and the process/explication of that stimulant. The observation of eye movement is an established method in many years now. The eye movements are supposed to depict the level of cognitive process a screen demands and consequently the level of facility or difficulty of its process. Usually, optical measurement concentrates on the following: (a) the eyes' focus points, (b) the eyes' movement patterns and/or (c) the pupil's alterations (Dix et al., 2004; Duchowski, 2007).

The measurement methodology must fulfill all three requirements of the cognitive neuroscience (experiential verification, operational definition, repetition) and include data-tools: (a) Recording device: might include special glasses with the recording camera or a web camera, (b) Registration data process – analysis software and (c) data process software (Papachristos, Nikitakos, 2010). The following figure shows the optical data registration procedure:

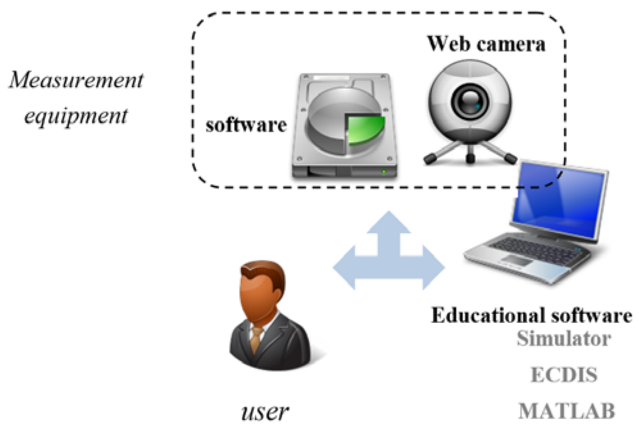

Figure 1. The Gaze tracking process (as rich picture)

The elements of the proposed approach include (Fig.2)(Papachristos et al., 2013):

1 Registration and interpretation of user emotional states (questionnaires)
2 Optical recording (gaze tracker)
3 Usability/Satisfaction & Educational assessment questionnaires
4 Wrap-up interviews (emotional assessments).

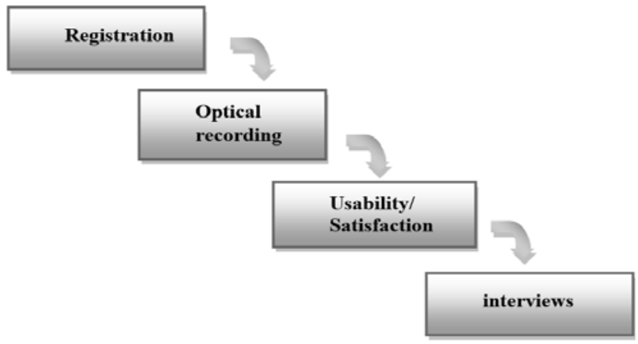

Figure 2. The steps of proposed research approach

In the experiment the optical data registration will be conducted by the "*Face Analysis*" software that was developed by the *IVML Lab of the National Technical University of Athens*, in connection with a Web camera set on the where the subject of the research (educational software i.e. MATLAB) (Asteriadis et al., 2009). That particular software records a large number of variables (42) that concern data on the form of the face as well but in the present research we focus only 5 parameters that refer to the user's eyes and head movement. The next diagram shows the software's optical interface during the registration procedure (Fig.3) and a figure for tool's operation (Fig.4).

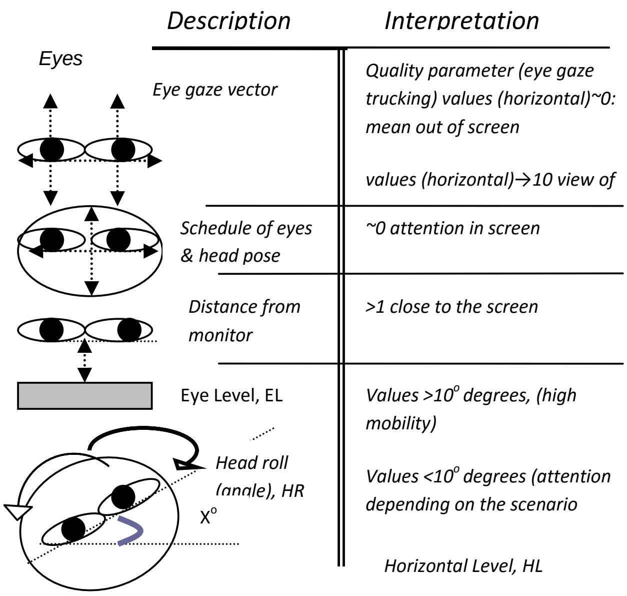

Figure 3. Biometric tool parameters interpretation ('Face Analysis')

The formalistic presentation of the tool (Face Analysis) gives a total output with a parameters set of User's Visual Attention (VA):

$$VA=\{p_i\},\ i\in[1..5] \qquad (1)$$

who p_i: parameters of VA, as

- p_1 [time]: time recording
- p_2 [gv (h,v)]: gaze vector f(horizontal, vertical)
- p_3 [h_p]: head pose f (pitch, yaw)
- p_4 [d_m]: distance of monitor (metric)
- p_5 [h_r]: head roll (angle)

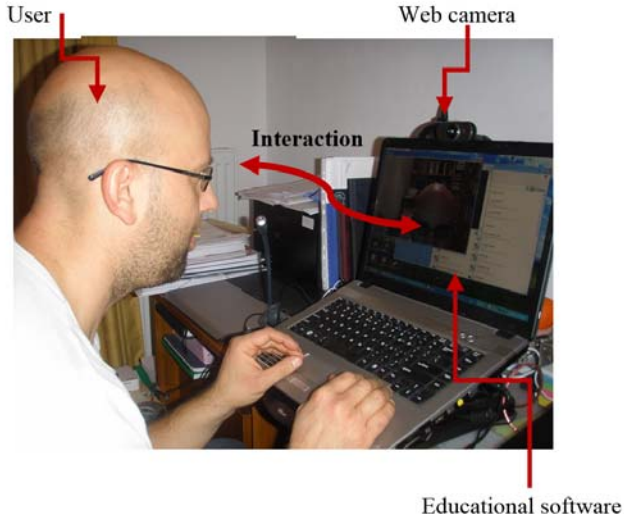

Figure 4. 'Face Analysis' software in action

For *sentiment/opinion analysis* used a *Lexicon Base (LB).* This approach based a Greek Lexicon of Emotions ("ANTILEXICON") (Vostanjoglou, 1998). Suppose the follow parameters for sentiment/opinion processing (Fig.5):

$$IndW_{+} = (\sum W_{S+}) / \quad TotN_{w} \qquad (2)$$

$$IndW_{-} = (\sum W_{S-}) / \quad TotN_{w} \qquad (3)$$

$$W_{S+} \mid W_{op+} = \quad \sum W \qquad (4)$$

$$W_{S-} \mid W_{op-} = \quad \sum W \qquad (5)$$

where W: number words with sentiment or opinion load per text (positive polarity+ or negative polarity-)

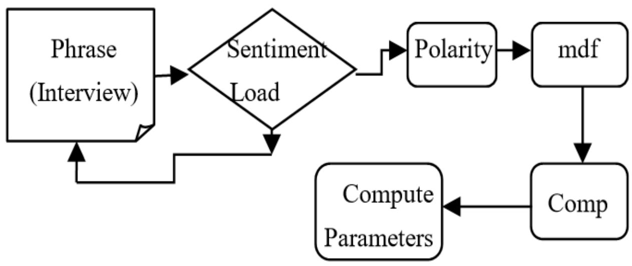

Figure 5. Sentiment process

The personal satisfaction modeling contains 5 levels (Papachristos et al., 2013):

Very dissatisfied	dissatisfied	neutral	Somewhat satisfied	Very satisfied
LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5

Figure 6. The Satisfaction levels

From these levels, we design the Research Personal Satisfaction Framework (RPSF) (Fig.7) (Papachristos et al., 2013):

- *Negative Level* (Levels 1 & 2)
- *Neutral Level* (Level 3)
- Positive Level (Levels 4 & 5)

Negative Level	Neutral Level	Positive Level
Level 1 AND 2	Level 3	Level 4 AND 5

Figure 7. The Research Personal Satisfaction Framework (RPSF)

Finally, we use a combination of methods (questionnaires, interviews), because in the international bibliography, the use of multiple methods of educational evaluation in educational practice is more effective and the combinatorial use of quantitative and qualitative approaches confines their weaknesses (Brannen, 1995, Bryman, 1995, Patton, 1990, Retalis et al., 2005, Tsianos et al., 2009). Specifically, the Mixed Methods Research (MMR) employs a combination of qualitative and quantitative methods. It has been used as a distinct approach in the social and behavioral sciences for more than three decades. MMR is still generating discussions and debates about its definition, the method involved, and the standards for the quality. Although still evolving, MMR has become an establish approach. It is already considered the 3rd research approach, along with the quantitative and qualitative approaches, and has its own emerging world view, vocabulary, and techniques (Fidel, 2008).

The Personal (subjective) Satisfaction is a difficult measuring factor. For that, we use a mixed technique by using a gaze tracker and language dimension/sentiment analysis with MMR methods (questionnaire & interview), verifying measurements can be accomplish in order to extract safer conclusions. The size of samples is small because in experimental psychology by using equipment, are 20-30 participants usually. The size of sample depends from nature of research (Borg and Gall, 1979, Cohen et al. 2008, Papachristos et al., 2013a, 2013b, 2013c).

4 ANALYSIS

I. The data of gaze tracking analysis come from three experiments for Gaze tracking (Fig.8)(Papachristos et al., 2013a, 2013b, 2013c):

- *Experiment-A(E-A)*: the execution a didactic scenario in a MATLAB environment that took place in Marine Academy of Aspropyrgos – MAA (Merchant Faculty). The random sampling took place in January 2011 in the Computer Science Lab of MAA. The sample consists of 16 students (15 Male, 1 Female) that were subjected to the specific experimental procedure, completed the questionnaire and gave interviews (MMR approach). The scenario is based on the educational material (according to the STCW-95 corresponding standard) tutored in the 5th semester, aiming at the following educational goals:

- mathematic tool for control systems design,
- control systems modeling, and
- model analysis and simulation

The scenario involves the following activities:

- transfer functions (tf) to MATLAB:

$$G_1(s) = 1 / s+1 \quad (6)$$
$$G_2(s) = 1 / s \quad (7)$$

- and computation the total transfer function (Gtotal(s)). Furthermore, calculating the response (image) of the Gtotal(s) in which there is a unitary feedback (H=1) and a step function entrance.

The scenario combines educational goals with the use of simple implementation commands in the MATLAB environment. Video recording of 5 - 18 min per student. We use simple scale for usability assessment.

- *Experiment-B(E-B)*: the execution scenarios in e-navigation environments (ECDIS), aiming:
  - to plan and display the ship's route for the intended voyage and to plot and monitor positions throughout voyage
  - follow SOLAS V/19.2.1.4

  The sampling was carried out on the January 2012 until May 2012, in the Information Technologies Lab of the National Marine Training Centre of Piraeus (NMTCP). Participated 3 Marine officers in experiment and they underwent a specific procedure (ships travels in different ports) in the ECDIS lab room with recording of 23 min per student. They completed the questionnaires and were interviewed follow the research methodology framework. We use SUS scale (SUS is a simple, ten-item scale giving a global view of subjective assessments of usability) for usability assessment (Brooke, 1996).
- *Experiment-C (E-C):* sampling was carried out between May and June 2012, in the Marine Engine System Simulator (MESS) Laboratory of the National Marine Training Centre of Piraeus (NMTCP). The samples consisted of 13 professional (Merchant Marine officers) that were subjected to a specific experimental procedure (operation management) in engine room simulator ERS 5L90MCL11, (video recording ~23 minutes per student), completed the questionnaires and gave interviews. We use SUS scale for usability assessment too.

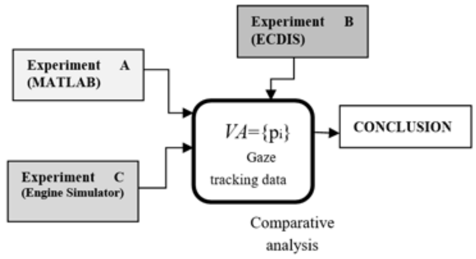

Figure 8. Diagram of Result Analysis for Gaze tracking

The result analysis:

- *E-A*: The VA parameters shows
  - the gaze vertical (p2) is 0 for a long time (mean, median and mode values for all satisfaction scales: Matlab & scenario), which means that users focus enough time out off screen,
  - in a distance from the monitor (dist_Monitor parameter) it is observed that approach the screen (>1) and keep a relatively close distance (values homogeneity),
  - $Time_{recording}$ parameter (video recording) is connected to the Satisfaction scale (grows in low scale to upper scale) (Fig.9).

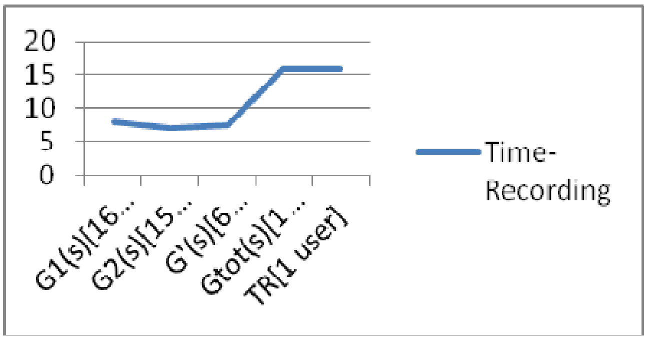

Figure 9. Time allocation relative success of didactic scenario (computing stages G1(s)/G2(s)/G'/Gtot/Time response)

- *E-B*: a relationship between Gaze parameter and Usability assessment of users. The gaze parameter depending from SUS score. It shows attention increases as assessment from ECDIS software, as shown the next table:

Table 1. Correlation between variables

Variable correlated	Spearman's rho	Sig. (2-tailed)	Remark
SUS Score – Gaze Vertical parameter (p2)	.393	.029	Positive

- *E-C*: we found the Visual Attention (VA) from the "Face Analysis tool" shows (Tab.2)
  - growing the attention as satisfaction scenario increase (mean grow high → very high) in dist parameter (distance from monitor, >1 close to the screen),

- growing the attention as satisfaction scenario increase (mean grow high → very high) in Head Roll parameter (rolling of the head – eye angle from horizontal level, <10 attention depending on the scenario, >10 high mobility),
- growing the attention as satisfaction scenario increase (mean grow high → very high) in Gaze tracking parameter (Gaze vertical parameter >1 view the screen).

Table 2. Variation of VA parameters

Satisfaction Scenario (Average)	Very high (4 male)	High (8 male)	Medium (1 male)
Gaze Vertical	8.28	7.09	0.21
Dist_Monitor	1.12	1.07	0.99
Head Roll	1.9	0.49	-2.16

II. The data of sentiment/opinion analysis come from three experiments for Gaze tracking (Fig.9)(Papachristos et al., 2013d; Papachristos and Nikitakos, 2014):

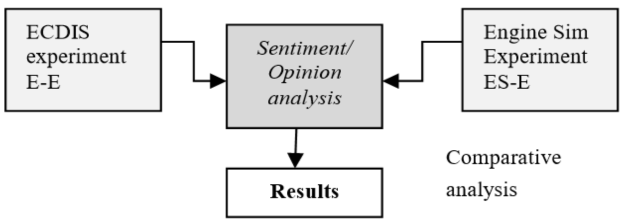

Figure 9. Diagram of Result Analysis for Sentiment Analysis

1 *Experiment ECDIS (E-E):* The experimental procedure for satisfaction phenomenon of the users-students in e-navigation ship's bridge environment *ECDIS* in May and June 2012, in the Marine Engine System Simulator (MESS) Laboratory of the National Marine Training Centre of Piraeus (NMTCP) (sample: 31 Marine officers).
2 *Experiment Engine Simulator (ES-E):* the sampling was carried out between January and February 2013. The samples consisted of 6 students-users. They were subjected to a specific experimental procedure (Diesel generator operation) in engine room simulator and completed the questionnaires and gave interviews (research approach).

We found in both experiments (E-E, ES-E):

- The most used phrase in user's answers in sentiment analysis has this format:

Phrase: (mdf | auxiliary verb) + satisfied (7)

- and opinion analysis:

Phrase: mdf +adjective| noun | verb (8)

Specifically, in E-E experiment found:

- In sentiment/opinion analysis, we observe the total word of answer's users depending from satisfaction (growing the sum of Total words from low → very high satisfaction) in Scenario & ECDIS satisfaction.
- The Mdf (modifiers) words (Mean Mdf, using Mdf) depending from satisfaction (growing from low → very high satisfaction) in Scenario & ECDIS satisfaction.
- The most used word in sentiment phrases is *"αρκετά (enough)"* (ECDIS & Scenario satisfaction form user;s answers) and the most used phrase in user's answers has this format: (mdf | auxiliary verb) + satisfied (verb).

Specifically, in ES-E experiment found:

- The Total N / Sum Mdf (Modifiers) Index depending from personal satisfaction (growing from very high → high satisfaction) in Scenario & Simulator satisfaction.
- The most used words in sentiment phrases is *"αρκετά (enough)"& πολύ (a lot/very)* (simulator & Scenario satisfaction form users answers) and the most used phrase in user's answers has this format: (mdf | auxiliary verb) + satisfied (verb) & mdf +adjective| noun | verb.
- Very High personal satisfaction for simulator (majority) and high personal satisfaction for simulator (majority).
- In sentiment/opinion analysis, we observe the Mean Mdf Index is 2 approximately for all cases.

5 CONCLUSIONS

This experimental procedure is a primary effort to research the educational and usability evaluation with emotion analysis (satisfaction) of the users-students in maritime simulators.

The main purpose of this research, is the investigation of personal satisfaction of a user of MET equipment (Engine room simulator, ECDIS, MATLAB) via the assistance of Gaze tracker (Face Analysis tool) & sentiment/opinion analysis, but also other methods like MMR (questionnaires-interviews).

The results from experiments until now, are shows:

1 optical parameters
  - the correlation between VA parameters and satisfaction:
    - time recorder (p1),
    - Gaze vertical (p2),
    - Distance Monitor (p4), and
    - Head Roll (p5),
  - and the correlation between VA parameters and usability assessment (SUS scale)(ECDIS experiment).
2 language process
  - common structure type of phrase for sentiment & opinion analysis,
  - observe the total word of answer's users depending from satisfaction, and
  - the most used word in sentiment phrases is "αρκετά (enough)"

The two techniques (gaze tracking, sentiment/opinion analysis) appears to be one capable of satisfying evaluation tool. The research continues with the numeral increase of the sample and the total processing and evaluation of the research findings (qualitative and quantitative data). The proposed approach may require further adaptations to accommodate evaluation of particular interactive systems.

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