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Customising ANN on Emojis for User Behaviour Prediction: An Unconscious Attitude towards Mathematical Problem

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Abstract
The major contributions of AI in modern technology are the application of emotion recognition tools which is mostly based on eye movement, facial expression and modification of its inference engine. These systems are schemes that are mostly built to understand user expression in an online E-learning environment or a Cooperate environment with limited ability to recognise exclusive expressions that determines the transmission of appropriate solutions. The basic emotions are expressed when involved with online surfing or interrelating with other personals online. At most times studying how to understand user expression is often a most tedious task, especially the subtle expressions. An emotion recognition system can be used to optimise and reduce complexity in understanding users' subconscious thoughts and reasoning through their pupil changes that automatically give a methodical strategy to a complex solution. This paper demonstrates the use of a PC webcam to read in eye movement data that includes pupil changes. A custom eye movement algorithm (CEMA) is used to capture users' activity to detect stress and record the data which is served as an input model to an inference engine (artificial neural network (ANN)) this helps to predict user emotional response conveyed as emoticons on the complex steps detected for a given problem this is directed to automatically display stress suppresser in form of a window based prototypical model. The window contains explicit steps for an average user's conceptual limit. This bridges the gap between high knowledge assimilation and an average comprehensive limit of a student.

1. INTRODUCTION

Using emoji is a common text-based expression and it is a novel form of investigation in recent research areas on AI. An emoji database containing emoji pack can contain a set of custom emoji designed with a specific signature tune in mind. In AI they are used as a form of emotional expression from a user to the interface [3], [1], [2]. For AI adaptive systems, an emotion recognition scheme is

built to understand user expression in an online business webpage on marketing site to understand user expression or set as an objective view towards client products. The major user attributes to extract is the user emotion based on stress and how to reduce its course.

In an educational enterprise, the focus of understand- ing a lecture note content through E-Learning is at its advancement. The basic emotions are expressed when trying to find a solution to a complex problems. Building advanced tools that incooperates explicit description of the most basic steps, reduces stress emotion in students. Also studying how to understand user expression can be a tedious tack, technology through AI are used to produce emotion recognition systems to optimise and reduce guesswork [4, 5, 6, and 7] working to upgrade procedures for optimising the comprehensive limit of an average student. The research question is: What are emotion recognition systems and their benefits to advancement to E-learning? The E-learning emotion recognition tool [3], [11]–[13] created here, is used to allow a certain program to process the expressions on a user's face, mostly using radical image dispensation; it functions as the brain of a person which is capable of recognising the emotions of an individual, its limitation is based on recognising subtle expression relatively complex to detect [8, 9, and 10] such as the basic steps to a complex solution to a mathematical problem in an online lecture note.

2. RECORDING EMOTIONAL RESPONSE WITH PUPIL CHANGES

This paper tends to give a diverse and modest trend to emotion recognition for E-learning in a different angle [10], such as the use of pupil changes of the eyes to monitor user emotion to complex solutions. The pupil dilation or constriction of the eyes not only reflects changes in light intensity or an instant change in the object's position but an underlying user response which is quite authentic. The eyes is the soul of a person's existence, every authentic expression of emotion is expressed through the eyes. To generate an accurate user attribute, the expression on the eyes based on pupil changes is adequate and can be used to encapsulate all basic expressions relating to the face. Studies have shown that the size of the eye's entrance pupil (virtual image) [19] of the physical pupil as seen through the cornea can be used to portray user emotion [19], i.e. the retinal illuminance is proportional to the entrance area of the pupil [15], [16] the signature of human delicate emotions. This standard method is what is followed here by specifying stimulus intensity by photopic luminance with light levels visual range measured in cdm−2. Equation 1 illustrates that M is the luminance in "millimberts", which is converted to cdm−2. The PC lens registers the luminance [17], [18] by recoding in terms of "millimberts"and integrates it to the E- learning tool. To recognise an emotional response to stress, the baseline (Algorithm 1) plays an important rule between recorded increase and decrease of pupil diameter and between the baseline that correlates to relaxed, stress, confused and neutral emotion of the user. The paper demonstrates the use of a PC camera to track the expression of the eyes that correlates to custom emoji and convey the users' expression on a particular complex step in the static webpage of the mathematical problem; this is set as the pilot study.

$$D = 7exp(\ 0.16M\ 0.4)Dn(l) = 7exp(0.10007l0.4)\ \ldots\ (1)$$

Through deep learning emotion recognition system can operate like the human brain to process data and develop patterns used for detecting objects for decision making [17, 18]. This means using an artificial neural network (ANN) based on the structure of the cortex of the brain; and have a great emotion recognition benefits.

Algorithm 1 Emotion recognition algorithm using subject's pupil changes

1: ***Input:*** *Subject Pupil;*
2: ***Output:*** *Recorded data, Predicted emotion*
3: *procedure Update Item(item*
Emoji expression, emotion state)
4: ***for*** *subject = 1:Students do*
5: *Ready subject's iris*
6: *Set pupil and voice localisation*

7: Compute pupil dilation and constriction
8: Determine a baseline for pupil change
9: ***if*** *pupil change is less than the average baseline*
then
10: Set user response to stress else goto v
11: end if
12: if pupil change is less than the average baseline
then
13: Set user response to stress else goto v
14: ***end if***
15: Set user response to relax
16: ***else*** *set user response to neutral mood goto 3*
17: Trace iris position
18: ***if*** *eyes closed, wait else go to 2* ***then***
19: initail eye position 20: ***end if***
21: ***if*** *eyes open and no iris detected to 2* ***else*** *3 then*
22: update eye position
23: ***end if***
24: Trace location of eye movement 25: Set calibration for both eyes
26: Locate iris position
27: Set point of location to field
28: Detect stress content on field
29: Locate eye positions
30: Capture content field
31: Display content field
32: Save emotion recognition data Tc(k)
33: Detect other stress content
34: Update window
35: ***if*** *Stress stimulus detection complete goto15* ***else***
then
36: update stimulus
37: ***end if***
38: end for
39: end procedure

Data is captured from an online learning site on complex computational steps to problems through E-learning and used as an inference knowledge base machine. The inference engine contains images that are applied as a form of comparison and emotion recognition variations for solving complex steps in a given problem. The images and data collected are stored to a server. For each user attribute generated, the dataset is served as an input to the system and localises a relevant image from this base by making a comparison to other stored images in form of explicitly described solutions to the problems as an output. This specified output is the predicted response of the user conveyed by emojis that automatically generates the simplest solutions. AI can help identify basic user emotions to visual contents by simply presenting them with different dynamic contents

Though, there are some places where emotion recognition is prohibited by law because some people don't like the use of AI interpreting their facial expressions. The system comes with a policy that a user will have to agree to the terms and conditions before any data is collected. This will enable proper authentication and anonymousness of personal information. Though emotion recognition systems are not near to perfection, the most advantageous part of it is that they can truly detect emotions apart from certain weaknesses such as the subtle expressions which are more startling than the truly basic emotions. To avoid wrong assumptions, a test needs to be run several times with different classification models. Novel models also need to be tested with different standard algorithms. This would encourage further modification and optimised strategies that would enhance decision making.

2.1. Using Emojis on E-learning static page as an analytical tool

The use of emojis on static E-learning webpages can help connect with students having both high comprehensive ability and average learner by increasing the comprehensive ability in problem solving and have a unique connection between the students and the lectures. The emojis convey messages better than subjective view and the online survey- based questionnaire approach. The system can be integrated on the server platform (Figure 1) to add a trace of personality to the most boring the complex content. All activities in the framework are based on three modules, 'test, 'report' and 'transfer from one server to the other for both archived data and usability testing (Figure 1). The use of emojis can bring a unique change in detecting the number of click-through rates, general engagement level, and open rates this would enhance the unique perception of the complex steps in the visual content. Application of analytic tools like emotion recognition systems' integration to the server hosting dynamic E-learning contents, would allow the administrators or lecturers have a unique connection with the students without the use of online surveys or subjective perception of the users. The use of emoticons to redefine gaze points will give an authentic user response to course content they viewed while looking at the steps of a solved problem in an E-learning site.

3. METHOD

The method adopted is based on an experimental setup where data are generated using students that interact with the tool to acquire datasets for analysis. The dataset is divided into training (75%) and test (25%). The generated data is simulated to two thousand instances to test the reliability of the custom eye movement and voice algorithm (CEMA Algorithm 1) of the tool. The standard ANN is used to predict the user response. Both models were used as an inference engine for the generated datasets. Typically computed features of the user attributes includes the pupil dilation and constriction (relays the emotional response of the users to the solutions of mathematical problems given in the visual field), fixation point in both the X and Y coordinate of the E-learning webpage, the number of emotional response detected for a particular user. The forms of data generated is also translated as text and assembled for adaptive algorithms like the ANN. The CEMA reads in user activity and makes predictions based on the discrete time-variant model. Error in predictions are computed and compared for both models on the training and test set. The learning process is based on an unsupervised procedure to allow the model to learn by itself and group the user response to the solutions in the mathematical problem provided; the generated model suppresser reduces stress mood into users' authentic responses like 'relax mood'.

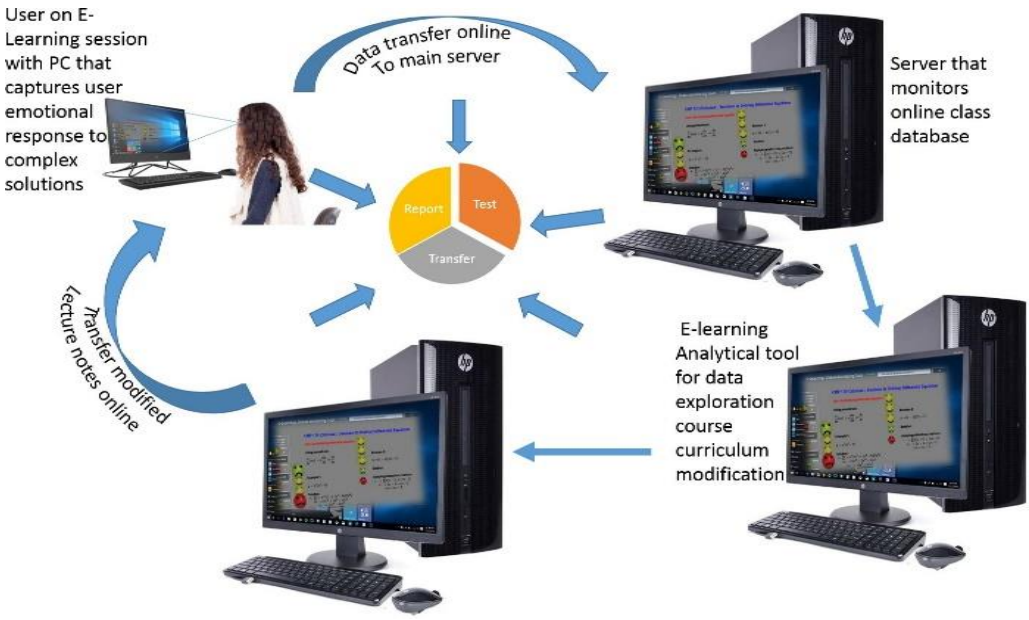

Figure 1. Framework for Advance E-learning with synchronized servers.

4. Result

Predicted emotional response was conveyed to the interface as a form of emojis. The eye movement behaviour thought recorded, cannot be visualised in the system but its compressed data is transferred to the host server that predicts the user emotional response based on the user attributes. Figure 3 shows a window with detected emoji face that portrays emotion expression of the users, two stress points were identifying during the session. This stress points were at the initial stage of the session (first step to the solution).Predicted emotional response was conveyed to the interface as a form of emojis. The eye movement behaviour thought recorded cannot be visualised in the system but its compressed data is transferred to the host server that predicts the user emotional response based on the user attributes. Figure 3 shows a window with detected emoji face that portrays emotion expression of the users, two stress points were identifying during the session. This stress points were at the initial stage of the session (first step to the solution).

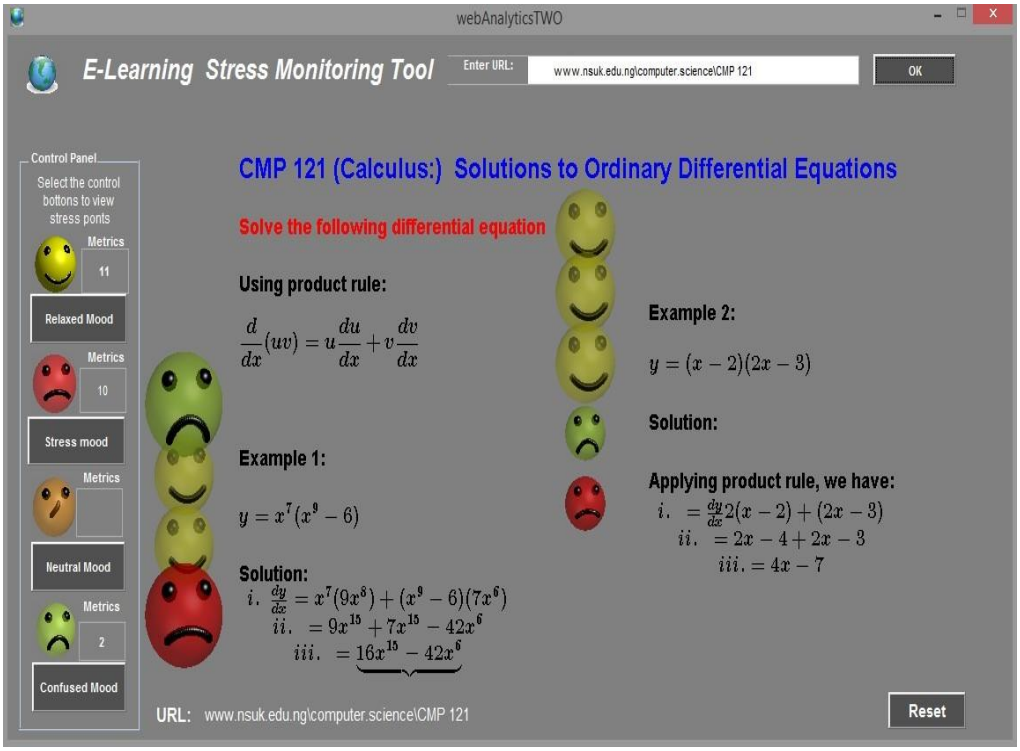

Figure 2. A captured webpage with emotional response of users to the steps in the mathematical problem and solutions presented

To authenticate a stress suppressor, the response state is initiated to form a pop up window containing the same problem both with easy and explicit solution stages for the user (Figure 4). This response is correlated to the amplitude of the user pupil change based on dilation or constriction of the pupil below or above baseline response. This form of psychological inducement helps increase the thinking process and comprehension ability of an average user that encourages interest and comfortability of the course content.

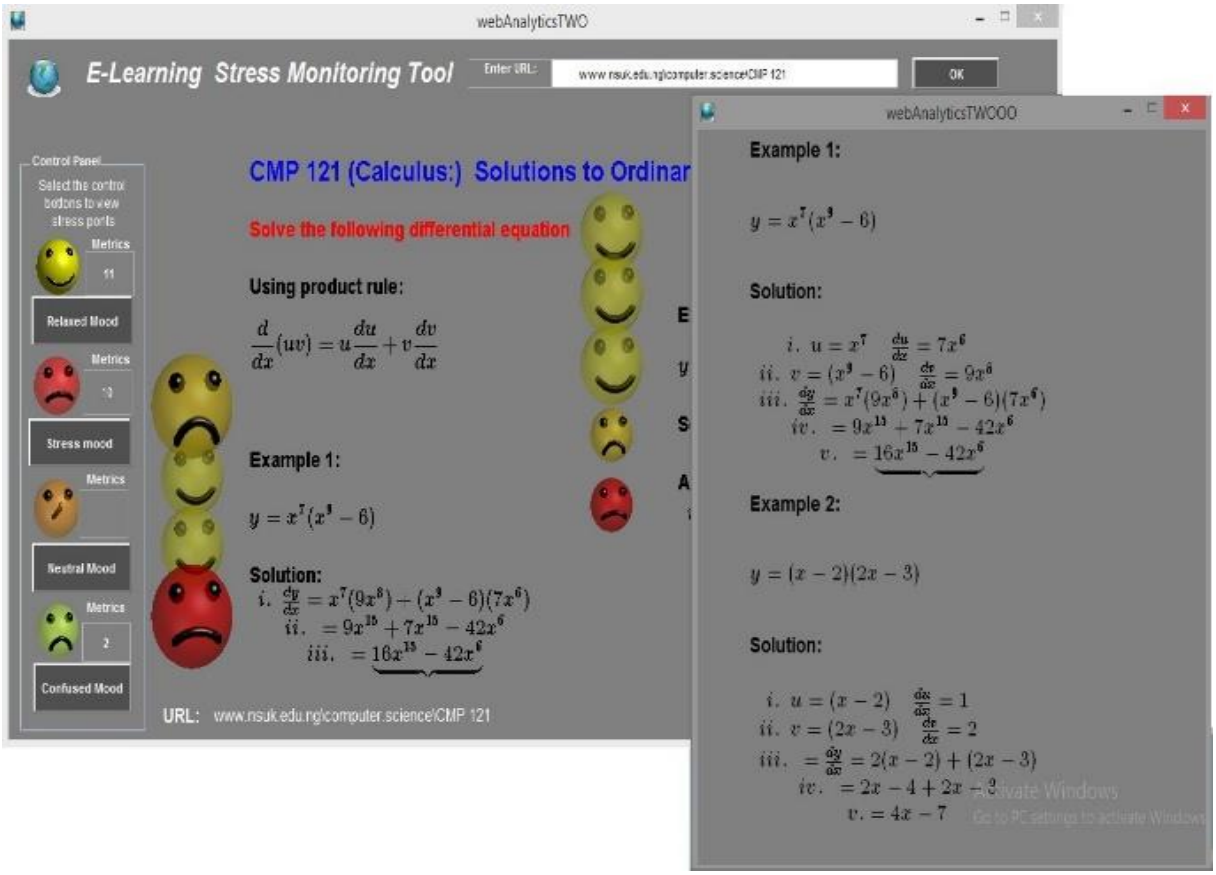

Figure. 3 A captured E-learning page with stress induced suppressor.

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