

Custom Affective Responses to Mitigate Student Frustration in ITS

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ABSTRACT_ Many Intelligent Tutoring Systems (ITS) incorporate students' affective states into their learner models due to the significance of affective states in the learning process. By identifying and reacting to students' emotive states, an ITS can enhance its adaptability and, thus, its benefits. We have previously developed and verified a theory-driven model for identifying the reasons behind students' displeasure as they engage with the ITS and for recognising it when they do. In this study, we propose an approach to address the many causes of students' discontent by providing encouraging messages. These statements are designed to express sympathy for failure, commend the student's effort, link the outcomes to the determined cause, and get input from the students, all in accordance with attribution theory. Our method was put into practice in three schools where kids engaged with the ITS. For our investigation, 188 students' data from the three schools were gathered over a two-week period. The findings indicate that the motivational messages contributed to a statistically significant ($p < 0:05$) reduction in the number of frustration cases. According to this study, there are fewer incidences of irritation per session when motivating messages apply attribution theory and address the cause of the frustration.

1.INTRODUCTION

A Canny Mentoring Framework (ITS) gives customized learning content to understudies in view of their requirements and inclinations. An ITS comprises of the learning content, the student model, and the variation motor. Student models are built from the log records accessible in the ITS. The understudies' connection with

ITS, like reactions to questions, the quantity of endeavors at an undertaking, and the time taken for different exercises, (for example, answering or perusing) are caught in the ITS log document. Student models additionally ordinarily contain data, for example, the understudies' past information and foundation [1], from which deriving the understudies' mental

states is conceivable. The variation motor customizes the gaining content in view of the information from the student model. It is currently deeply grounded that the educational experience includes both mental and emotional cycles [2], [3], and the thought of full of feeling processes has been displayed to accomplish higher learning results [4], [2]. The significance of an understudy's full of feeling part in learning has driven ITS to incorporate understudies' emotional states like disappointment, fatigue, disarray, stream, interest, and tension in their student models. In this examination work, we center around the reaction to understudies' disappointment. Flow research on recognizing disappointment incorporates stu-marks' self-detailed information of their full of feeling state [5], [6], mining the framework's log document [7], face-based feeling acknowledgment framework [8], dissecting the information from actual sensors [5], and utilizing detecting gadgets, for example, physiological sensors [9]. Answering disappointment includes paying attention to the individual who is baffled without responding or intruding on [10] and by giving chances to communicate their feelings [4]. In school systems, dissatisfaction has been tended to by giving criticism conveyed utilizing specialists [11], [12]. The specialists show

the inspirational messages to address the adverse results of disappointment [4], [11], and [12]. The specialists are intended to show sympathy and urge the understudies to learn. In this examination work, to identify (perceive) understudies' dissatisfaction, we follow a hypothesis driven approach [13], in which we develop a model for understudies' disappointment utilizing log information of their collaboration with the ITS. This model depends on hypothetical meanings of dissatisfaction [14], and is shaped by choosing and properly joining the elements in the ITS log record that predicts an understudy's disappointment. The model assists us with figuring out the commitment of each component towards the understudy's disappointment. Subsequently this approach gives us data of when the understudy is baffled as well as why the understudy is disappointed. This prompts an educated variation while answering understudies' dissatisfaction by making and showing customized persuasive messages as input.

2.LITERATURE SURVEY

2.1 Affective States in Learning

The integration of affective states in learning environments has been extensively researched, highlighting the

critical role emotions play in the learning process. Research by D'Mello and Graesser [2], [3] has shown that considering both cognitive and affective processes leads to higher learning outcomes. Pekrun et al. [4] further support the importance of emotions, demonstrating that affective processes can significantly enhance learning experiences.

2.2 Recognizing Student Frustration

Several methods have been explored to recognize student frustration in ITS. Self-reported data is a common approach, where students provide direct feedback on their emotional states [5], [6]. Another method involves mining system log files to infer frustration based on interaction patterns [7]. Facial expression analysis [8] and physical sensor data [5] are also used to detect emotional states. Additionally, physiological sensors have been employed to capture subtle changes in students' physical responses indicative of frustration [9].

2.3 Addressing Frustration through Feedback

Effective feedback mechanisms are crucial for addressing student frustration. Research by Lepper et al. [10] emphasizes the importance of listening to students and

providing opportunities for them to express their feelings. Feedback delivered through agents has been shown to be effective in mitigating negative emotions. For instance, Arroyo et al. [11], [12] developed agents that display motivational messages to counteract frustration and encourage learning. These agents are designed to show empathy and support, creating a more positive learning environment.

2.4 Theory-Driven Models for Frustration Recognition

Theory-driven approaches have been employed to develop models for recognizing and addressing student frustration. Baker et al. [13] proposed a model based on theoretical definitions of frustration [14], utilizing ITS log data to predict when and why a student is frustrated. This approach allows for a more comprehensive understanding of the factors contributing to frustration, enabling the creation of personalized feedback tailored to each student's needs.

In summary, the existing literature underscores the importance of integrating affective states in ITS, recognizing student frustration through various methods, and addressing frustration with empathetic and supportive feedback. Our research builds

on these foundations by implementing a theory-driven model to deliver personalized motivational messages, ultimately aiming to reduce student frustration and enhance the learning experience.

3.PROPOSED SYSTEM

In this paper author is describing concept to detect frustration in students and this frustration detection technique is using by many Intelligent Tutoring System with the help of Learning Models. Prior frustration detection can allow institution to help students overcoming from frustration, this frustration can develop in students due to lack of concentration, confusion and getting bored during classes.

In this paper by detecting frustration we can send motivational messages to praise student which can help him in fighting frustration, to achieve this we present a strategy to respond to students' frustration by offering motivational messages that address different causes of frustration. Based on attribution theory, these messages are created to praise the student's effort, attribute the results to the identified cause, show sympathy for failure or obtain feedback from the students.

All existing techniques were able to detect frustration but they don't propose any

concept of motivating frustrated student to overcome from this problem, but in propose system not only we are detecting frustration we are able to find cause or problem of frustration and offer him with motivational and sympathy messages to fight frustration.

To build this system we are using theory-driven approach based machine learning model and previous students LOGS DATA, using this log data and machine learning we will build a learning model and then whenever we issue new student data then this application apply new student data on that learning model to predict best matching result, this result will contains information about students whether he is suffering with any frustration or performing well, if suffering from frustration then what its root cause. All this information we can get from learning model result.

To implement learning model we are using PYTHON machine learning Algorithms and we are using past student log data.

3.1 Dataset Information

To implement above technique we are using 'Mindspark' previous students data, this data contains students' performance average values collected from various tests like confusion, concentration, bored and frustration. Below I am showing few

records from 50000 students dataset and this dataset name is 'affect_estimates.csv' which is available inside dataset folder.

Dataset values

id, student, observed_confused, observed_concentrating, observed_bored, observed_frustrated, affect, to

0, 72720, 0.17183861, 0.428695172, 0.393139273, 0.164317191, 0, 1
 1, 72720, 0.132175878, 0.65661031, 0.184330121, 0.128531024, 1, 1
 2, 72720, 0.079290338, 0.770555317, 0.131177962, 0.08729333, 1, 1
 3, 72720, 0.05293958, 0.836300731, 0.118124247, 0.035456825, 1, 2

In above dataset all bold names are the dataset column names and below are the average values. In above columns 'affect, to' show important values of dataset such as whether student is frustrated or not, if frustrated then what its cause. In dataset we have given values from 0 to 5 and below are the description of those values

NUL = 0

ENG = 1

BOR = 2

MULT = 3

FRU = 4

CON = 5

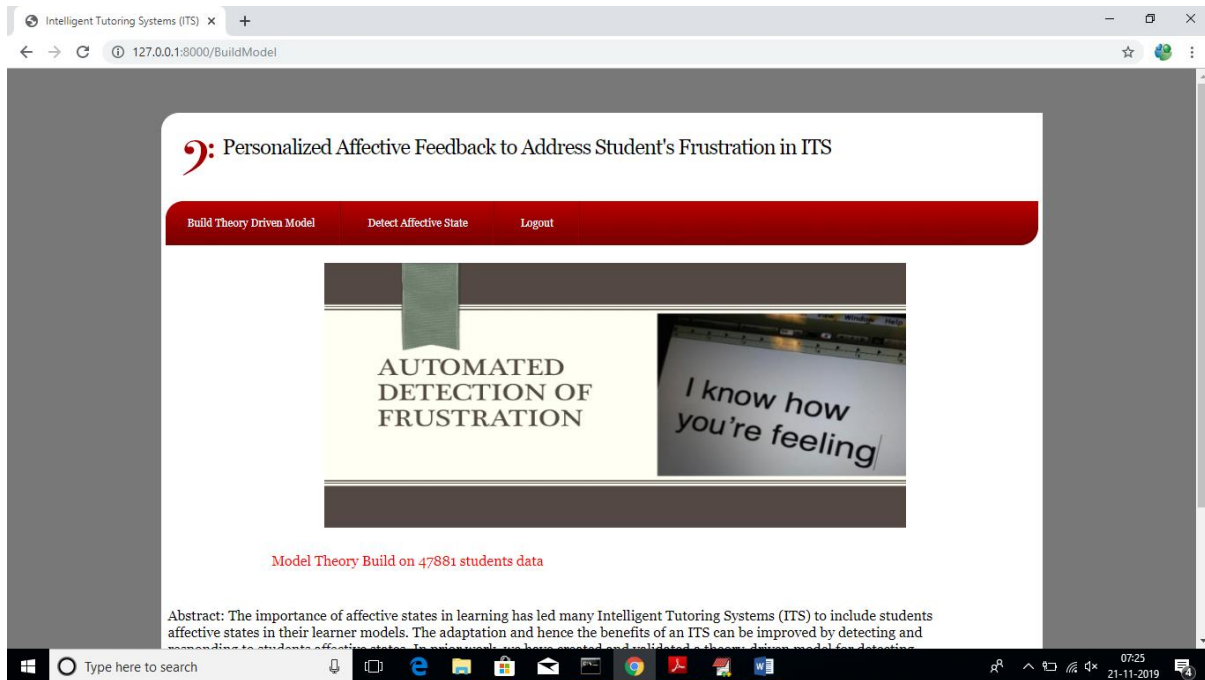
If NUL means student performing well and in dataset we give value as 0, ENG means student is having engaging concentration problem, BOR means getting bored, MULT means student is suffering from multiple problems such as lack of concentration and confusion etc, FRU means frustration and CON means confused. In dataset we cannot use normal names as learning models work only on integer values not on names, so we assign unique values to each problem. In dataset if we get values as 0,1 then 'affect is' 0 which means performing ok and 'to' is 1 which means having engage concentration problem.

If we get result as 0, 0 then 'affect' 0 means performing well and 'to' 0 means has no problem.

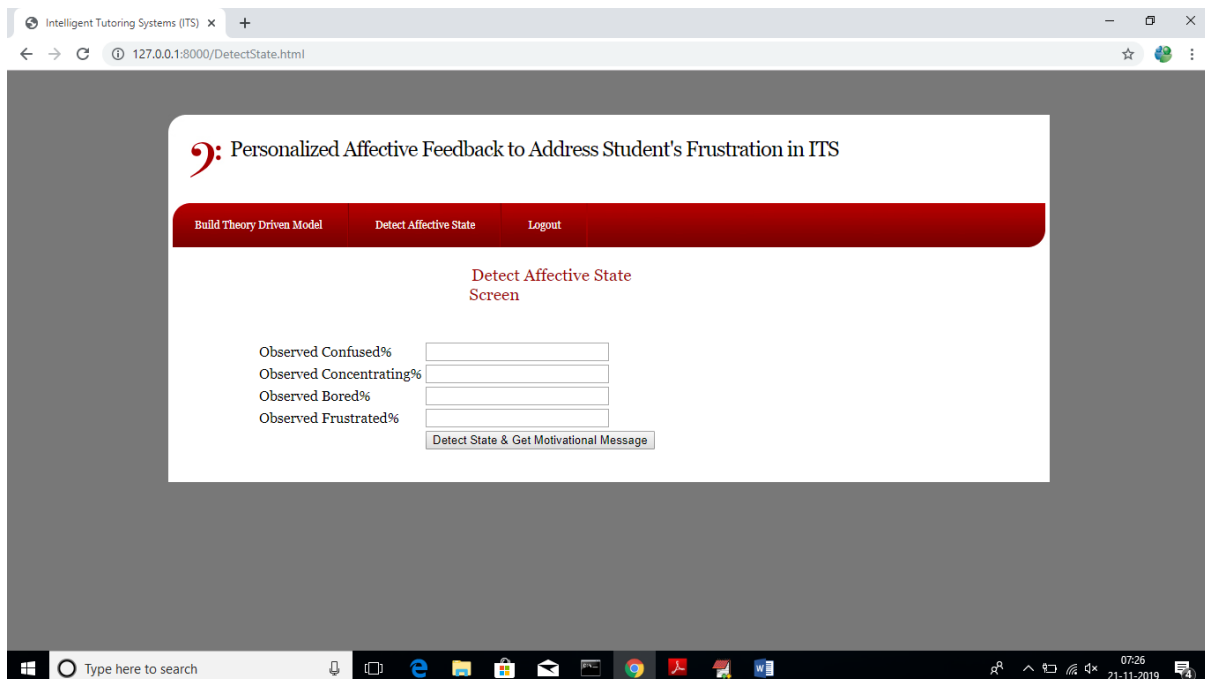
If we get result as 1, 1 then 'affect' 1 means having concentration problem and 'to' 1 means is effecting student state.

Similarly algorithm will evaluate all states and give us the result. To get result just we need to enter student current average value

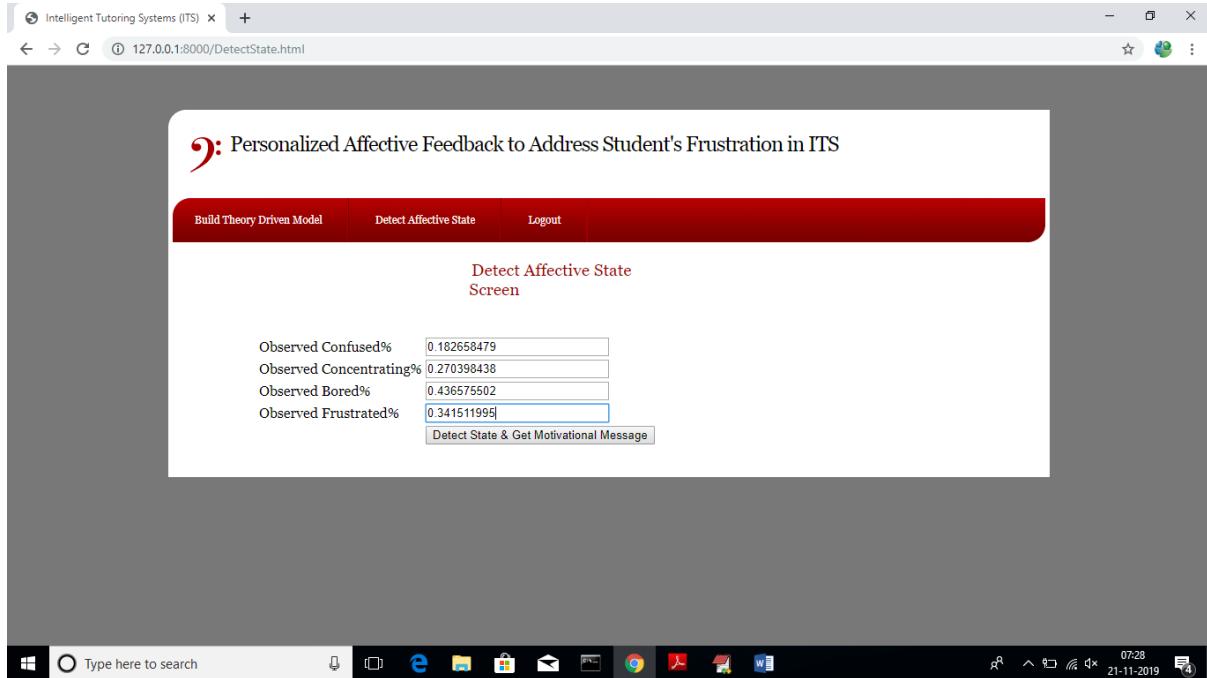
4.RESULTS AND DISCUSSION



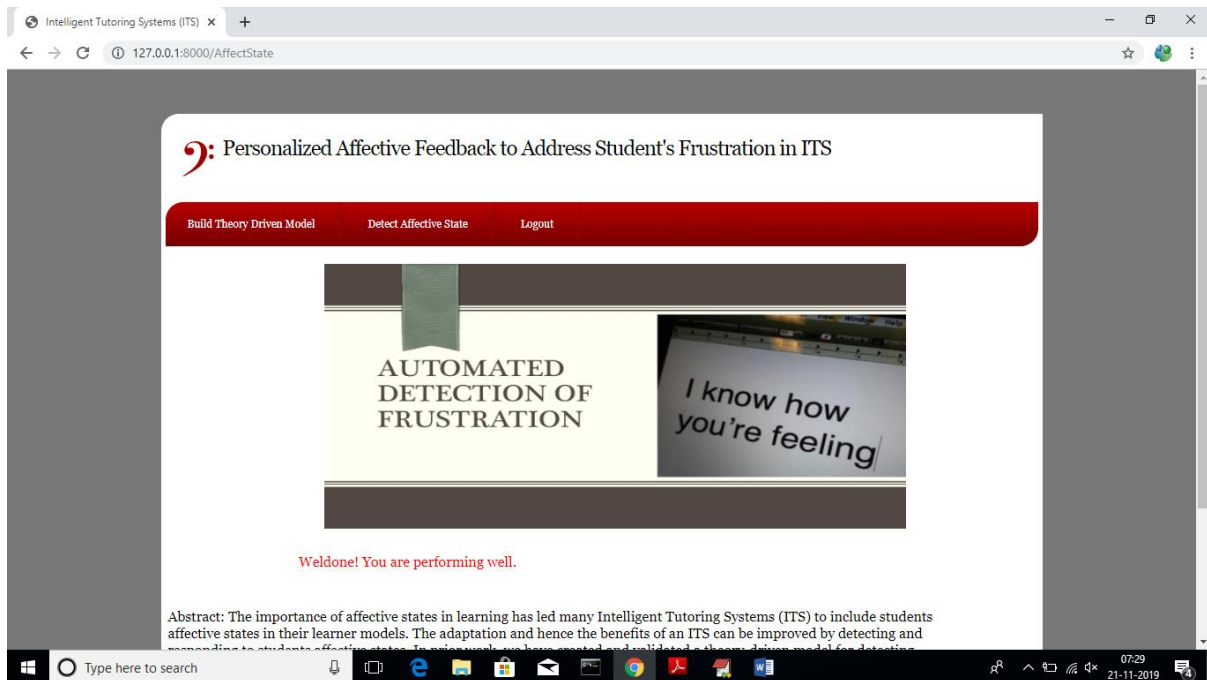
In above screen we can see in red lines that application build learning model using 47881 number of students data. We need to build model only one time, once after building model we can predict student frustration just by entering values. Now click on 'Detect Affective State' link to get below screen



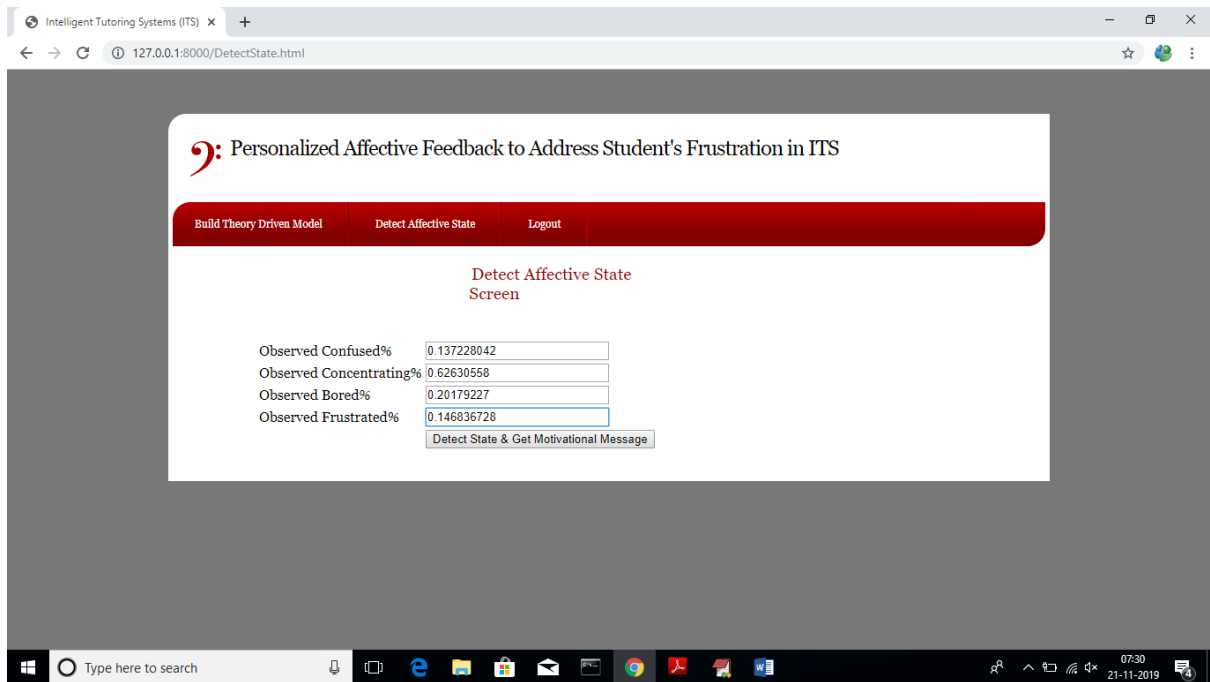
In above screen we need to enter current student performance values to detect his frustration problem.



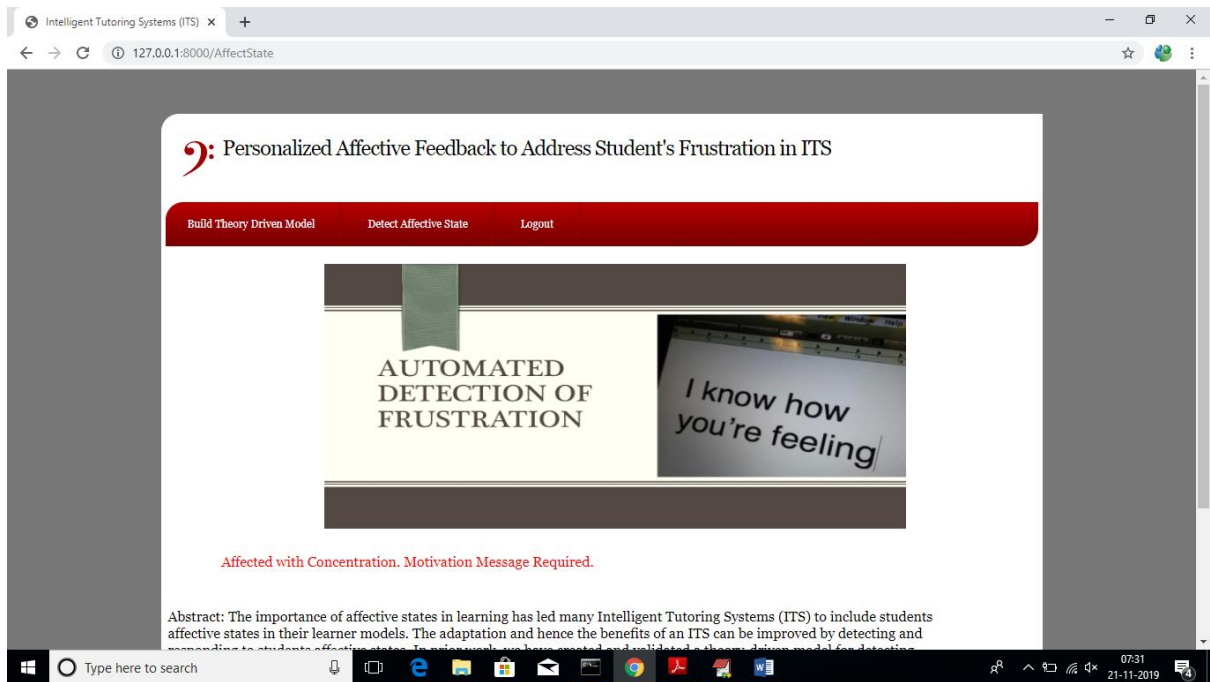
In above screen I entered some values and now click on button to get result. For above value we got below result



In above screen we got result as ‘Student performing well’, now we will test with some other values



For above screen values we got below result



In above screen we can see student is frustrated and the root cause is lack of concentration and it will tell admin to send motivation messages. Similarly u can test with any values and if u confuse then u can use below values to detect various frustration causes

5.CONCLUSION

In our method, the motivating messages' effect on frustration was examined, and the causes behind the students' moments of irritation were utilised to craft the feedback messages. However, in our upcoming work, we intend to examine the effect of particular motivating messages on students' moments of dissatisfaction in order to gain a greater understanding of what aspects to take into account while developing the messages. Additionally, we plan to construct an algorithm in our subsequent work to generate motivational messages in response to learners' affective states based on their past knowledge, the nature of the affective state, and its duration.

REFERENCES

- [1] Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2015–2016 White Paper. Available at: <http://www.cisco.com/c/en/us/solutions/co>llateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.html
- [2] B. Cici, M. Gjoka, A. Markopoulou, and C. T. Butts, “On the decomposition of cell phone activity patterns and their connection with urban ecology,” in Proc. MobiHoc 2015 (Hangzhou, China), Jun. 22-25, 2015, pp. 317–326.
- [3] M. C. Gonzalez, C. A. Hidalgo, and A.-L. Barabási, “Understanding individual human mobility patterns,” *Nature*, vol. 453, pp. 779–782, 2008.
- [4] Y. Jin, N. Duffield, A. Gerber, P. Haffner, W.-L. Hsu, G. Jacobson, S. Sen, S. Venkataraman, and Z.-L. Zhang, “Characterizing data usage patterns in a large cellular network,” in Proc. CellNet Workshop 2012 (Helsinki, Finland), Aug. 13, 2012, pp. 7–12.
- [5] M. Kosinski, D. Stillwell, and T. Graepel, “Private traits and attributes are predictable from digital records of human behavior,” *Proc. the National Academy of Sciences of the United States of America*, vol. 110, no. 15, pp. 5802–5805, 2013.