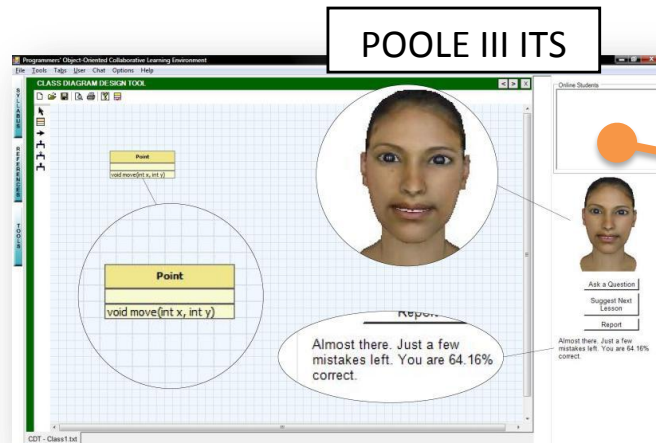
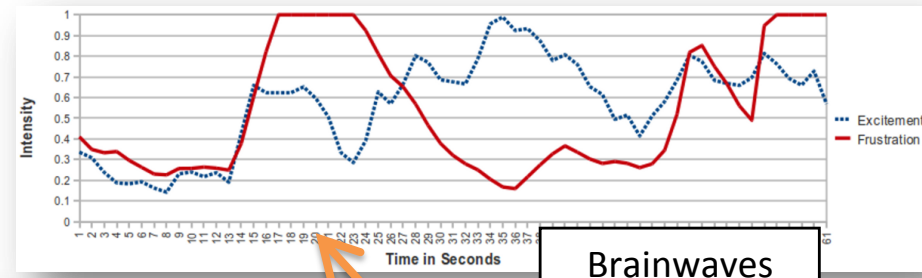


CAN A STUDENT'S EMOTIONS TOWARDS FEEDBACK GIVEN BY AN ITS BE PREDICTED?

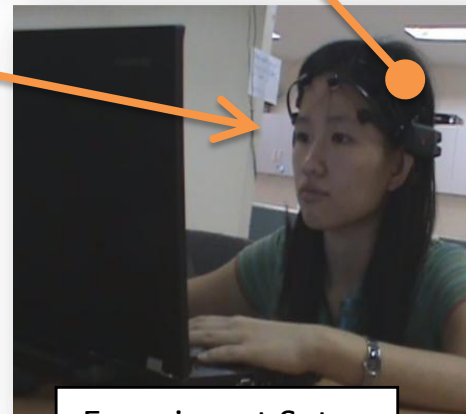
The Emotiv Epoc is an EEG based device which is capable of extracting the subject's excitement, frustration, engagement and meditation values in real time which are used for identifying their emotional state.



The Programmer's Object Oriented Learning Environment (POOLE III) is an ITS which helps students learn how to create class diagrams.



Brainwaves



Experiment Setup

12 students were asked to use POOLE III while wearing the Emotiv Epoc to measure their emotional states while receiving feedback from the ITS. Logs from both POOLE III and Emotiv Epoc were collected.



Gender	Student profile
Age	
Accommodation	Personality values
Emotional Stability	
Extroversion	
Inquisitiveness	
Orderliness	
Engagement	Brainwave data
Excitement	
Frustration	
Meditation	
Grade	POOLE III log data
Message	
Delta Frustration	Label

Naïve Bayes Classifier

Accuracy: 58.30%
Classification Error: 41.70%
Kappa: 0.053
Root Mean Squared Error: 0.525

	true less frustrated	true more frustrated	class precision
pred. less frustrated	126	97	56.50%
pred. more frustrated	67	80	54.42%
class recall	65.28%	45.20%	

Can something still be done to improve the results?

Feature Analysis

Are the current features able to capture factors that affect the student's emotions when they receive feedback?

Feature Generation

What features can be added into the current data set to further predict the student's reaction to the feedback?

How do they affect the results?

Are the current features now able to capture factors that affect the student's emotions when they receive feedback?

New Features added

Problem count

The more problems a student has tried solving will probably affect his/her frustration level.

of times feedback is seen

A student will probably react when he/she keeps on seeing the same feedback repeatedly.

Categorization of feedback

Feedback can be categorized as hints or assessments which have different purposes and might be interpreted differently by the student.

Last feedback category seen

Constantly requesting for hints or assessments and shifting between the two may cause students to have different expectations and reactions.

Change in the grade

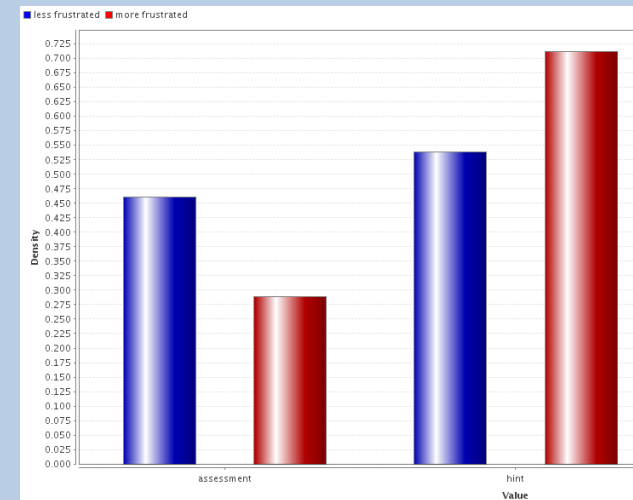
As the student tries new approaches to solve the problem, his/her grade may either increase or decrease causing reactions from that result.

Performance Improvements

Accuracy:	62.64%
Classification Error:	37.36%
Kappa:	0.153
Root Mean Squared Error:	0.512

	true less frustrated	true more frustrated	class precision
pred. less frustrated	127	81	61.06%
pred. more frustrated	66	96	59.26%
class recall	65.80%	54.24%	

Other Findings



Upon analysing the data, the hints provided by the system were seen to often increase student frustration verifying student comments collected from a survey.

Adventures in Feature Analysis and Modification in Data Mining

Paul Salvador Inventado
De La Salle University, Manila

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UNC Charlotte

Problem Description

What was the driving question
in performing data mining?

Data Collection and Initial Analysis

Where did the data come from and what were the initial results?

Iterative Process of Feature Creation

What had to be done to give more meaningful results?

Preliminary Findings

Did the modifications on the features help? What was discovered through the data mining task?

Special thanks to:



Leigh Ann Sudol Ryan Baker