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### Emotional Awareness During Bug Fixes – A Pilot Study

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# Emotional Awareness During Bug Fixes – A Pilot Study



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## Problem Context

- This study examines the effects of a programmer's emotional awareness on progress while fixing bugs.
- The goal of the study is to capitalize on emotional awareness to ultimately increase progress made during software development. This process could result in improved software maintenance.

## Research Question

Can we determine emotional state of a developer using biometric sensors during debugging?

## Data Sources

Tobii X3-120 Eye Tracker



Affectiva

:) Affectiva

Shimmer GSR



## Study Environment

iTrace infrastructure ([www.i-trace.org](http://www.i-trace.org)) was modified to capture gazes within the Eclipse IDE from all three data sources.

A server/client application was written to synchronize events between each data source and output biometric data and typed interactions including window focus events.



## Tasks and Participants

- 3 bug tasks were chosen from an open source repository – JabRef
- JabRef is a reference management system
- 3 students were piloted in Computer Science.

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## Task Description and Prompt

Review bug report and fix bug in code.

Bug 2: No comma added to separate keywords  
When adding a keyword via the content selector, nocomma is added before the keyword. I have set "When adding/removing keywords separate themby:" to ", " in the Preferences > Groups panel. But keywords still get separated by a space only.

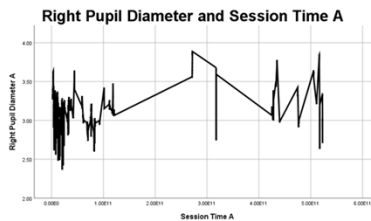
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Answer the following questions after you are done with the task.

Difficulty: Easy | Avg | Difficult

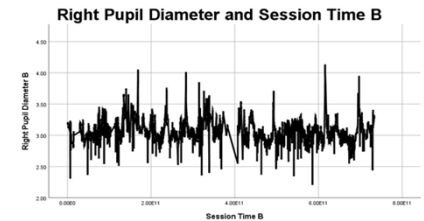
Confidence: Low | Medium | High

Short description of your solution (classes/methods affected):

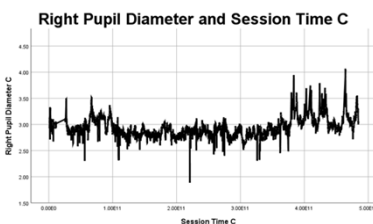
## Results: Right Pupil Dilation in Time



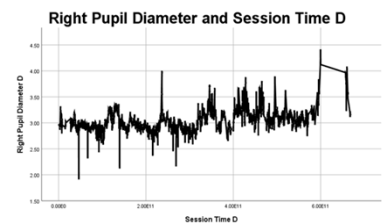
- During session time A there was a small increase with pupil size from the beginning towards the halfway point of the trial. Then a decline was seen towards the end.



- In Trial B there was a significant increase in the amount of pupil dilation change as well as a steadier diameter change in the amplitude.



- In Trial C we saw a smaller amount of change in the amplitude of the diameter change and an increase at the end of the session time.



- Trial D showed a similar start as Trial C but an earlier increase in the median diameter of the right pupil.

## Conclusions

- There is a connection between pupil dilation and emotional arousal as task progresses.
- GSR did not show too much difference but this could be due to placement of electrodes.
- We have some promising evidence that biometric sensors can be used to determine emotional state during bug fixes.

## Ongoing Work

- Lessons learned include changing the placement of the electrodes for the GSR sensor due to typing. The sensors will now be placed on shoulder and not palm.
- Analyze webcam data from Affectiva.
- Conduct the study on a larger sample.