### Motivation

Every computer programmer has experienced reading complex or poorly written code. One aspect of code complexity is the complexity of the lexicon, i.e., identifiers and comments. How do we characterize the quality of the lexicon? Can we identify exactly which identifiers/comments are harder to comprehend than others?

### Objective

The purpose of the project is to study the impact of poorly written code on comprehension. One way to measure comprehension empirically is by tracking a subject’s cognitive load, while they try to understand foreign code. Our task is to design the procedure and create the tools needed for correlating cognitive load to source code identifiers.

### Method

In order to study the impact of poorly written code on comprehension, we measure cognitive load and map it to the source code lexicon, i.e., the identifiers/comments that a subject is looking at. The subject’s cognitive load is recorded using fNIR imaging; concurrently, the location of the subject’s gaze is recorded using an eye tracker. The gaze locations are mapped to the source code real time. The cognitive load data is then synchronized with the gazes. With a post-experimental questionnaire, subjects are interviewed for their subjective view of what parts of the code they struggled with the most and why.

### Results

The graph below shows a subject’s cognitive load over time. The peaks indicate high cognitive load.

The visualization below is a mapping of a user’s gaze duration or cognitive load to the lexicon they were looking at.

### Future Work

- Perform experiments with software developers.
- Extend iTrace to support more programming languages.
- Support other forms of brain imaging like EEG.

### Glossary

- **Lexicon**: Source code identifiers, such as variable and method names as well as comments.
- **Cognitive Load**: The total amount of mental effort being used in the working memory.

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