As an extension to this project, we have started developing a refactoring plugin to support new additions to the Java 8 Collections API\[2\]. These libraries utilize lambdas to make common operations on collections user-friendly and easily parallelizable.

Anonymous Inner Classes (AIC) in Java are widely used in many applications, but the syntax is unnecessarily bulky. Java 8 will introduce Lambda Expressions as a replacement for certain AIC.

We need an automated refactoring tool to perform these conversions quickly and reliably.

```java
button.addActionListener(new ActionListener()
{
    @Override
    public void actionPerformed(ActionEvent e)
    {
        System.out.println("Lambda");
    }
});
```

Conversion

```java
button.addActionListener(e -> {
    System.out.println("Lambda");
});
```

### Goals

- Create a refactoring plugin for the NetBeans IDE to support automatic conversion from AIC to lambdas where possible.
- Submit the plugin as an official patch to the NetBeans source code. NetBeans has over 1 million active users.
- Empirically evaluate the usefulness of the refactoring.

### Fundamental Questions/Challenges

Not all AIC can be converted to lambda expressions. Multiple preconditions must be checked. For example, a lambda must represent an instance of an interface that defines only one method.

Other cases require that additional actions be taken, such as automatic adding of a cast if the type of the resulting lambda cannot be inferred in a given context.

### Research Plan

Refine the plugin to handle known corner cases. Apply the refactoring on open-source projects. Continue to fix new corner cases as they are discovered.

Empirically evaluate the applicability of the refactoring by analyzing open-source projects.

### Research Results

In conjunction with other NetBeans contributors\[1\], we have developed a plugin that correctly handles all documented corner cases.

We also analyzed how often this refactoring can be applied on a group of open-source projects.

![Number of Possible Lambda Conversions in Open Source Projects](image)

### Related Work/Interaction with Other Projects

As an extension to this project, we have started developing a refactoring plugin to support new additions to the Java 8 Collections API\[2\]. These libraries utilize lambdas to make common operations on collections user-friendly and easily parallelizable.

```java
int totalCharacters = 0;
for (String s : strings)
{
    totalCharacters += s.length();
}
```

Conversion

```java
int totalCharacters = strings.parallelStream()
    .map(s -> s.length())
    .reduce(0, (x, y) -> x + y);
```

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\[1\] Jan Becicka and Jan Lahoda, from Oracle, NetBeans
\[2\] Myself and Gabriel Alexandru Gyori (“Politehnica” University of Timisoara)