

Automated Assessment Of Software Product Line Configuration Expressions:

METHOD ANNOTATIONS

```
public addZoomValue(zoomHTML: Element): {
    if ("zoomValue": "true") {
        if (zoomHTML !== null) {
            const positionAfterHeading = function <T>(
                ...
            ) else {
                ...
            }
        }
    }
}
```

```
public addZoomValue(zoomHTML: Element): {
    if (zoomValue == true) {
        ...
    }
}
```

Cf1: SOURCE CODE IN FORM 1

Cf2: SOURCE CODE IN FORM 2

METRICS OF Cf1

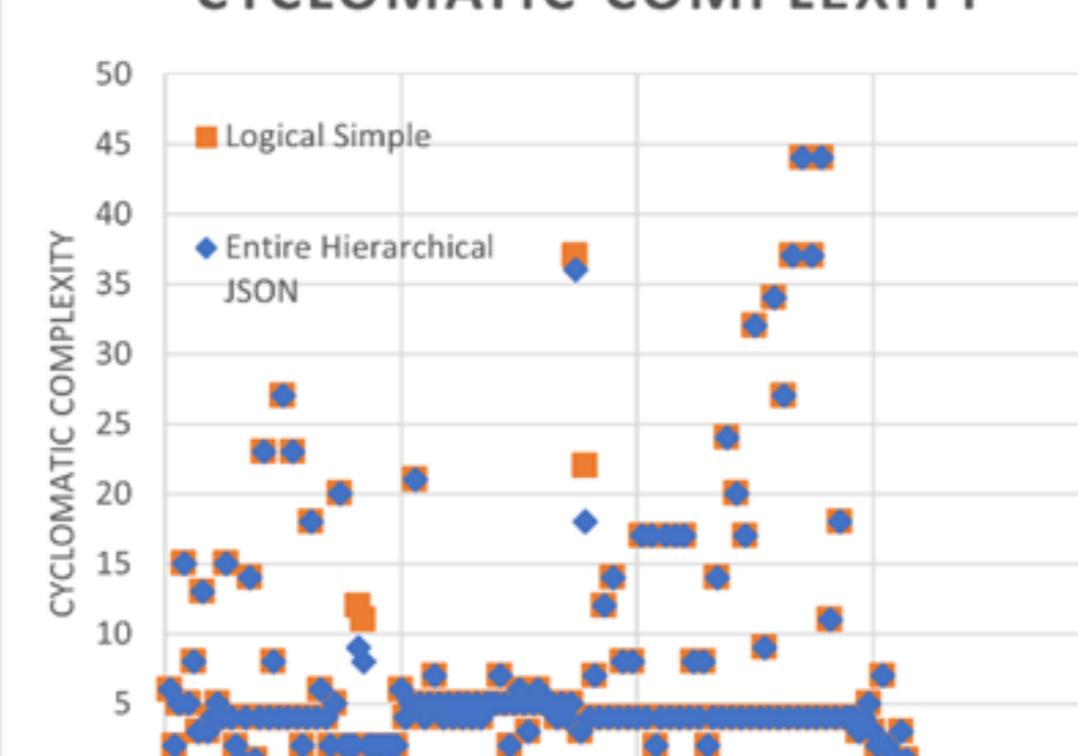
METRICS OF Cf2

TRANSFORMATION

TESTING SIGNIFICANCE OF DIFFERENCE

DIFFERENCES BETWEEN Cf1 AND Cf2 METRICS

CYCLOMATIC COMPLEXITY



```
if () {
    class RemoveDirective {
        constructor(element: ElementRef) {
            element.nativeElement.addEventListener(
                "click", () => {
                    element.nativeElement.remove();
                }
            )
        }
    }
}
```

CLASS ANNOTATIONS

Table 1. Logical vs. entire JSON configuration expressions in control flow – simple conditions (1–4 conditional statements)

Metric name	Corr.	W	p-value	95% CI	Est.	p > 0.05
Cyclomatic Number	0.9994	10	0.0975	2.0000-3.5000	3.0000	T
Cyclomatic Density	0.9682	66	0.0038	5.5195-17.5546	12.146	F
Halstead Bugs	0.9980	353	0.5324	-0.001-0.0075	0.0005	T
Halstead Difficulty	0.9938	506	1.2213	-0.3240-E-06	-0.470	F
Halstead Effort	0.9971	864	0.0031	-26.3833-E-06	-71.8428	F
Halstead Length	0.9975	87	0.9651	7.0000-1.0000	1.0000	T
Halstead Time	0.9971	864	0.0031	-1.4660-3.9916	-3.992	F
Halstead Program Vocabulary	0.9989	426	0.1143	0.9999-0.0000	0.0000	T
Halstead Volume	0.9981	369	0.5770	20.2585-1.0708	1.0708	T
Physical LOC	0.9976	0	1.4337	-10.0000-E-4	-2.0000	F
Logical LOC	0.9951	0	3.2567	-11.0000-E-3	1.0000	F

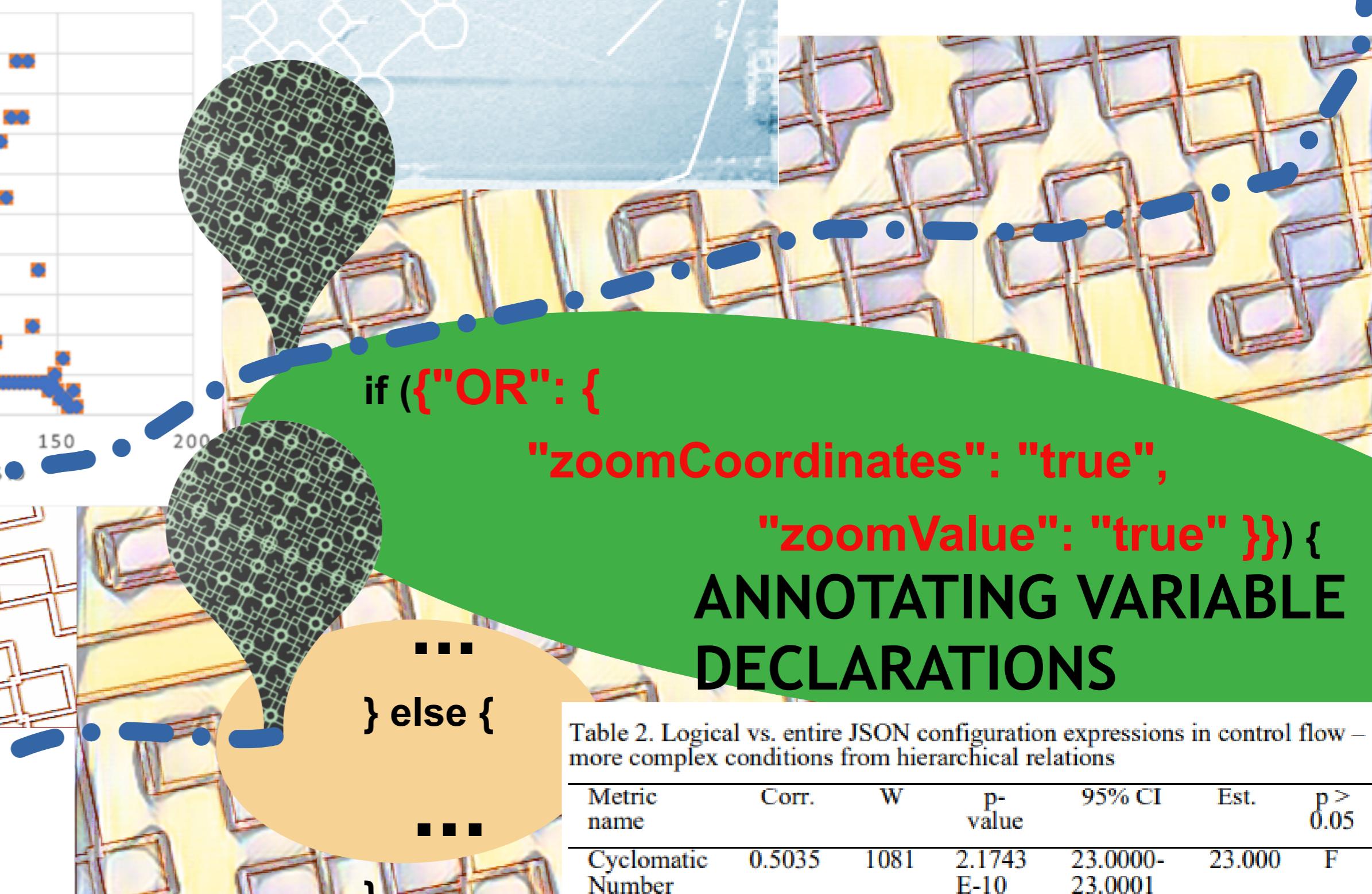
```
if ("OR": { "zoomCoordinates": "true",
            "zoomValue": "true" } }) {}
```

```
import { ZoomManagementComponent } from
    "../puzzle-builder/pages/zoom-management/
        zoom-management.component";
```

ANNOTATING IMPORTS

```
if ({"wholeBlockFile": {} }.wholeBlockFile)
class RemoveDirective {
    constructor(element: ElementRef) {
        element.nativeElement.addEventListener(
            "click", () => {
                element.nativeElement.remove();
            }
        )
    }
}
```

NAMED WRAPPER EXPRESSIONS



ANNOTATING VARIABLE DECLARATIONS

Table 2. Logical vs. entire JSON configuration expressions in control flow – more complex conditions from hierarchical relations

Metric name	Corr.	W	p-value	95% CI	Est.	p > 0.05
Cyclomatic Number	0.5035	1081	2.1743	23.0000-E-10	23.0001	F
Cyclomatic Density	-0.895	1081	3.4928	284.803-E-09	413.72	F
Halstead Bugs	0.9995	1081	3.3396	0.0305-E-09	0.0320	F
Halstead Difficulty	0.8507	1081	3.6300	4.3765-E-09	5.6685	F
Halstead Effort	0.9949	1081	3.6300	3881.24-E-09	7039.93	F
Halstead Length	0.9999	1081	2.1720	11.0000-E-10	11.0001	F
Halstead Time	0.9949	1081	3.6300	215.625-E-09	391.1069	F
Halstead Program Vocabulary	0.9959	1081	2.6728	7.0000-E-09	7.5000	F
Halstead Volume	0.9995	1081	3.6300	90.7875-E-09	95.0369	F
Physical LOC	0.9823	543	0.0033	1.0000-1.5000	1.0000	F
Logical LOC	0.3912	0	2.170	-30.0000-E-10	-30.00	F

```
class ZoomManagementComponent {
    constructor(puzzleManagerService: PuzzleManagerService) {
        if (({"OR": { "zoomCoordinates": "true",
                    "zoomValue": "true" }}) {}
    }
}
```

PARAMETER ANNOTATIONS