Towards a Prioritization of Code Debt: A Code Smell Intensity Index

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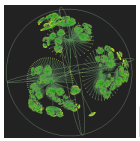
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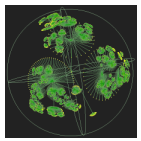

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Code smells and Technical Debt

Code smells: symptoms of problems at code or design level that can be resolved through the right refactoring steps

Sources of Technical Debt

The management of code smells involves different decisions:

- which code smells to refactor?
- what to refactor first? (prioritization)

Prioritization: Code smell Intensity

What is Intensity:

- a number in the range 1–10
- used to rank code smells

Intensity can be computed for detection strategies based on metrics and thresholds, e.g. (Shotgun Surgery),

$$\text{CC} \geq \text{HIGH} \wedge \text{CM} \geq \text{HIGH} \wedge \text{FANOUT} \geq \text{LOW}$$

Intensity considers where the evaluated smell is placed in the metric distributions.

Example instance

- Metric values: $\text{CC} = 8$; $\text{CM} = 10$; $\text{FANOUT} = 6$
- Intensity: $(7.75 + 7.75 + 10)/3 = 8.5$ (High) **Why?**

Metric distribution and thresholds (1)

We associate five points to Intensity value ranges on the distribution of each metric:

1. Very Low: $[1, 3.25)$;
2. Low: $[3.25, 5.5)$;
3. Mean: $[5.5, 7.75)$;
4. High: $[7.75, 10)$;
5. Very High: $[10, 10]$.

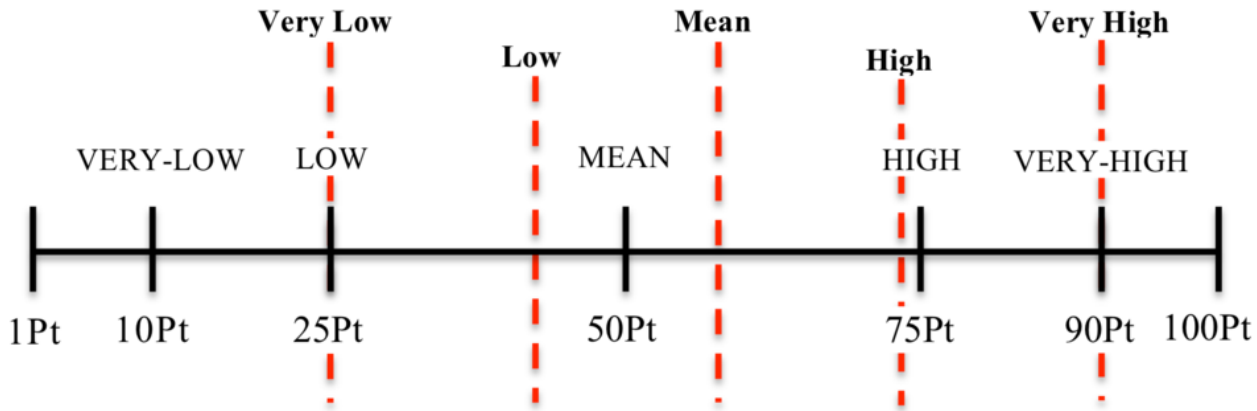

Figure 1:FANOUT Intensity points for Shotgun Surgery

Metric distribution and thresholds (2)

In the example:

- CC $\geq$ HIGH(5): CC $= 8 \rightarrow$ High (7.75)
- CM $\geq$ HIGH(6): CM $= 10 \rightarrow$ High (7.75)
- FANOUT $\geq$ LOW(3): FANOUT $= 6 \rightarrow$ Very High (10)

$\rightarrow (7.75 + 7.75 + 10)/3 = 8.5$ (High)

Table 1:Shotgun Surgery metric thresholds

Metric	VERY-LOW	LOW	MEAN	HIGH	VERY-HIGH
CC	2	3	4	5	10
CM	2	3	4	6	13
FANOUT	2	3	4	5	6

Open questions

Can we use code smells and Intensity to enhance existing measures of Technical Debt?

How do developers behave when dealing with code smells of very different intensity levels?

Thank you!

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