DCC / ICEx / UFMG

Detection Strategies

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Motivation

- A metric alone cannot answer all questions about the system
  - Metrics must be used in combination
- A metric is too fine grained to be understood
  - We need to provide engineers with means to work with metrics at a more abstract level

Detection Strategies

- A detection strategy is a composed logical condition, based on metrics, by which code fragments with specific properties are detected
- It relies on two mechanisms
  - Filtering
  - Composition

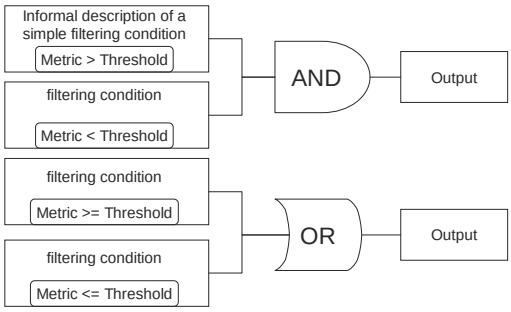
Filtering Mechanism

- Its goal is to reduce the data set
- Two types of filters
  - Absolute comparator uses classical comparison of numbers (>, <, >= e <=)
  - Relative comparator specifies the number of entities to be retrieved (i.e., relative to the original data)

Composition Mechanism

- It supports a interpretation of multiple result sets based on the AND and OR operators
- Notation

Abstract Example



Detection Strategies

- God Class
- God Method
- Feature Envy
- Shotgun Surgery
- Refused Bequest

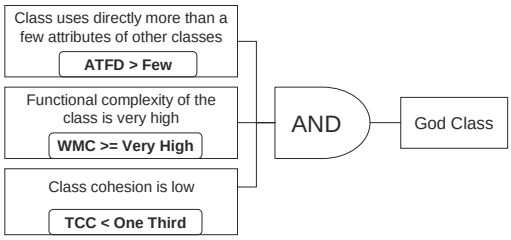
Work Definition of God Class

- God Class …
  - performs too much work
  - lacks internal relationships between its methods
  - accesses a lot of data from other classes
- In other words, God Class has
  - High complexity
  - Low cohesion
  - Access foreign data

Selecting Metrics for God Class

- High complexity
  - Weighted Method per Class (WMC)
- Low cohesion
  - Tight Class Cohesion (TCC)
- Access foreign data
  - Access to Foreign Data (ATFD)

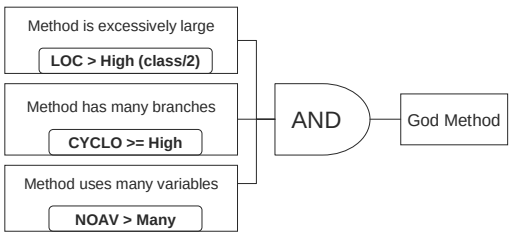
Strategy for God Class



God Method

- It is a long method (size)
  - Line of Code (LOC)
- It makes intensive use of branches
  - McCabe's Cyclomatic Complexity (CYCLO)
- It defines many local variables and uses many instances variables
  - Number of Accessed Variables (NOAV) (counts attributes, local variables and parameters)

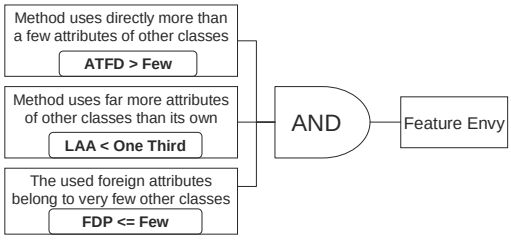
Strategy for God Method



Feature Envy

- Method uses directly more than a few attributes of other classes
  - Access to Foreign Data (ATFD)
- Method uses far more attributes from other classes than its own class.
  - Locality of Attribute Accesses (LAA)
- The used foreign attributes belong to very few other classes
  - Foreign Data Providers (FDP)

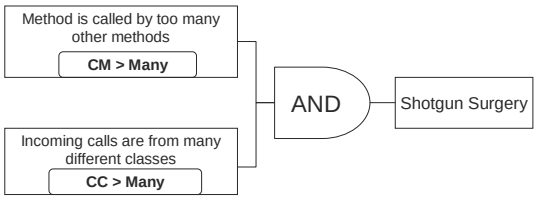
Strategy for Feature Envy



Shotgun Surgery

- Operation is called by too many other operations
  - Changing Methods (CM)
- Incoming calls are from many classes
  - Changing Classes (CC)
- CC and CM count coupling connections from other classes outside the inheritance tree

Strategy for Shotgun Surgery



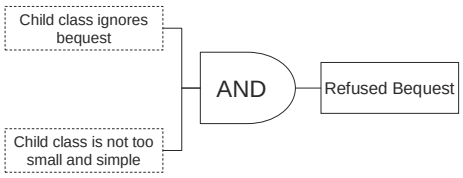
Refused Bequest

- Child class ignores bequest
  - Parent provides more than a few protected methods
  - Child uses only little of parent's bequest
  - Overriding methods are rare in child
- Child class is not too small and simple
  - Functional complexity above average
  - Class complexity not lower than average
  - Class size is above average

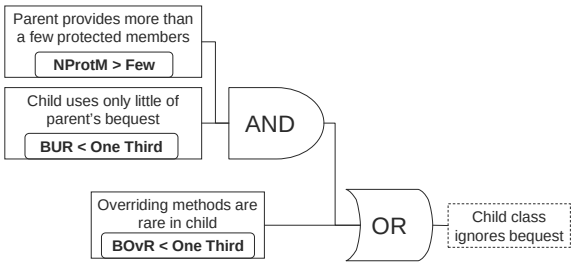
Used Metrics

- Child class ignores bequest
  - Number of Protected Members (NProtM)
  - Base-class Usage Ratio (BUR)
  - Base-class Overriding Ratio (BOvR)
- Child class is not too small and simple
  - Average Method Weight (AMW)
  - Weighted Methods per Class (WMC)
  - Number of Methods (NOM)

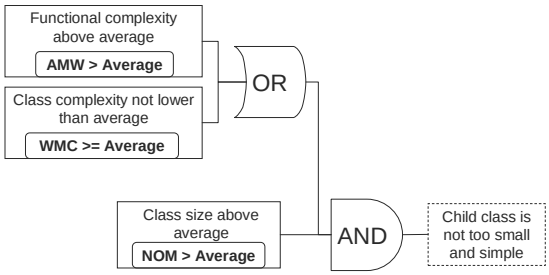
Strategy for Refused Bequest



Child Class Ignores Bequest



Child Class is not Too Small



Bibliography

- M. Lanza e R. Marinescu. **Object-Oriented Metrics in Practice**. Springer, 2006.
  - Section 4.1 Detection Strategies
  - Section 5.3 God Class
  - Section 5.4 Feature Envy
  - Section 5.6 Brain Method
  - Section 6.5 Shotgun Surgery
  - Section 7.3 Refused Parent Bequest