An Evaluation of the MOOD Set of Object-Oriented Software Metrics

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Criteria for Valid Metrics

1. Must allow different entities to be distinguished
2. Must obey representation condition
3. Each unit of attribute contributing to a valid metric is equivalent
4. Different entities can have the same attribute value

Types of measurement

- direct
  - does not depend on other measures
- indirect
  - involves one or more other measures
  - e.g. density

Indirect metrics

- 1. Explicitly defined model
- 2. Model must be dimensionally consistent
- 3. No unexpected discontinuities
- 4. Units and scale types must be correct

MHF definition

- Summation over all methods in all classes of 1 minus the V(M) divided by the total number of methods

\[ MHF = \frac{\sum_{c=1}^{n_c} \sum_{m=1}^{M(c)} (1 - V(M_{m,c}))}{\sum_{c=1}^{n_c} M(c)} \]

Model for MHF?

- What would be a good abstraction?
- Is there a well-understood Empirical Relationship?
- Scale Type?
Validation – MIF/AIF

1. Must allow different entities to be distinguished
2. Must obey representation condition
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Indirect Validation – MIF/AIF

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Inheritance Factor

\[ M_{i}(C_{i}) = \text{number of methods declared in a class}\]
\[ M_{i}(C_{i}) = \text{number of methods inherited (and not overridden)} \]
\[ M_{i}(C_{i}) = M_{i}(C_{i}) + M_{i}(C_{i}) = \text{number of methods that can}\]
\[ \text{be invoked in association with class}\]

\[ \sum_{i=1}^{TC} M_{i}(C_{i}) \]
\[ \sum_{i=1}^{TC} M_{a}(C_{i}) \]

\[ MIF = \frac{\sum_{i=1}^{TC} M_{i}(C_{i})}{\sum_{i=1}^{TC} M_{a}(C_{i})} \]

Model for MIF?

1. What would be a good abstraction?
2. Is there a well-understood Empirical Relationship?
3. Scale Type?

Validation – MIF/AIF

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Indirect Validation – MIF/AIF

1. Explicitly defined model
2. Model must be dimensionally consistent
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**Coupling Factor**

\[ CF = \frac{\sum_{i=1}^{TC} \sum_{j=1}^{TC} is\_client(c_i, c_j)}{TC^2 - TC} \]

**Model for CF?**

- What would be a good abstraction?
- Is there a well-understood Empirical Relationship?
- Scale Type?

**Validation – CF**

- 1. Must allow different entities to be distinguished
- 2. Must obey representation condition
- 3. Each unit of attribute contributing to a valid metric is equivalent
- 4. Different entities can have the same attribute value

**Indirect Validation - CF**

- 1. Explicitly defined model
- 2. Model must be dimensionally consistent
- 3. No unexpected discontinuities
- 4. Units and scale types must be correct

**Polymorphism Factor**

Let \( M_o(C_i) \) be the number of overriding methods in class \( i \).
Let \( M_n(C_i) \) be the number of new methods in class \( i \).
Let \( DC(C_i) \) be the number of descendants of class \( i \).

\[ PF = \frac{\sum_{i=1}^{TC} M_o(C_i)}{\sum_{i=1}^{TC} [M_n(C_i) \times DC(C_i)]} \]

**Model for PF?**

- What would be a good abstraction?
- Is there a well-understood Empirical Relationship?
- Scale Type?
Validation – PF

- 1. Must allow different entities to be distinguished
- 2. Must obey representation condition
- 3. Each unit of attribute contributing to a valid metric is equivalent
- 4. Different entities can have the same attribute value

Indirect Validation - PF

- 1. Explicitly defined model
- 2. Model must be dimensionally consistent
- 3. No unexpected discontinuities
- 4. Units and scale types must be correct