

**CARLOS III UNIVERSITY OF MADRID  
TECHNICAL UNIVERSITY OF MADRID**



**INPUT VARIABLES RATING LEVEL SELECTION METHOD FOR  
COCOMOII EARLY DESIGN / POST ARCHITECTURE**

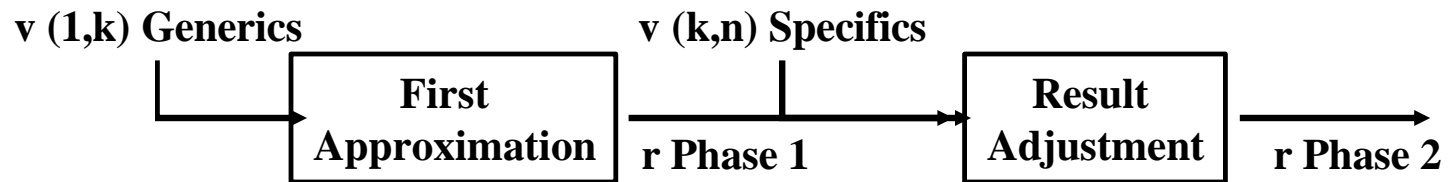
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# 1. Introduction

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Parametric estimation models:



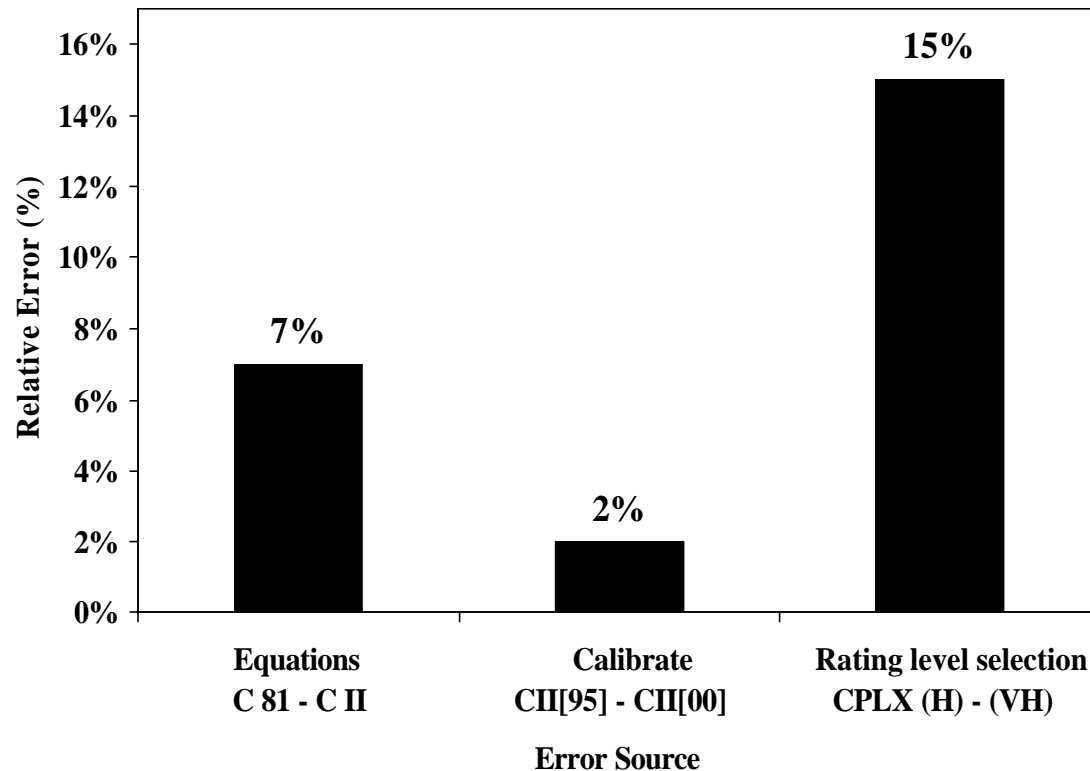
Functioning fundamental aspects:

1. Equations definition
2. Parameters Calibration
- 3. Input Variables rating level selection**

# 1. Introduction

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The problem of correct rating level selection for first input variables in estimation parametric models:



## 2. Rating level selection mathematical model

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Goal:

- Definition of a new mathematical method for input variables rating level selection in estimation parametric models

## 2. Rating level selection mathematical model

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- **Conceptual Fundamental:**

- **First Level Input Variables (FLIV):**

- Are directly included in the equations

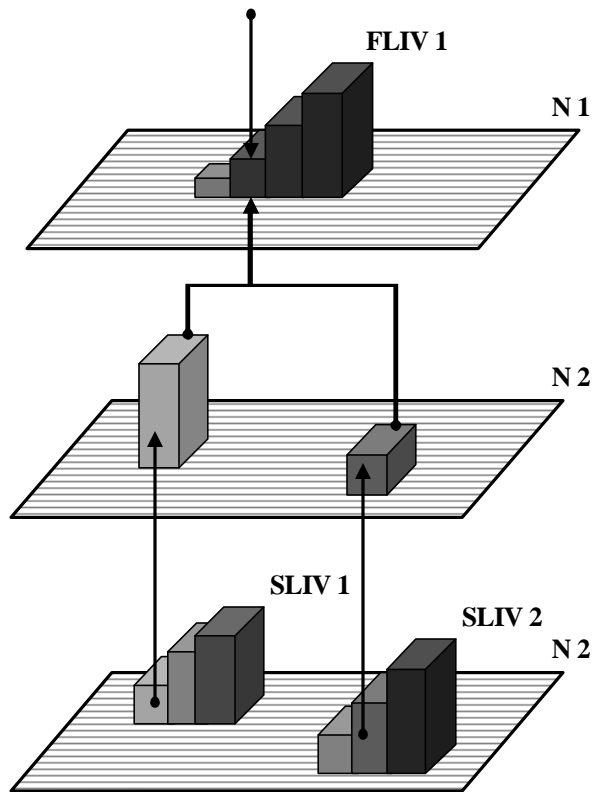
- The rating of some FLIV depends on the value of a set of heterogeneous factors or characteristics, which affect such variable:

- **Second Level Input Variables (SLIV):**

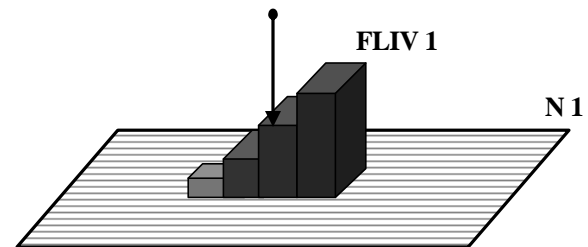
- Their effect over the final estimations will be reflected through the corresponding FLIV

# 2. Rating level selection mathematical model

Rating Level Selection Method proposed



Traditional Rating Level Selection Method



# 3. Example

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- ▶ COCOMO II Post-Architecture model has the following criterion for the FLIV DOCU variable rating level selection

Rating	Description
Very Low	Many of the lifecycle needs are not covered
Low	Some of the lifecycle needs are not covered
Medium	Correct amount of documentation for the lifecycle needs
High	Excessive for the lifecycle needs
Very High	Very excessive for the lifecycle needs

- ▶ Let's suppose we have a project in which it is not clear if the value selected for the variable DOCU must be high or very high, due to a doubt about the difference between high or very high.

# 3. Example

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- ▶ COCOMO II Post-Architecture model 2000.0 proposes the following numerical values for the FLIV DOCU:

Rating	Value
Very Low	0.81
Low	0.91
Medium	1.00
High	1.11
Very High	1.23

- ▶ Values proposed to:
  - ▶ Very High = **1.23**
  - ▶ High = **1.11**



# 3. Example

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▶ Three SLIV have been defined for the FLIV DOCU:

## 1. Type of documentation (T-DOCU)

Rating	Description	Value
Very Low	Only the basic development documentation (user required document, software requirements, code documents and user manual)	0
Low	More refined technical documentation which include functional analysis and low rating design	2
Medium	In addition to the previous documents, documentation related to software project management (description of the project plan, estimation documentation, follow-up reports and final analysis)	4
High	In addition to the previous documents, documentation related to quality assurance of the plans and tests	6
Very high	In addition to the previous documents, documentation related to auditing, management plans and other documentation	8

▶ Taking into account the values of the above table (T-DOCU) the rating level is High, and its numerical value is **6**

# 3. Example

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▸ Three SLIV have been defined for the FLIV DOCU:

## 2. Documentation complexity (C-DOCU)

Rating	Description	Valor
Very Low	The documentation is prepared using CASE tools only, without any type of modification	0
Low	The documentation is prepared with modifications (textual comments) of the output generated by CASE tools	2
Medium	The content of the documentation is prepared, in many cases, by modifying the models obtained during the software development	4
High	The content of the documentation is, in many cases, a text written specifically for this purpose	6
Very High	The content of the documentation consists, in many cases, of new models and text written specifically for this purpose	8

▸ For this SLIV, the rating to be selected is Medium, with a numerical value of **4**

# 3. Example

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▸ Three SLIV have been defined for FLIV DOCU:

## 3. Use of standards and traceability (ST-DOCU)

Rating	Description	Value
Very Low	Standards are not used to prepare the documentation of the software project. The documents are not related	0
Low	Only some of the documents on technical development follow predefined standards and the sections are consistent among them	2
Medium	All the technical documents under development follow predefined standards and their sections are consistent among them	4
High	All the technical and management documents follow a predefined standard and are consistent among them. This allows the state of the project to be controlled	6
Very High	There are documents related to quality assurance which adapts to a standard and makes explicit references to other documents	8

▸ For this SLIV, the rating that must be selected is High, with a numerical value of **6**

## 4. Correspondence set

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▸ FLIV DOCU. COCOMO II P-A 2000.0:

If we build  $C_{DOCU}$ , the set product of  $X_{DOCU}$  x  $Y_{DOCU}$ , which define the correspondence  $\mathbf{j}$  between  $X_{DOCU}$  and  $Y_{DOCU}$ , we obtain:

$$C_{DOCU} = \{ (x_{j_{DOCU}}, y_{k_{DOCU}}) \mid \forall x_{j_{DOCU}} \in X_{DOCU} \wedge y_{k_{DOCU}} \in Y_{DOCU} \} =$$
$$\left\{ \begin{array}{l} (0.81, 0), (0.81, 2), (0.81, 4), (0.91, 6), (0.91, 8), (1, 10), (1, 12), \\ (1, 14), (1.11, 16), (1.11, 18), (1.23, 20), (1.23, 22), (1.23, 24) \end{array} \right\}$$

## 4. Correspondence set

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- ▶ The set  $B_{DOCU}$  is:

$$B_{DOCU} = \{T-DOCU, C-DOCU, ST-DOCU\} =$$

$$\{b_{1_{DOCU}}, b_{2_{DOCU}}, b_{3_{DOCU}}\} =$$

$$\{(6), (4), (6)\}$$

- ▶ If we take the equation:  $y_{k_{ai}} = \sum_{l=1}^r w_l (b_{m_l})^{f_l}$

- ▶ Considering  $w_l = 1.00$  y  $f_l = 1.00$  for all  $l$  we obtain the pair:

$$C_{DOCU} = \{(1.11, 16)\}$$

# 6. Conclusions

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Future lines of work:

- Study of SLIV
- Study of mathematical equations to obtain FLIV rating level from SLIV
- Study of the SLIV calibration

# Getting in Touch

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