Another (necessary) digression The 4 Variable Model

Describes the essential relationship between requirements and design

Illustrates why the software design has different inputs and outputs from the requirements!

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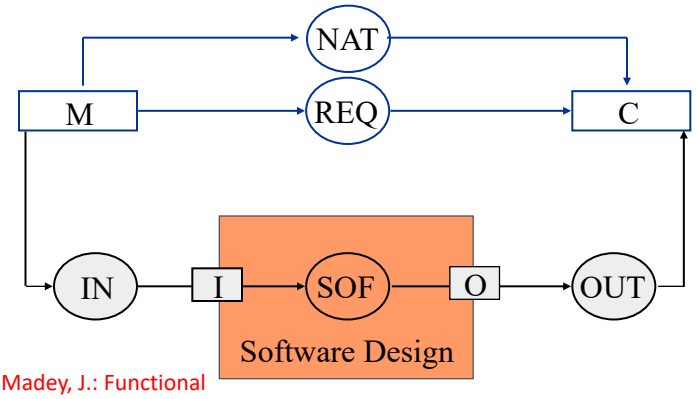
The 4 Variable Model



Parnas, D.L., Madey, J.: Functional documents for computer systems. Science of Computer Programming 25 (1995) 41-61

C = REQ(M*), and related to the software through
I = IN(M) and C = OUT(O)

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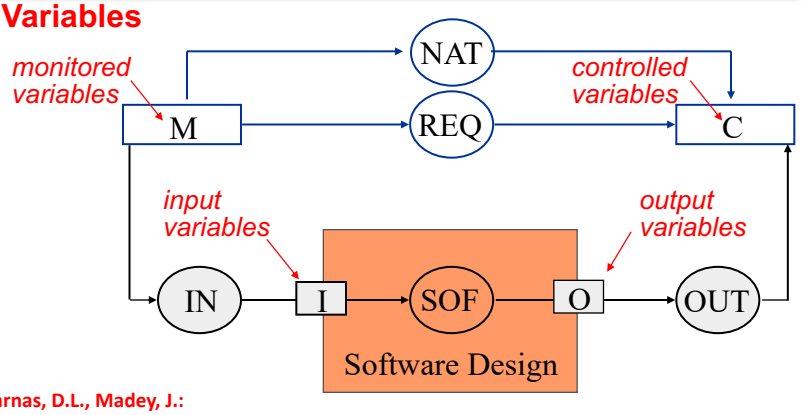
The 4 Variable Model

Variables



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C = REQ(M*), and related to the software through
I = IN(M) and C = OUT(O)

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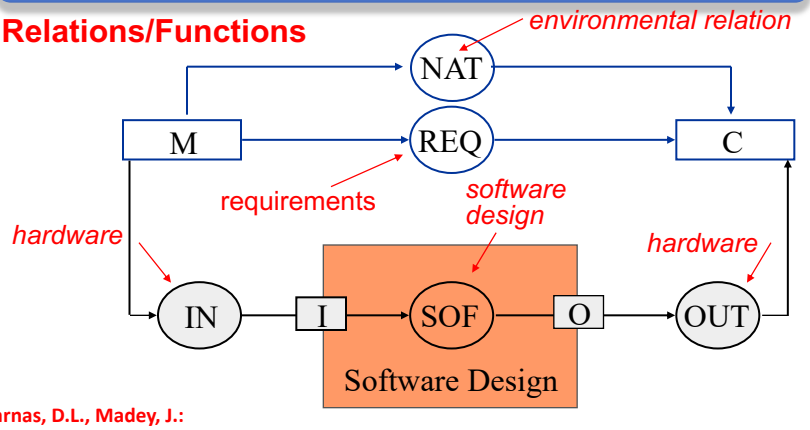
The 4 Variable Model

Relations/Functions



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C = REQ(M*), and related to the software through
I = IN(M) and C = OUT(O)

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Example of IN

- IN represents the function performed by the input hardware
- Assume we have hardware that converts physical temperature (degrees Celsius) to an unsigned 12-bit integer
- Assume also we can determine that

  i = round(m*4/5)

  where m is the monitored variable (temp) and i is the 12-bit integer that represents m in the computer

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Consequence

- Every time we want to use m (temp) in the software, we have to remember that we actually have i in the software, not m!
- Once we know this, we can deal with it really well, using a modified version of the 4 Variable Model

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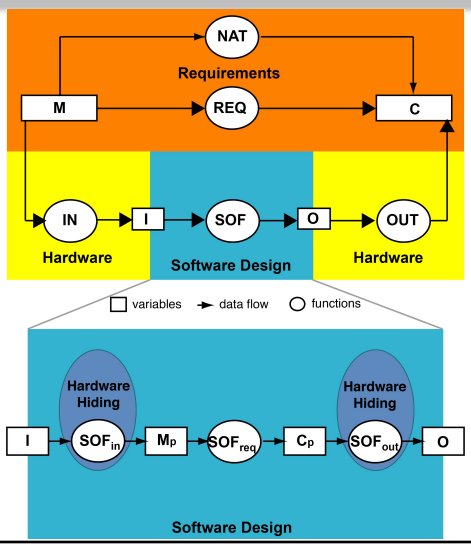
Modified 4 Variable Model



M_p and C_p are the solution! Called Pseudo-M and Pseudo-C.

You will see later that SOF_{in} and SOF_{out} are hardware hiding functions, designed to make it easy to change hardware without having to change SOF_{req}, the major software design

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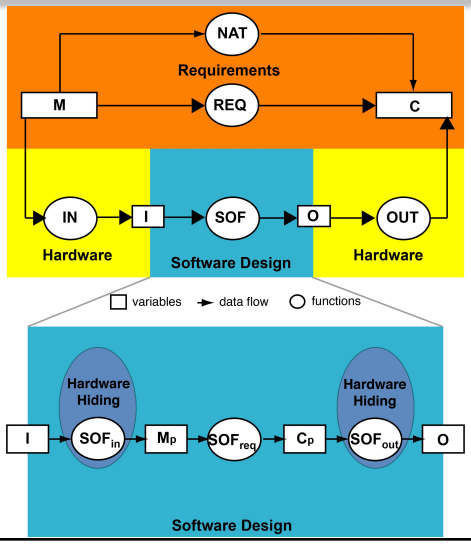
Modified 4 Variable Model



Continue example of input hardware we used previously:

If we want to produce m_p (temp) so that it is close to the original m, we can multiply i by 5/4, so we get:

$i = round(m*4/5)$

$M_p = i*5.0/4.0$

Can then bound $abs(M-M_p)$

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