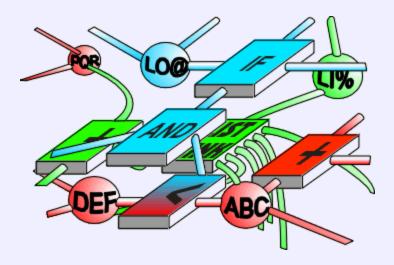
## **Logical Surface**





## We have a statement

## a = b + c

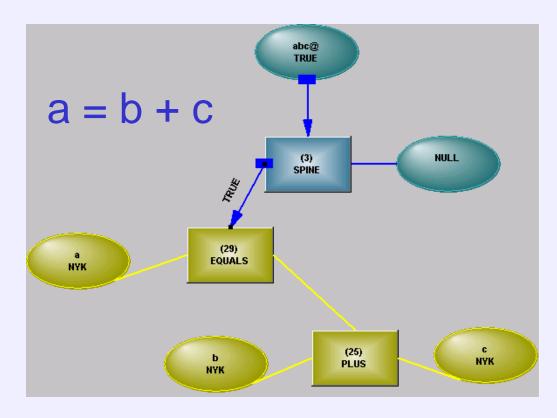
## What does the EQUALS represent?



We want every possible inference

# **Logical Structure**

## Statements are written on a logical surface



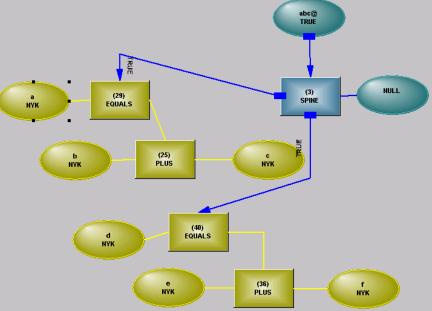


## We have two statements

a = b + c d = e + f

## They are related somehow

## They hang off the same spine





### We have a statement

## IF a = b + c THEN d = e + f

The EQUALS expressions look the same, but there is nothing obviously linking the statement to its environment



# **Sentential Logic**

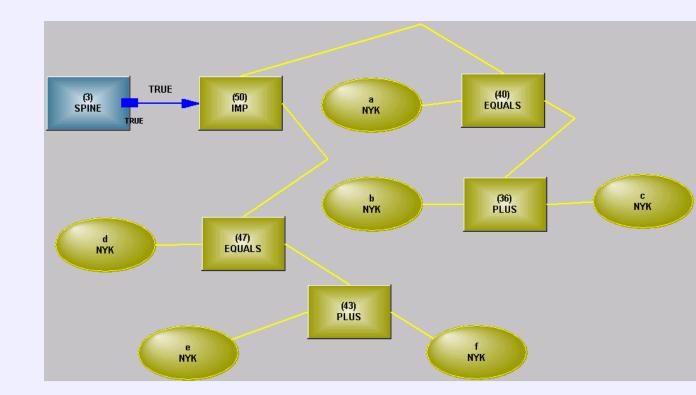
When Plato wrote down the rules for propositional logic, he wasn't inventing something, he was trying to write down how we reason - why don't we use those rules to drive the IF...THEN...

The closer the system works to the way our reasoning works, the easier it should be to understand and to interface with.



# **Logical Connections**

The numerical statements now become part of a larger logical statement, also anchored to the spine and controlled by it. All the inferences are alive and well.



### IF a = b + c THEN d = e + f



#### Attenuation@ begin 📉 🤜

I Peak Ground Acceleration (PGA)

In(Ah) = -3.512 + 0.904 \* M - 1.328 \* In(abs((Rseis^2 + (0.149 \* exp(0.647 \* M))^2)^0.5)) + (1.125 - 0.112 \* In(Rseis) - 0.0957 \* M) \*F + (0.440 - 0.171 \* In(Rseis))\*Ssr + (0.405 - 0.222 \* In(Rseis))\*Shr + epsilon1

#### 1 Spectral Acceleration

In(SAh) = In(Ah) + c1 + c2 \* tanh(c3\*(M - 4.7)) + (c4 + c5 \* M)\*Rseis + 0.5\*c6\*Ssr + c6\*Shr + c7 \* tanh(c8 \* D) \* (1 - Shr) + fSA(D,c6,Shr,Ssr) + epsilon

I Spectral Acceleration parameters based on the shaking duration

GetCoeff = getSAhCoeff(ASK(MeanDuration), SAhCoeff%, {c1,c2,c3,c4,c5,c6,c7,c8)

### End !Attenuation@

I Data taken from Papaioannou&Papazachos paper

### GreeceGIS@ begin

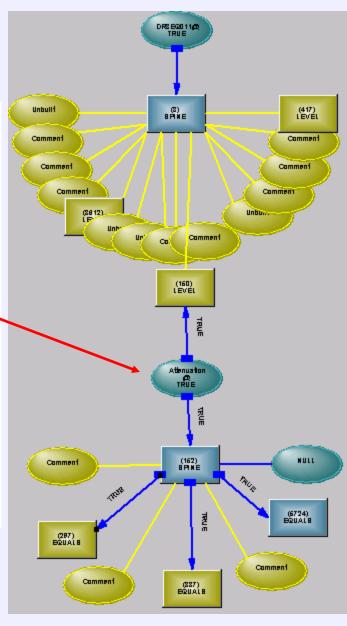
/ Local site conditions
GetSvals = GetSiteSvals(site\$,SitesInfo%,{Shr,Ssr,D,F})
End !GreeceGIS@

### EventTemplate@ Subnet 😯

Vars% = { Magnitude, Magnitude.Value, Magnitude.Units\$,Direction\$,ReferenceDate\$,Rseis} Magnitude.Units\$ in {",'Mw'}



# The model text is written on a layered logical surface



# **Object Existence**

When dealing with objects, their existence takes the place of sentential logic

Existence logic is controlling the objects, while sentential logic controls the relations among objects and the operations on numbers

The logical surface becomes multi-dimensional, as only a logical surface can, as it follows and supports the logic of the problem



# **Relation Logical Surface**

A text document has its own logical surface – a discourse. Some relations support their own discourse or logical surface – "John thinks…" introduces a new discourse level, where a logical value from the ToThink relation provides control to everything hung off it. This kind of clausal logic can be overridden without error:

John thinks Fred is guilty, but he is wrong

John still thinks that Fred is guilty, so that part is true. It is more complicated than that, as part or all of the discourse may not exist – "Section 9 is void" – so existential control is also provided for the discourse.



# An Active Surface

A book has a name, a spine, chapters and sections - it has a logical, but passive, structure. It is intended to be read by an active structure, a person, which can subsume it.

The model needs a logical structure but one that is active and manylayered, as there is no other active structure to read it.



