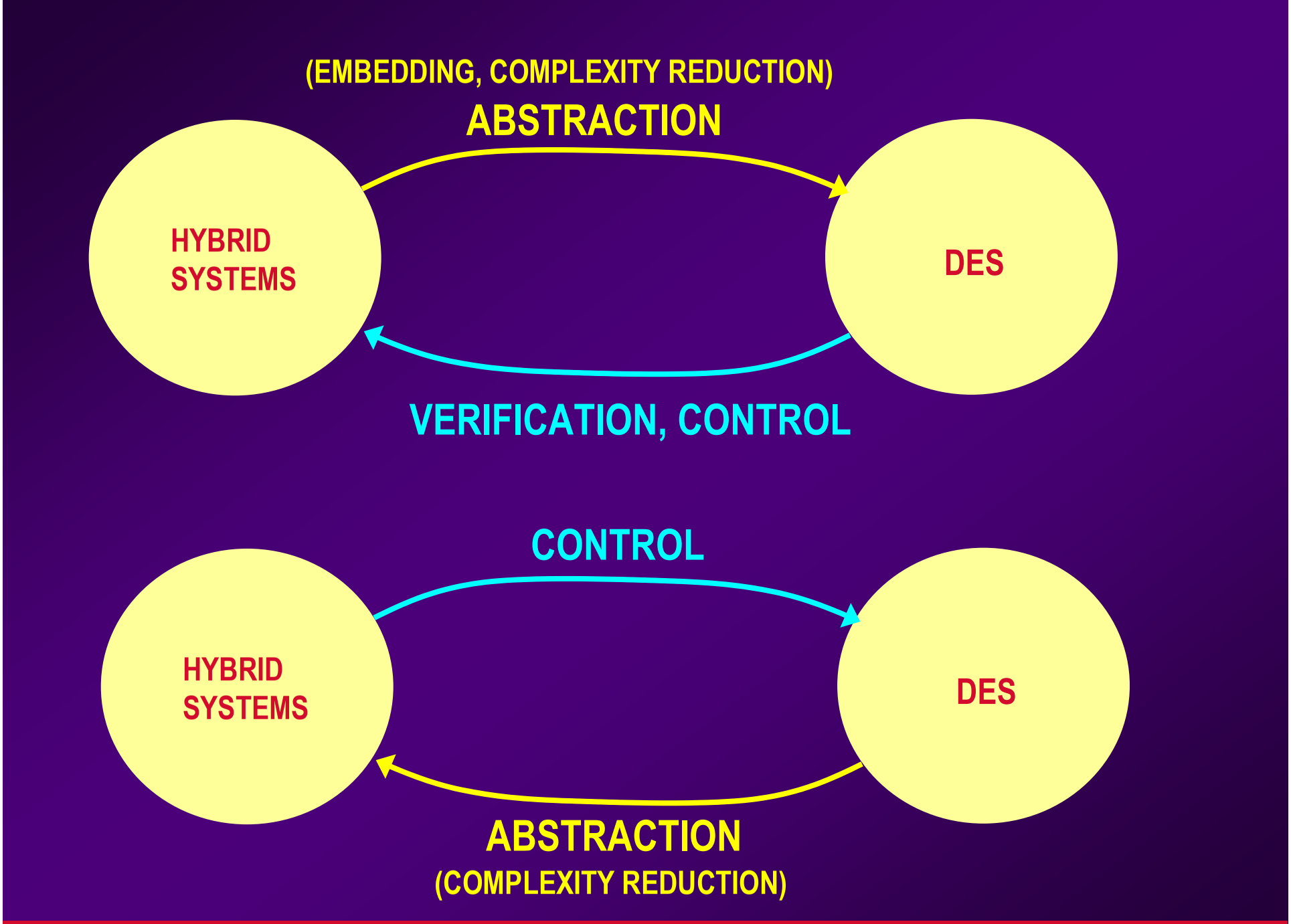
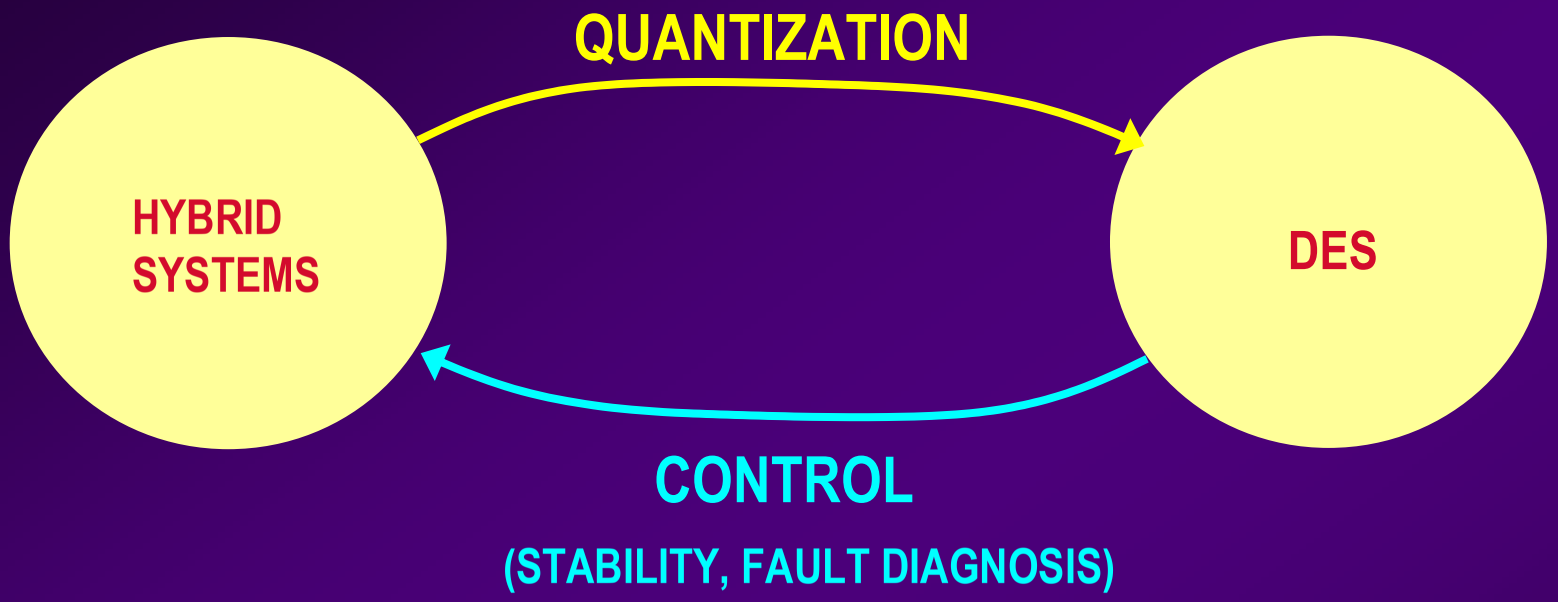
WHAT HAVE I LEARNED AT THE DISC SUMMER SCHOOL?

WHY HYBRID SYSTEMS ?

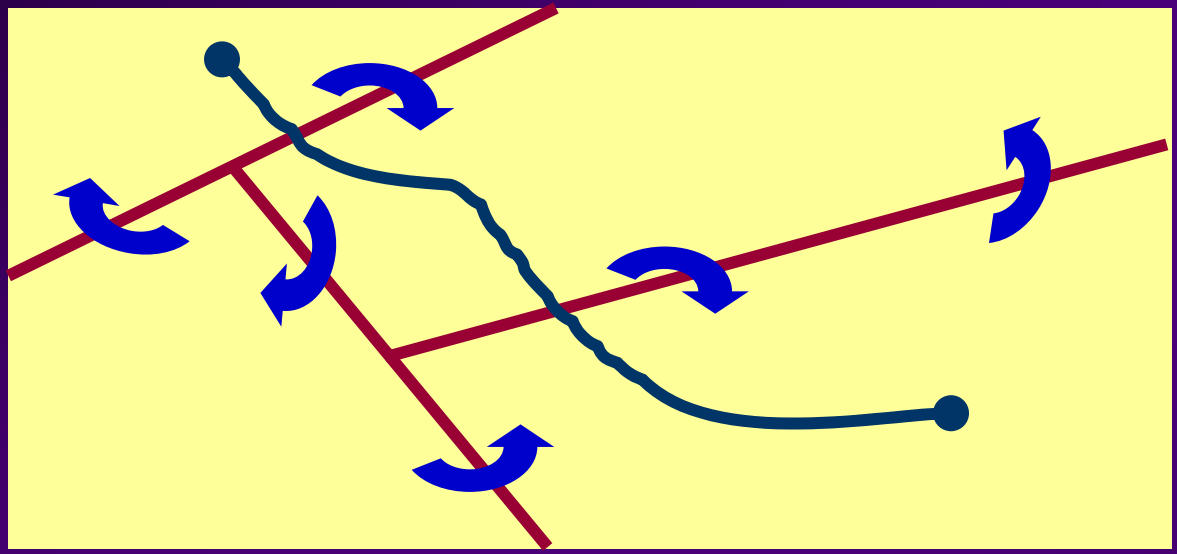
- **COMPLEXITY** (*PHYSICAL*, BUT MOSTLY *OPERATIONAL/ORGANIZATIONAL*)

- **UNCERTAINTY** – Switching is one way of dealing with uncertainties, (e.g., ABS)

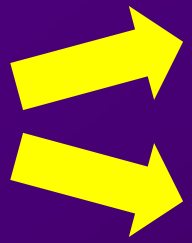

(EMBEDDING, COMPLEXITY REDUCTION)
ABSTRACTION
HYBRID SYSTEMS
DES
VERIFICATION, CONTROL
CONTROL
HYBRID SYSTEMS
DES
ABSTRACTION
(COMPLEXITY REDUCTION)


QUANTIZATION
HYBRID SYSTEMS
DES
CONTROL
(STABILITY, FAULT DIAGNOSIS)

SWITCHING VIEWPOINT



- STABILITY, REACHABILITY
- IDENTIFICATION
- OPTIMAL CONTROL



SWITCH TIMING

MODE SELECTION (SCHEDULING)

HYBRID *SYSTEMS* v HYBRID *MODELS* OF (COMPLEX) DYNAMIC SYSTEMS

Gear shifting in a vehicle

Quantization

DETERMINISTIC HYBRID SYSTEMS v

STOCHASTIC HYBRID SYSTEMS

Not as much progress…

EXPERIMENTAL WORK, LABORATORIES FOR HS

- "REAL SYSTEMS", LAB. PROTOTYPES
- SIMULATION
- LEGO SYSTEMS

MODELS FOR HS

Why is THIS model BETTER than THAT for a specific problem ?

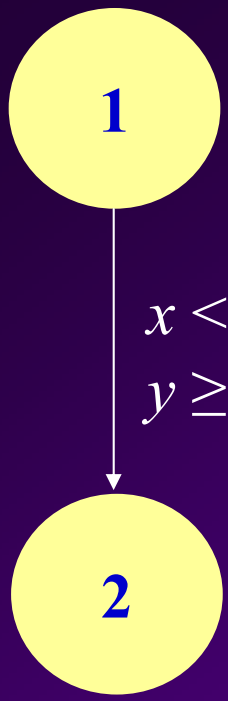
Which modeling framework should I use ?

Who cares ? They are all GREAT!

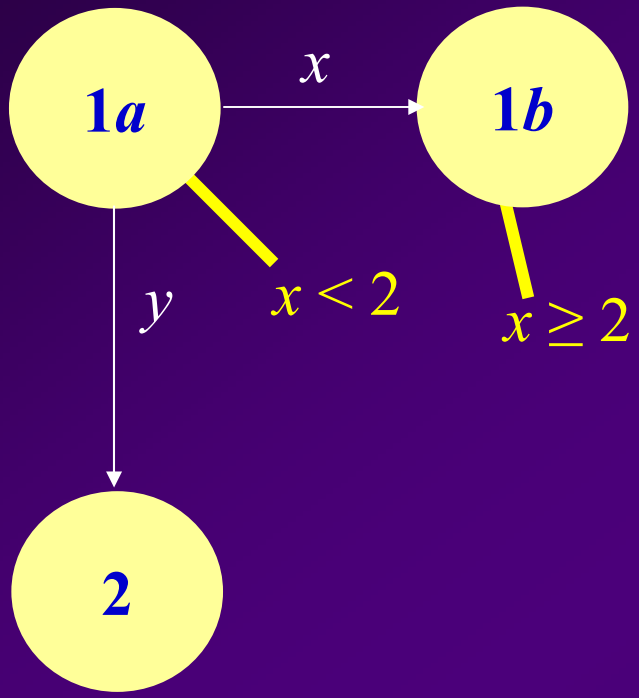
So, just pick one that suits you or your problem and just solve your problem…

…and please try NOT to invent yet another modeling framework!...

NOTE: I counted 16 new terms and 18 acronyms in one presentation…



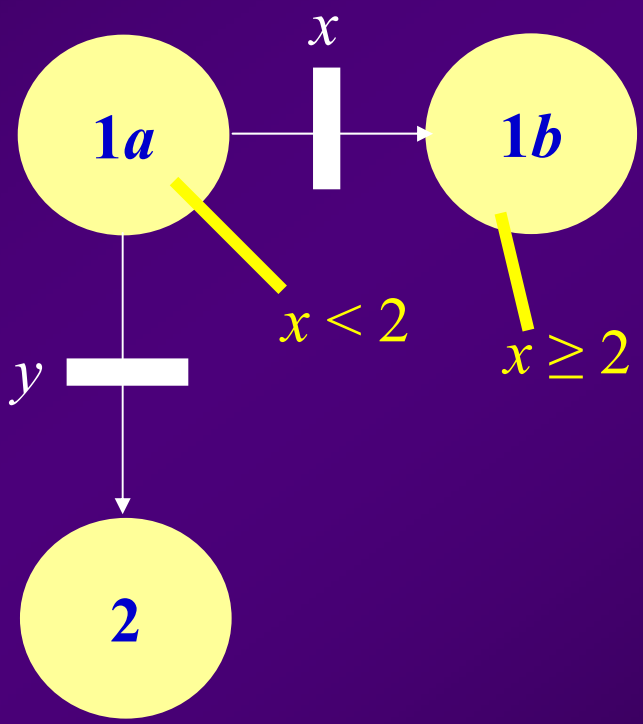
TIMED AUTOMATON



EVENTS: $x \rightarrow x = 2$

$y \rightarrow y = 3$

TIMED AUTOMATON (with clock structure)



TIMED PETRI NET

COMPUTER SCIENCE APPROACHES v SYSTEMS AND CONTROL APPROACHES

- Build tools
- Explore/Simulate
- Let the computer do the work

[JUST DO IT]

- Dynamic Programming
- Linear Programming
- Lagrange Relaxation
- Gradient-Based Optim.
- Perturbation Analysis

[JUST PROVE IT]

Can we combine ?