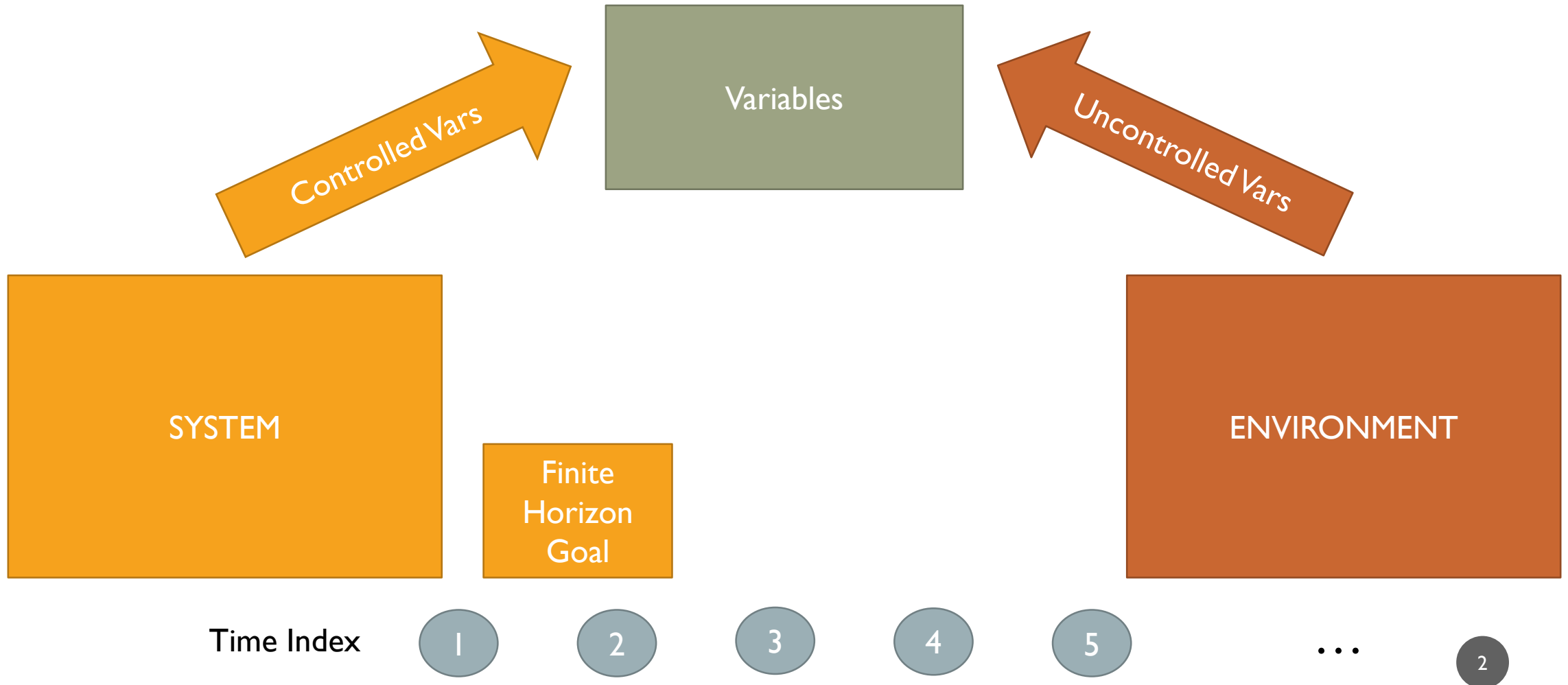


# VERIFICATION AND REALIZABILITY IN FINITE-HORIZON MULTIAGENT SYSTEMS

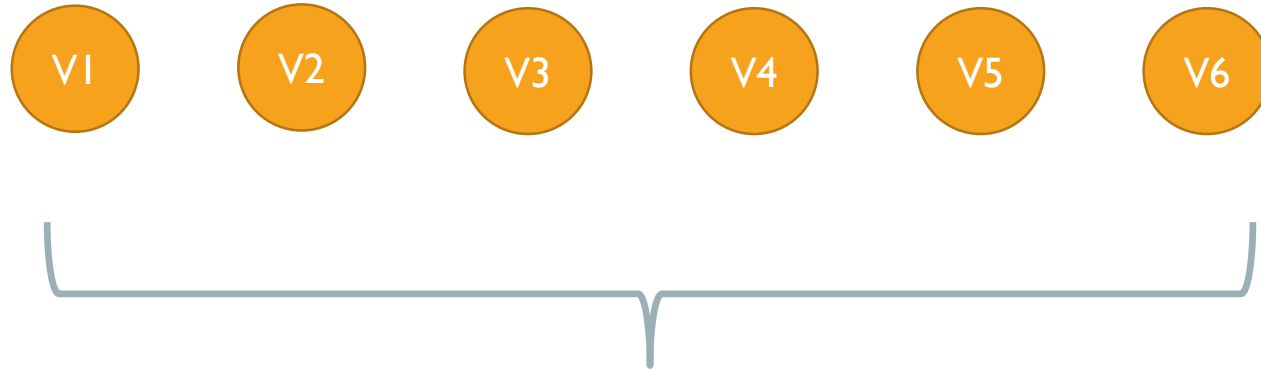
Senthil Rajasekaran and Moshe Y.Vardi

Rice University

# REACTIVE SYSTEMS



# STRATEGIES



Strategy for agent  $i$  is given by  
a function  
 $\pi_i : \Sigma^* \rightarrow \Sigma_i$

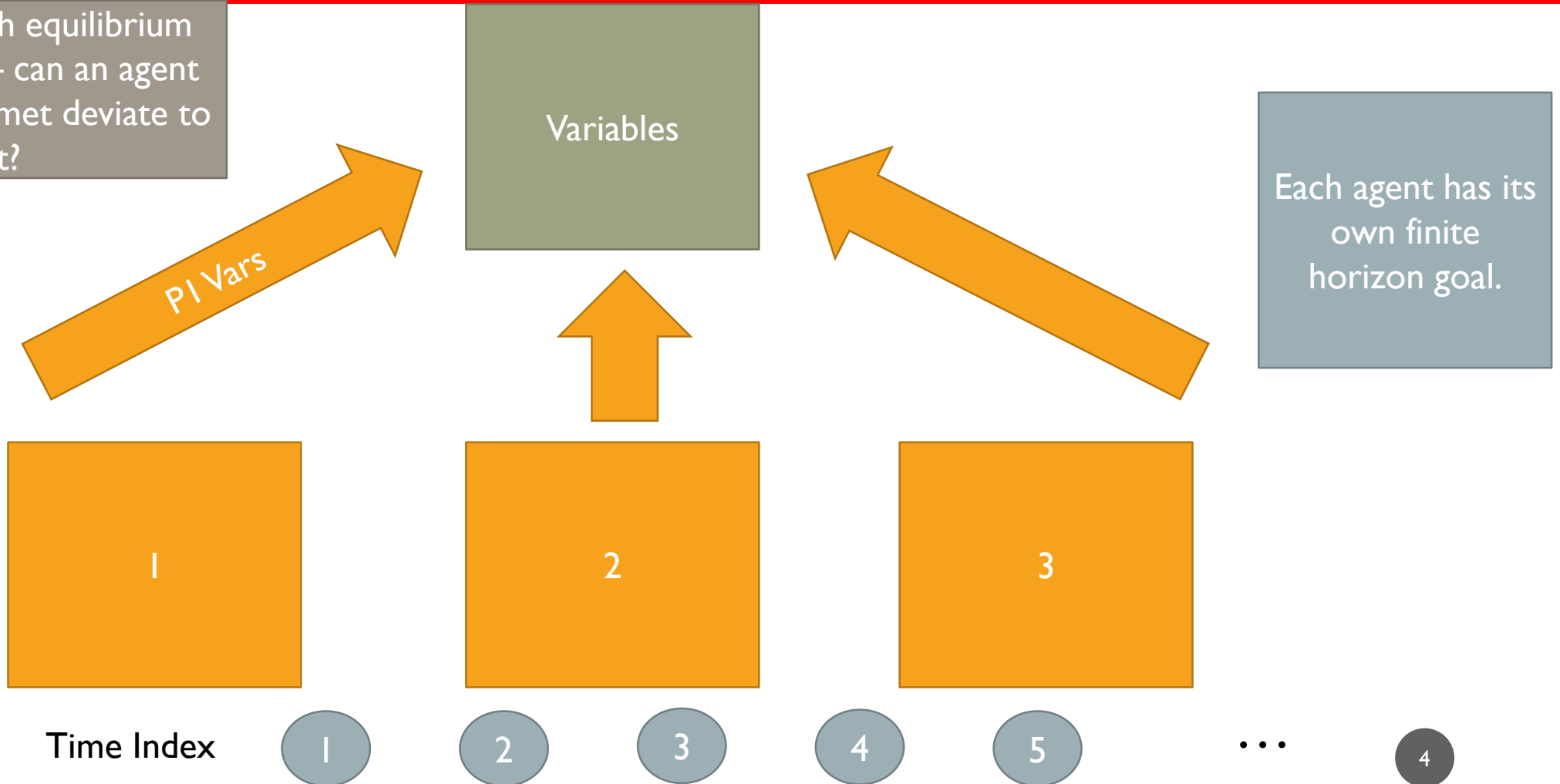
Deterministic finite state  
transducer



Valuations of Agent  
 $i$ 's variables

# MULTIAGENT SYSTEMS

Consider the Nash equilibrium solution concept – can an agent that does not goal met deviate to meet it?



# VERIFICATION AND REALIZABILITY

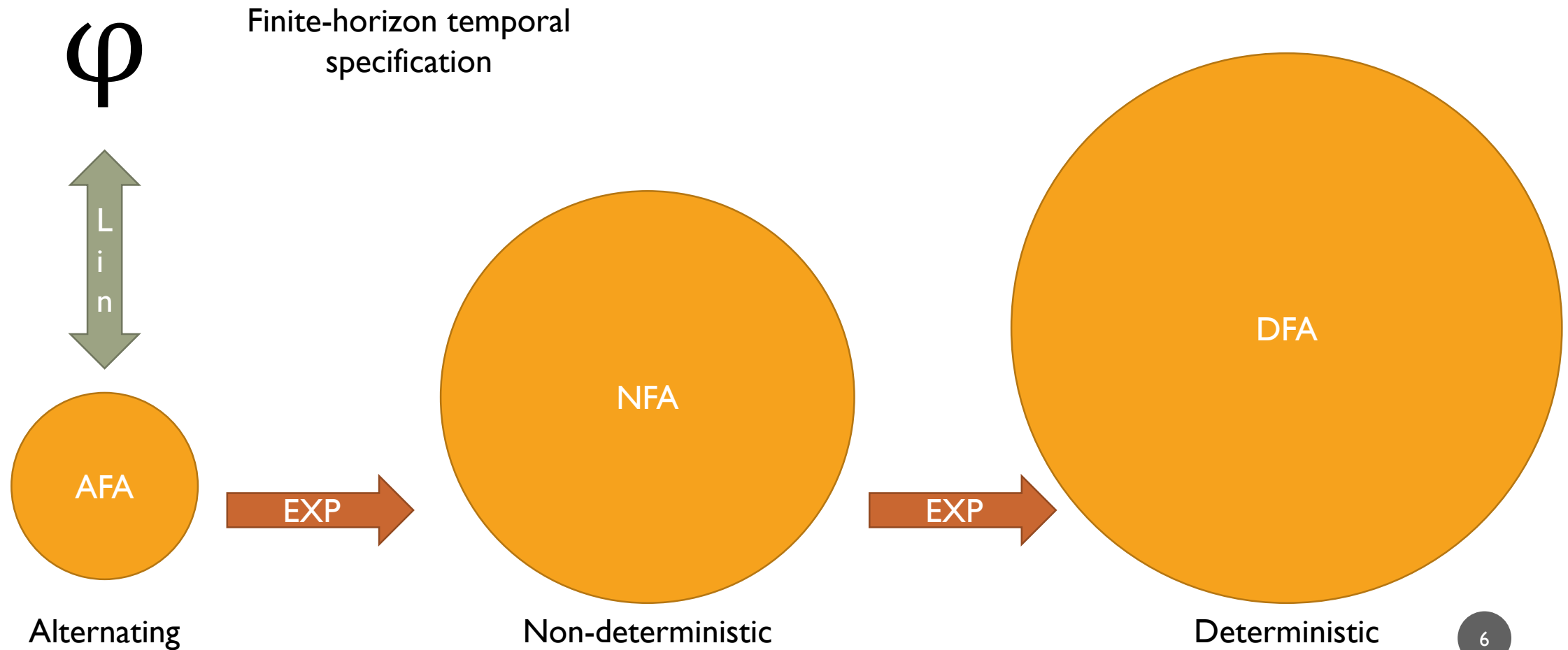
Verification: **Given** a strategy for each agent, **check** if it's a Nash equilibrium.



Realizability: **Determine** whether a Nash equilibrium **exists**.



# AUTOMATON TYPES



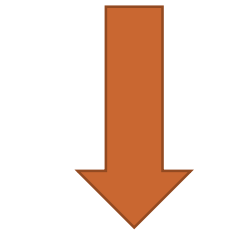
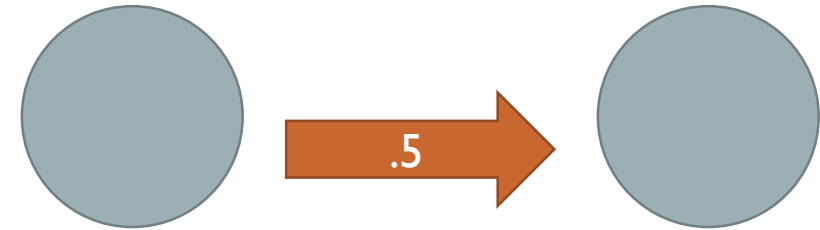
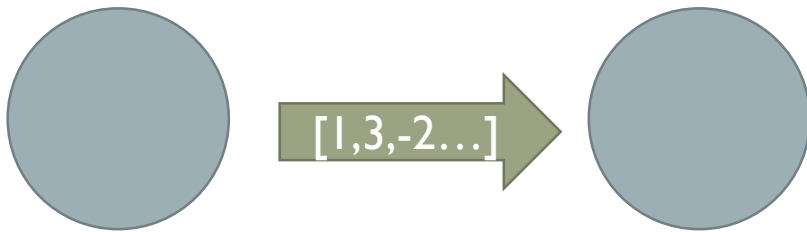
# COMPLEXITY-THEORETIC CHARACTERIZATION

Goal Specification	Verification	Realizability
Deterministic	PSPACE-complete	PSPACE-complete
Nondeterministic	PSPACE-complete	EXPTIME-complete
Alternating	PSPACE-complete	2EXPTIME-complete

**Verification** does not seem to care about the succinctness of the automaton representation, but this induces a strict hierarchy for **Realizability**.

# FUTURE WORK

Deterministic setting with quantitative goals induced from weighted transitions and discounted sums



Finite word automaton goals as before but probabilistic setting