

ODED GOLDREICH

- lecture notes www.wisdom.weizmann.ac.il/~oded/pt-en.html
(on property testing)

TESTING $\left. \begin{array}{l} \text{DYNAMIC} \\ \text{EVOLVING} \end{array} \right\}$ ENVIRONMENTS

- evolving phy. environments
- moving objects

SPECIFIC MODEL: d-DIM. CELLULAR AUTOMATA

$$d = 1, 2, 3$$

- EVOLUTION RULE $\Gamma: \Sigma^{3^d} \rightarrow \Sigma$

- VIEWING FUNCTION $V: \Sigma \rightarrow \Sigma'$

(fully visible state vs partially visible...)

TESTING WHETHER AN EVOLUTION TABLE

IS Γ -LEGAL (i.e. evolves according to Γ) $E: \underbrace{[t]}_{\text{time}} \times \underbrace{[n]^d}_{\text{space}} \rightarrow \Sigma$

- If E is Γ -legal, then whp accept $V \circ E$
- If F is ϵ -far from any $V \circ E'$ such that E' is Γ -legal, then whp reject F .

What makes this different from general P.T?

1. time-conforming observer/tester

if queries (j, \cdot) after (i, \cdot)
then $j \geq i$ must hold

2. temporal query complexity

$\cong \max_{i \in [t]} \left\{ \# \text{ queries to } E_i(\cdot) \cong E(i, \cdot) \right\}$

THM: \exists evolution rule $\pi: \Sigma^3 \rightarrow \Sigma$

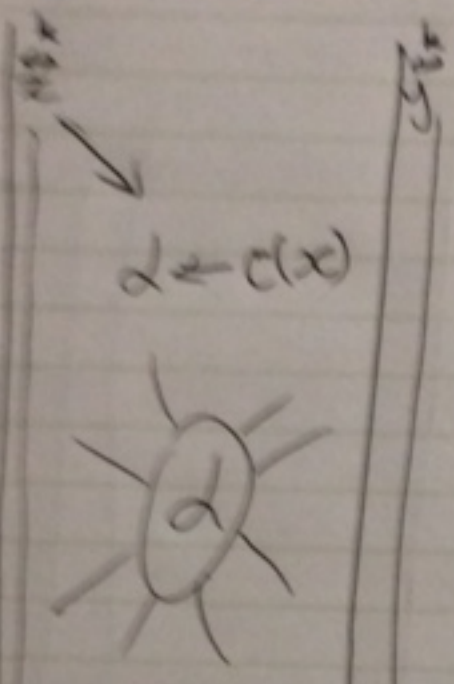
st. π -legal evolution requires

time-conforming tester of complexity $n^{\Omega(n)}$

but admits a non-time-conforming tester
of query complexity $\text{poly}(\log n)$.

$C = \text{ET/D}$
~~ET/D~~
~~ET/D~~
~~ET/D~~
~~ET/D~~

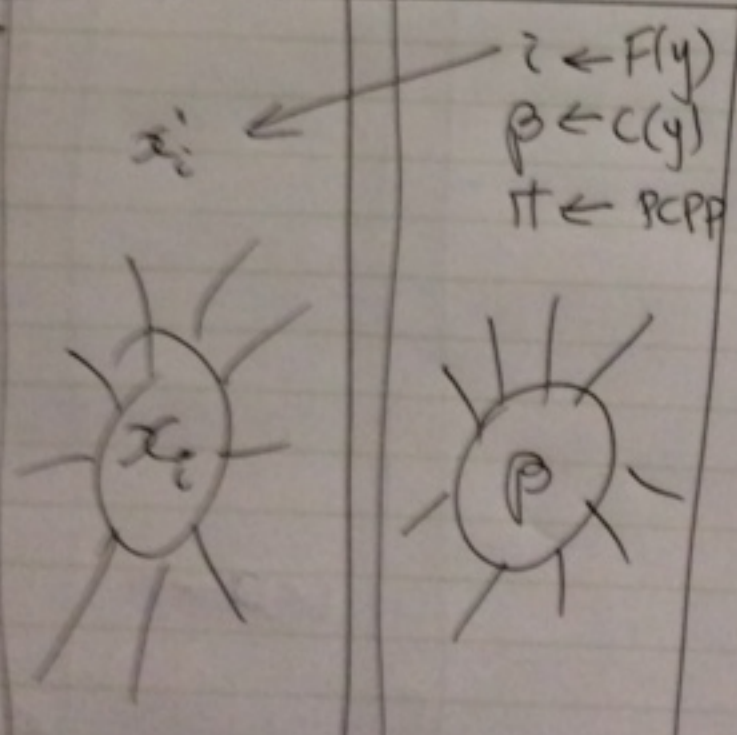
$n = \text{poly}(k)$
 $t = O(n)$



F is a
 nondeterministic
 extractor
 for bit-fixing
 sources.

delete α

$x_i \in \mathcal{X}$
 bit advisory
 sets
 $x_i \in \mathcal{X} \Rightarrow y_i \in \mathcal{Y}$



asserting
 $i = C^{-1}(\beta)$