

## [Synchronization + Constrained coding (inner code)]

 $\Sigma = \{0, 1, 2, 3\}$  (A,T,G,C)

 $\ell$  : constraint length

 $\mathcal{Q} \subset \Sigma^\ell$  : valid state set

 (ex)  $\mathcal{Q}_{\ell,k}^R$  : maximum run-length  $k$ 
 $\mathcal{Q}_{\ell,\varepsilon}^B$  : local  $\varepsilon$ -balanced

 $\mathcal{Q}_\ell^M$  : motif (?)

 $\mathcal{Q}_\ell^S$  : synchronization (?)

 $\mathcal{Q} = \mathcal{Q}_{\ell,k}^R \cap \mathcal{Q}_{\ell,\varepsilon}^B \cap \mathcal{Q}_\ell^M \cap \mathcal{Q}_\ell^S \cap \dots$ 

 state:  $\mathbf{q} = q_0 q_1 \dots q_{\ell-2} q_{\ell-1} \in \mathcal{Q}$ 

 left-shift:  $\overleftarrow{\mathbf{q}} a = q_1 q_2 \dots q_{\ell-1} a \in \Sigma^\ell$ 

 state transition:  $t(\mathbf{q}, a) = \{\mathbf{q}' = \overleftarrow{\mathbf{q}} a \mid \mathbf{q}' \in \mathcal{Q}\}$   
 $|t(\mathbf{q}, a)| \in \{0, 1\}$ 

 edge label set:  $\mathcal{L}(\mathbf{q}) = \{a \mid t(\mathbf{q}, a) \neq \phi\}$ 

 encoding:  $f_e : \mathcal{Q} \times \mathbb{B}^2 \rightarrow \Sigma$ 

$\mathcal{L}(\mathbf{q})$	00	01	10	11
$\{0, 1, 2, 3\}$	0	1	2	3
$\{0, 1, 2\}$	0	1	2	2
$\{0, 1, 3\}$	0	1	3	3
$\{0, 2, 3\}$	0	0	2	3
$\{1, 2, 3\}$	1	1	2	3
$\{q_0, q_1\}$	$q_0$	$q_0$	$q_1$	$q_1$
$\{q\}$	$q$	$q$	$q$	$q$
$\phi$	(invalidate $\mathbf{q}$ )			

 outer code:  $\mathcal{C}_0$  : left-bit

 $\mathcal{C}_1$  : right-bit

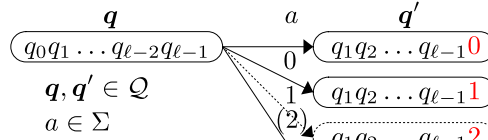
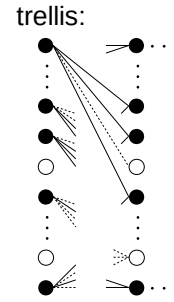
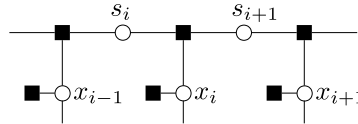
 (rate)  $R(\mathcal{C}_0) > R(\mathcal{C}_1)$ 

evaluation: ?

constrained channel capacity

IDS channel capacity (finite length?)

FBA soft output: mutual info?


 FBA:  $s_i = (\mathbf{q}_i, d_i)$   
 $x_i = (x_i^0, x_i^1) \in \mathbb{B}^2$ 

 (edge)  
 -1: Z  
 0: 00  
 1: 01  
 2: 10  
 3: 11  
 4: 0\*  
 5: 1\*  
 6: \*\*

info mapping: rate-1

