2   1   1, 2

1   2

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Digit Recognition by Molecular Immunocomputing

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1.

(memory)

[1].

(immunological memory)   [2].

(emergent)   .

, "   2   (second brain)"

[3, 4].

(pattern recognition)
(feature extraction)
(diversity)
(learning)
(memory)
(distributed detection)
(self-regulation)
(threshold mechanism)
(co-stimulation)
(dynamic protection)
(probabilistic detection)

2.2

2.

2.1

(celluar-automata)

-      (shape-space)

[4].

(immune network model)
(negative selection algorithm)
(computer security)
(anomaly detection in time
series data)
(fault diagnosis)
(pattern recognition)

2.3

DNA　　　　　　　　DNA　　　　　　　[5]. DNA
　　　　　　　　　　　　　　DNA
, DNA
　　　　　[6]. DNA　　　　　　　　　　,
　　　(peptide)　　　(antibody)
　　　(peptide computing)
[7],　　　　　　　　　　　　　　　　　　　[8].

(immunocomputing)
(pattern recognition)　　　　　　　　　[9],
　　　　　　　(biochip)
　　[10].

　　　　　　　　　　　　　　　　　,

.

　　　　　　　　　　　　　　　　　,

.

DNA

(molecular immunocomputing)　　　　　　.
　　,　　　　　　　　　　　　　.

(nucleotide)　　　　　　　　　　　DNA
　　　RNA　　　　　　　　　　.
　　　　20
.

,　2X10^{10}　　　　　　　　　[11].
　　　　　　　　　　　DNA　　　　　　　　,
　　　　　　.

KLH(keyhole limpet hemacyanin)　　　BSA(bovine
serum albumin)
　　(conjugation)　　　　　　,
　　　,　　　　(conjugated protein)
　　　[12].
　　　　　　　　　　　　　,
.　　　　　　　　　　　　　　3
,　　　　　　　　　　　.
-
, ELISA(enzyme-linked imunosorbent assay)

[11].

.

3.

"0"　"1"
.
"0"　"1"　　　,　"0"　"1"

DNA　　　　　.
2　7×7
.

[　　1.] "0"　"1"　　2　　DNA

"0"-DNA template sequence:
5'- **a** tcc ctt tcg ggc ttc ggg ctt cgg gct tcg ggc ttc ggg ctt tcc ctt – 3'
"0"-RNA transcript sequence:
3' – **ugu** agg gaa agc ccg aag ccc gaa gcc cga agc ccg aag ccc gaa agg gaa – 5'
"1"-DNA template sequence:
5'- **a** ttc ttt ttc ctt ttt tct ttt ttc ttt ttt ctt ttt tct ttt ttc ttt – 3'
"1"-RNA transcript sequence:
3' – **ugu** aag aaa aag gaa aaa aga aaa aag aaa aaa gaa aaa aga aaa aag aaa – 5'
[　　2.] DNA　　　RNA　　　　　(transcription)

"0"-RNA transcript sequence:
5' – aag gga aag ccc gaa gcc cga agc ccg aag ccc gaa gcc cga aag gga **ugu** – 3'
"0"-peptide sequence:
NH₂ – **K G K P E A R S P K P E A R K G C*** – COOH
"1"-RNA transcript sequence:
5' – aaa gaa aaa aga aaa aag aaa aaa gaa aaa aga aaa aag gaa aaa gga **ugu** – 3'
"1"-peptide sequence:
NH₂ – **K E K R K K K K E K R K K E K E C*** – COOH
[　　3.] RNA　　　　peptide　　　　(translation)

"0"　　"1"　　2　　7×7
　　　　　,　　　　　　　　(cytosine),
　　　(thymine),
(guanine)　　　　　　　　[　　1].
(adenine)　　　　　　　　DNA

(STOP codon)
. 7×7
2   DNA   1   DNA   .
, 1   DNA
1   RNA   [2].   1
RNA   (codon table)   (rule)
1   [3].   ,
(codon)   ,   1   RNA   3
DNA   noise   tolerant
. 2   1
noise- tolerent   , 2
1   (nucleotide)
(frameshift)   . 1
C-
(cystein)   (code)
.

(disulfide bond)
.   7×7
(adenine)   .
" 1"   -
, " 0"
.   ,   '

.   ELISA
.

4.

" 0"   " 1"   , 7×7

.

noise- tolerent

.

7×7   ,

(cystein)   17   ,
(hapten)
15 ~ 20
[12].   ,
2   7×7
.

'
,   .

'

10   ,   .
(phage display libraries)
2
[13].

, ABO-
-
(kit)   (chip)   ,

[10].

(immunochip)   (biocomputer)
[10],

.

5.
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