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Exercises on parallel computing

Athens, 1996.

1., The theme

2., Shortly about the classification of signals

3., The correlation functions

4., Realization on parallel machine

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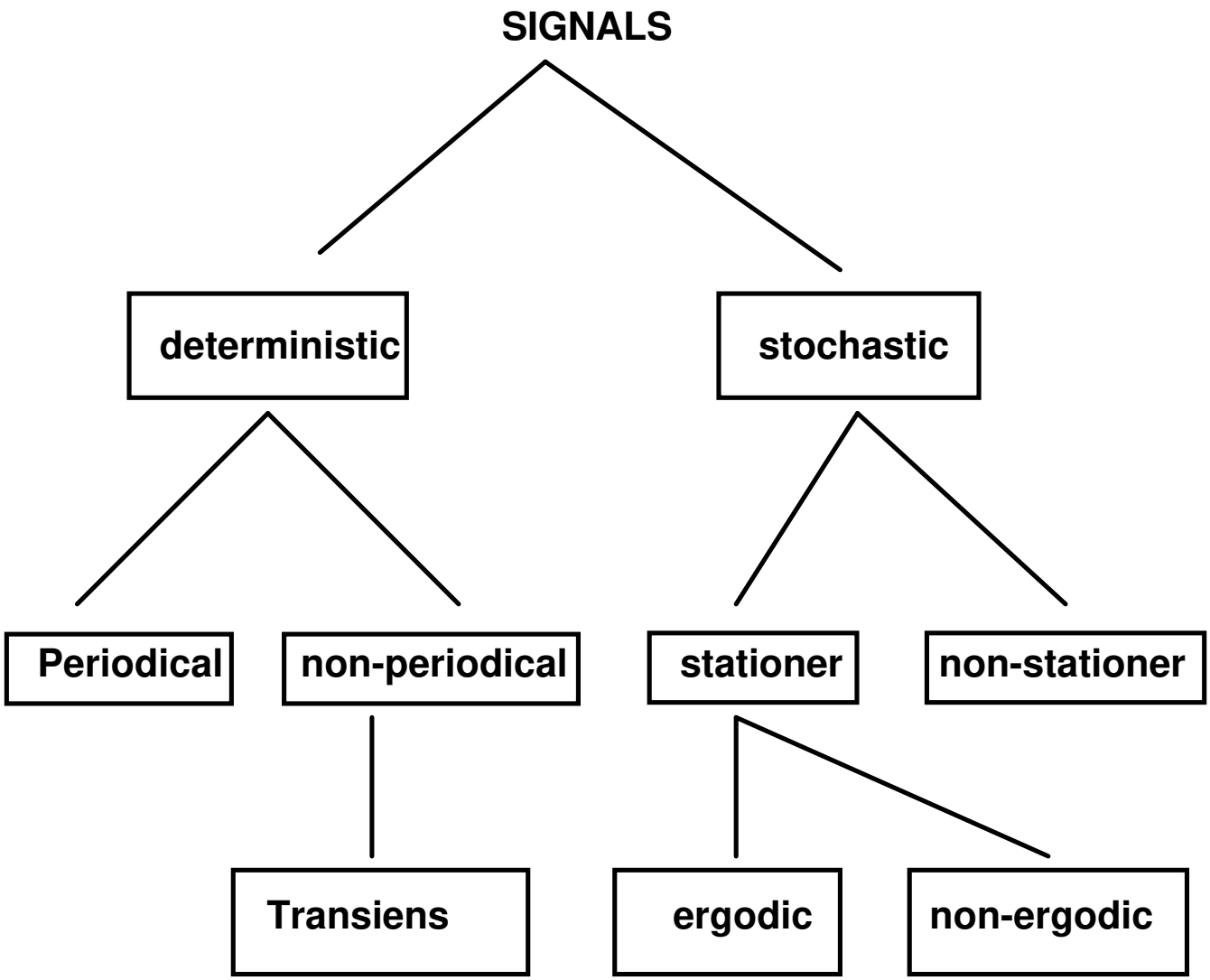
Briefly about the classification of signals



Features of the Periodical signals

- The amplitudes of the signals are repeated
- The momentary values of the signals are know
- The sign only once, without repetition: We can be determined at every moment

Stochastic signals

- Telling the momentary values in advance is not possible
- The changes in the sign do not determine the value taken at the next moment
- Description can be don by statistical parameters

Correlation functions

- The change of stochastic signals cannot given in advance
- Point out a connection between the values of the sign in one particular and a later moment
- a lot of measuring and average the data

The correlation function can be given by the following formula:

$$\mathbf{k_{xx}(t_1)= \lim} \quad \frac{1}{2T} \int_{-T}^{T} x(t)x(t+t1)dt$$

This function gives information:

⇒ What the connection or correlation between the values that are successive in time of one sign
⇒ Auto-correlation Function

Features of auto-correlation function

- $K_{xx}(t_1 = 0)$ equal to X^2 square mean of stochastic sign
- $K_{xx}(t_1 = \infty)$ equal to square of the mean of the stochastic sign
- Even function
- The period time of auto-correlation function is equal to the period time of periodical component of the sign
- The function is enables to select periodical sign components in case of relatively high noise level too

Correlators

- **Real - time correlators**
- **Numeric collelators**

Real-Time

- analog
- digital

The advantages of real time correlators:

- quickness
- relatively cheap
- more flexible to handle them

Numeric collerators

- available accuracy
- multi-channel function

Realization

Find to details of periodical signals in the noise

HW Environment

- **Parsytec 16 transputer (T800) machine**
- **Network and workstation**
- **ULR/telnet**

The software environment

- **CDL (Component Distribution Language) script**

  the number of processors

  the processor types

  how the processors are interconnected

  how much external memory

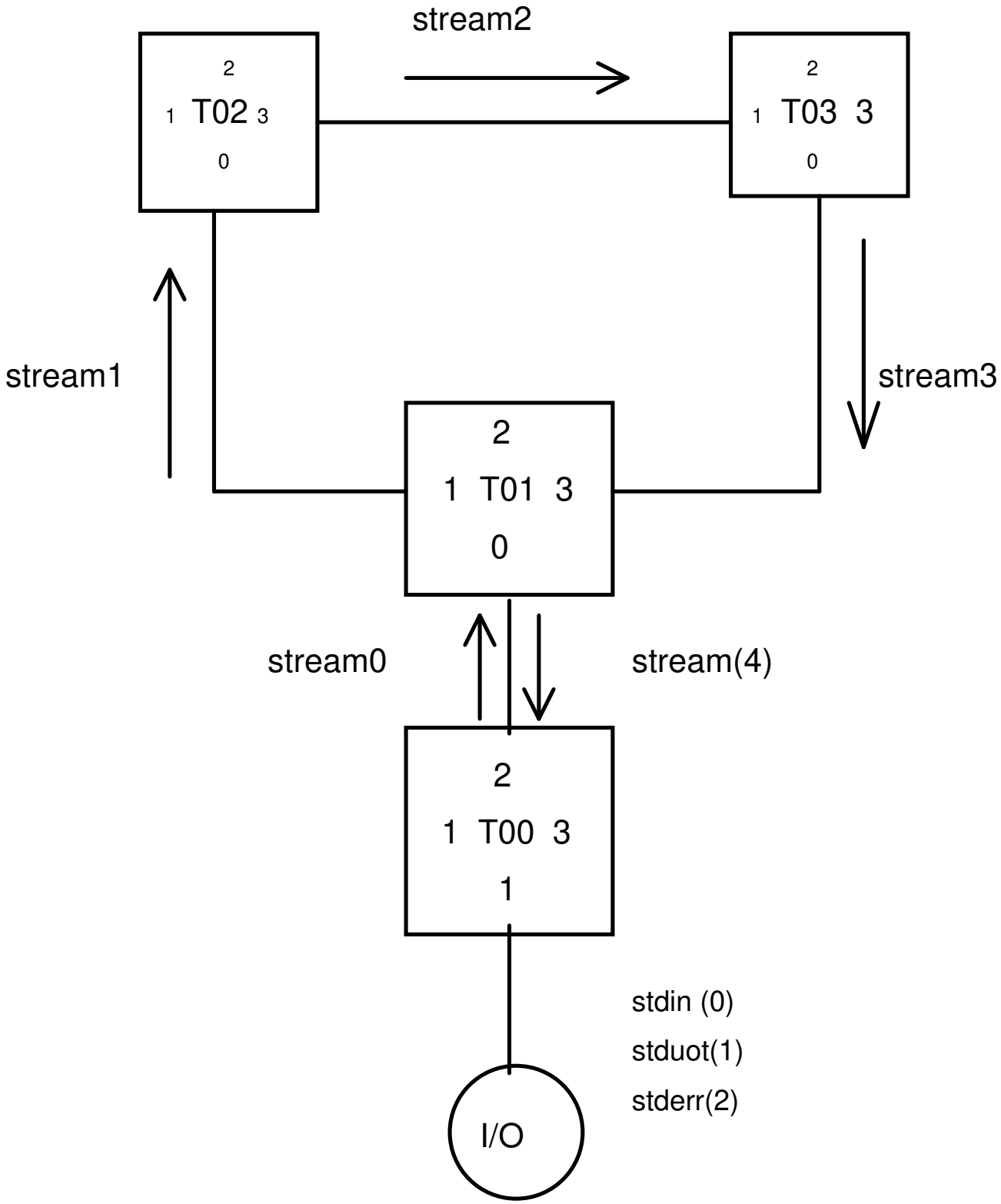
- **The resource map file**

  a description of how the tasks are connected together (i. e., how the communicate with each other).

  an optional description of the resource requirements for each task

- **The Unix standard data streams extended by the POSIX file descriptor header file supported by the HELIOS**

The topology definition


stream2
2
1 T02 3
0
2
1 T03 3
0
stream1
stream3
2
1 T01 3
0
stream0
stream(4)
2
1 T00 3
1
stdin (0)
stduot(1)
stderr(2)
I/O

Run of the program

/helios/usr/jfiedler/fj bit3.txt

Ask the sample: ab0

result[0]: 717
result[1]: 46
result[2]: 2

Ask the sample: 65b

result[0]: 838
result[1]: 44
result[2]: 0

Ask the sample: 291

result[0]: 736
result[1]: 43
result[2]: 5

Ask the sample: fff

result[0]: 501
result[1]: 12
result[2]: 0