Algorithm of compression data Karhunen Loeve and some points of view

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REZUMAT. Lucrarea se referă la utilitatea algoritmului de compresiea datelor în alte scopuri decât acesta. Se pune problema asemănării unor grupuri de date, obiecte sau orice altceva ce se poate reprezenta. Se poate folosi oriunde acolo unde este nevoie să se compare rezultate între ele sau să se folosească o bază de date a unui obiect pentru proiectarea unui alt obiect asemănător.

1 Data stock and compression

This paper will be an application of compression data KL algorithm. For the first time we have the following data table

$$X = \begin{pmatrix} 12 & 10.8 & 20 & 55 & 58 & 24 & 10 & 40 & 10 & 10.5 \\ 20 & 7.5 & 12 & 2 & 60 & 20.2 & 65 & 0 & 40 & 13.5 \\ 2 & 20 & 8 & 40 & 50 & 14 & 12 & 65 & 10 & 19 \end{pmatrix}$$

$$M(X) = \frac{\sum X}{n} \qquad R = (X - mx)\cdot(X - mx)^T \qquad \lambda = \mathrm{eigenvals}(R)$$

$$T = \mathrm{eigenvecs}\ (R)$$

λ =

	0
14	$-1.148\cdot10^{-14}$
15	$9.181\cdot10^{-15}$
16	$-1.555\cdot10^{-14}$
17	$1.942\cdot10^{-14}$
18	$4.097\cdot10^{-14}$
19	$5.129\cdot10^{-14}$
20	$8.947\cdot10^{-14}$
21	$9.295\cdot10^{-14}$
22	$-7.443\cdot10^{-14}$
23	$-8.809\cdot10^{-14}$
24	$-1.232\cdot10^{-13}$
25	$1.707\cdot10^{-13}$
26	$-1.751\cdot10^{-13}$
27	$1.079\cdot10^{-12}$
28	$-1.237\cdot10^{-12}$
29	$1.196\cdot10^{4}$

λ =

	0
0	0
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	$-3.048\cdot10^{-15}$
12	$-5.298\cdot10^{-15}$
13	$3.841\cdot10^{-15}$
14	$-1.148\cdot10^{-14}$
15	$9.181\cdot10^{-15}$

T =

	0	1	2	3	4	5
0	$4.446\cdot10^{-15}$	0.695	0.097	0.083	-0.264	0.099
1	0	0	0	$3.331\cdot10^{-15}$	$-8.371\cdot10^{-15}$	$1.807\cdot10^{-15}$
2	$1.812\cdot10^{-14}$	0.087	-0.704	$8.669\cdot10^{-3}$	-0.024	-0.243
3	0	0	0	0	$1.294\cdot10^{-15}$	0
4	0	0	0	0	$-1.06\cdot10^{-15}$	0
5	0	$2.379\cdot10^{-15}$	$-6.606\cdot10^{-15}$	$-5.83\cdot10^{-14}$	$1.13\cdot10^{-13}$	$-2.829\cdot10^{-14}$
6	-0.707	$7.101\cdot10^{-15}$	$-1.729\cdot10^{-14}$	0	$-1.103\cdot10^{-15}$	0
7	$-2.145\cdot10^{-15}$	-0.013	0.052	0.725	-0.107	-0.286
8	0.707	$-7.055\cdot10^{-15}$	$1.741\cdot10^{-14}$	$1.038\cdot10^{-15}$	$-1.533\cdot10^{-15}$	0
9	0	0	0	$-1.552\cdot10^{-15}$	$5.657\cdot10^{-15}$	0
10	$-1.788\cdot10^{-14}$	-0.089	0.694	-0.101	-0.017	-0.257
11	0	0	0	$1.233\cdot10^{-15}$	$-2.701\cdot10^{-15}$	0
12	$-5.324\cdot10^{-15}$	-0.707	-0.08	0.078	-0.228	0.098
13	0	-0.016	$-4.018\cdot10^{-3}$	-0.071	-0.437	0.22
14	0	0	0	$-2.137\cdot10^{-15}$	$4.765\cdot10^{-15}$	$-1.158\cdot10^{-15}$
15	0	0	0	$3.318\cdot10^{-15}$	$-7.429\cdot10^{-15}$	$2.276\cdot10^{-15}$

Rxx =

	0	1	2	3	4	5	6
0	152.523	167.343	53.723	-378.528	-415.578	4.323	177.223
1	167.343	183.603	58.943	-415.308	-455.957	4.743	194.443
2	53.723	58.943	18.923	-133.328	-146.378	1.523	62.423
3	-378.528	-415.308	-133.328	939.422	$1.031\cdot10^{3}$	-10.728	-439.828
4	-415.578	-455.957	-146.378	$1.031\cdot10^{3}$	$1.132\cdot10^{3}$	-11.778	-482.878
5	4.323	4.743	1.523	-10.728	-11.778	0.123	5.023
6	177.223	194.443	62.423	-439.828	-482.878	5.023	205.923
7	-193.278	-212.058	-68.078	479.672	526.622	-5.478	-224.578
8	177.223	194.443	62.423	-439.828	-482.878	5.023	205.923
9	171.048	187.668	60.248	-424.502	-466.053	4.848	198.748
10	53.723	58.943	18.923	-133.328	-146.378	1.523	62.423
11	208.098	228.318	73.298	-516.452	-567.003	5.898	241.798
12	152.523	167.343	53.723	-378.528	-415.578	4.323	177.223
13	276.023	302.843	97.223	-685.028	-752.077	7.823	320.723
14	-440.278	-483.058	-155.078	$1.093\cdot10^{3}$	$1.2\cdot10^{3}$	-12.478	-511.578
15	51.253	56.233	18.053	-127.198	-139.648	1.453	59.553
16	-502.028	-550.808	-176.828	$1.246\cdot10^{3}$	$1.368\cdot10^{3}$	-14.228	-583.327
17	300.723	329.943	105.923	-746.327	-819.378	8.523	349.423
18	-193.278	-212.058	-68.078	479.672	526.622	-5.478	-224.578
19	133.998	147.018	47.198	-332.553	-365.103	3.798	155.698
20	276.023	302.843	97.223	-685.028	-752.077	7.823	320.723
21	53.723	58.943	18.923	-133.328	-146.378	1.523	62.423
22	201.923	221.543	71.123	-501.127	-550.178	5.723	234.623
23	-193.278	-212.058	-68.078	479.672	526.622	-5.478	-224.578
24	-316.778	-347.558	-111.578	786.172	863.122	-8.978	-368.078
25	127.823	140.243	45.023	-317.228	-348.278	3.623	148.523
26	152.523	167.343	53.723	-378.528	-415.578	4.323	177.223
27	-502.028	-550.808	-176.828	$1.246\cdot10^{3}$	$1.368\cdot10^{3}$	-14.228	-583.327
28	177.223	194.443	62.423	-439.828	-482.878	5.023	205.923
29	66.073	72.493	23.273	-163.978	-180.028	1.873	76.773

We compute the mean of X and correlation matrix R. The eigenvalues of this matrix are λ.and T is eigenvectors of this matrix.

2 Procedures

Now, is necessary to get the follows:

- in descendent order will arrange the eigenvalues of matrix $R(R_{XX})$;
- divided in any significant batches this string with observing the graphic of the new values of *X* that become *Y*;
- on these parts we will generate the new values of data as *Y* matrix;
- representation on graphics the parts of new values *Y*.

$$Y = T \cdot X$$

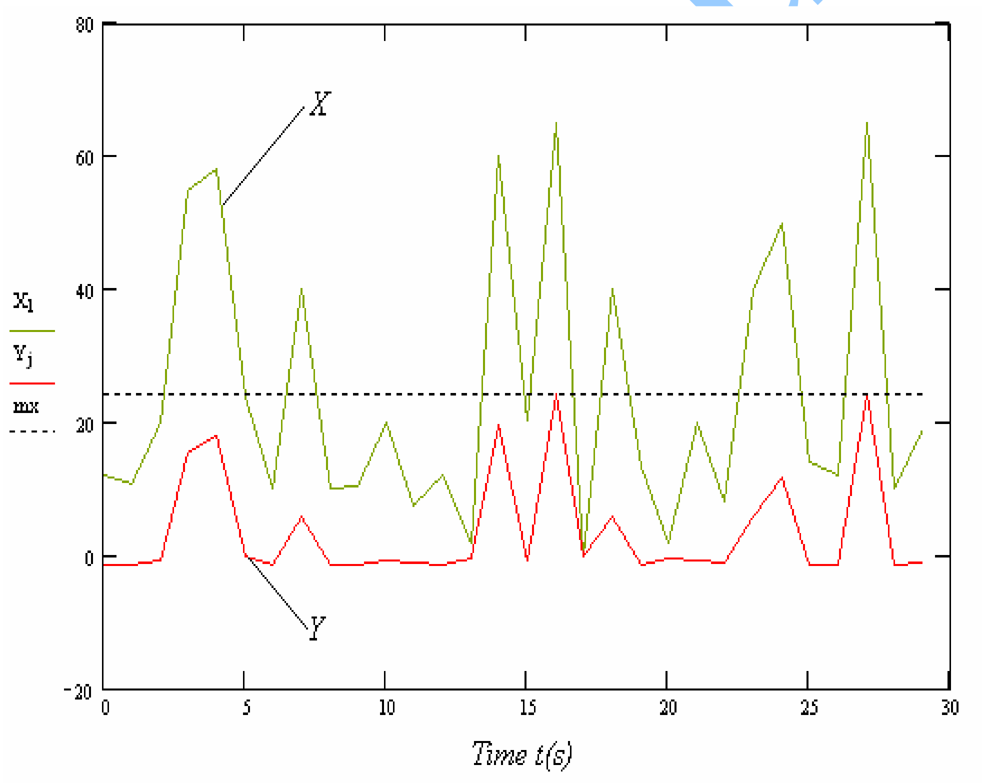

Figure 2.1

- **The first part**

$$Y_1 = T_1 X_1$$

$$T_1 = \begin{pmatrix} -0.212 & -0.095 & -0.272 & -0.149 & 0.205 & 0.235 \\ -0.014 & 0.112 & 0.036 & 0.052 & -0.059 & -0.095 \\ -0.077 & 0.099 & -0.035 & -0.117 & 0.095 & -0.113 \\ 0.27 & 0.178 & -0.105 & 0.301 & -0.174 & 0.372 \\ 0.037 & -0.058 & 0.053 & 0.662 & 0.728 & -0.131 \\ 8.549\times 10^{-3} & 0.013 & -0.04 & -0.014 & -0.042 & -0.049 \end{pmatrix}$$

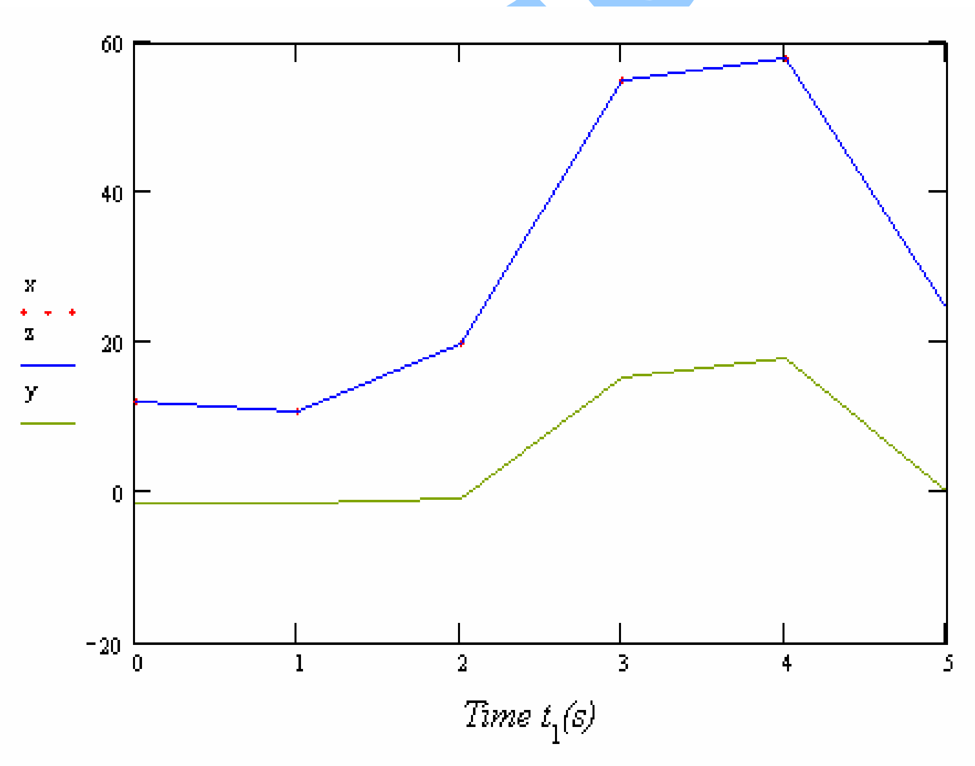

Figure 2.2

- **Second part**

$$Y_2 = T_2 X_2$$

$$T_2 = \begin{pmatrix} -0.069 & -0.082 & 0.148 & -0.012 & 0.097 & -0.182 \\ 0.107 & 0.085 & -0.243 & -0.165 & -0.177 & 0.026 \\ -0.05 & 0.301 & -0.045 & -0.183 & -0.154 & -0.185 \\ 0.162 & 0.194 & 0.048 & -0.14 & 0.057 & -0.176 \\ -0.048 & 9.194\times 10^{-3} & 5.114\times 10^{-3} & 0.026 & -0.046 & 0.026 \\ -0.261 & 0.205 & -0.137 & -0.133 & -0.173 & -0.042 \end{pmatrix}$$

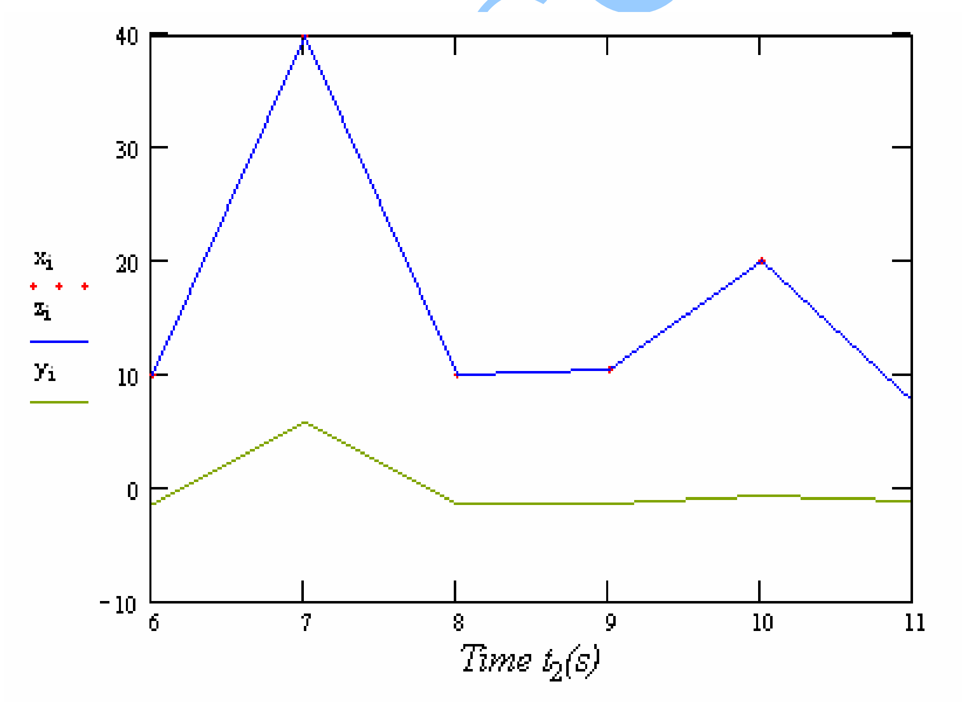

Figure 2.3

- **Third part**

$$Y_3 = T_3 X_3$$

$$T_3 = \begin{pmatrix} -0.096 & 6.088\times 10^{-3} & -0.055 & -0.032 & -0.159 & -0.137 & -0.145 \\ 0.283 & -0.607 & -0.22 & -0.215 & -0.042 & 0.097 & 0.326 \\ -0.395 & -0.375 & 0.044 & -0.424 & -0.2 & -0.056 & -1.214\times 10^{-3} \\ 0.123 & 9.981\times 10^{-3} & -0.03 & -0.038 & -0.029 & 0.035 & -0.251 \\ 0.031 & 2.459\times 10^{-3} & -2.35\times 10^{-3} & 0.033 & -0.026 & 0.022 & 0.042 \\ 5.517\times 10^{-3} & -9.051\times 10^{-3} & -4.612\times 10^{-4} & -2.818\times 10^{-3} & 0.01 & -0.026 & -6.343\times 10^{-3} \\ 0.051 & -0.016 & 0.051 & 0.142 & 0.31 & -0.714 & 0.429 \end{pmatrix}$$

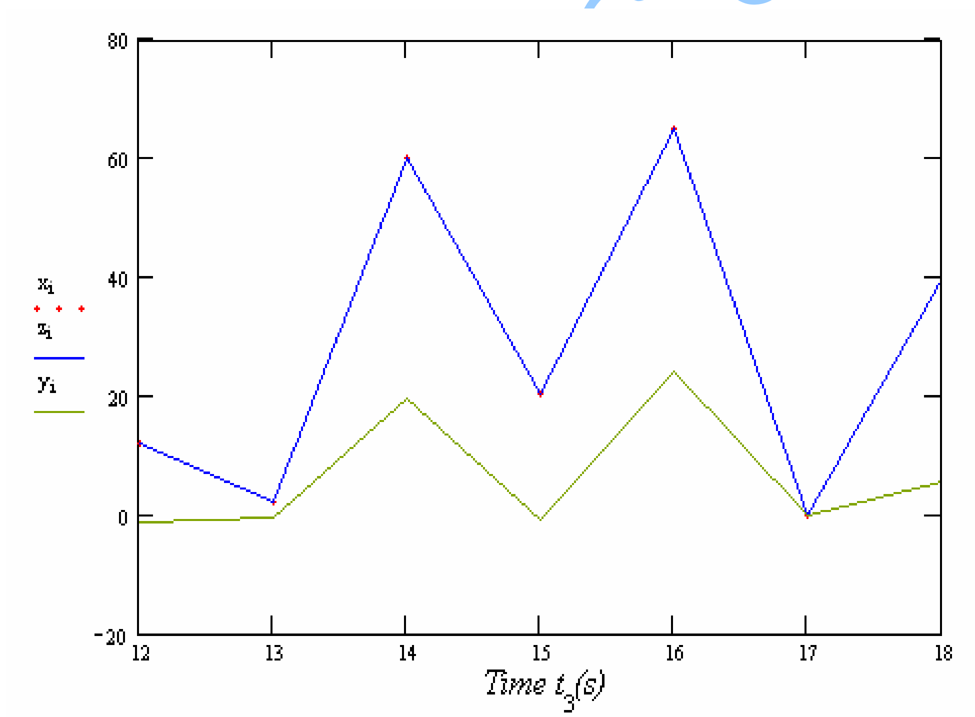

Figure 2.4

- **Fourth part**

$$Y_4 = T_4 X_4$$

$$T_4 = \begin{pmatrix} 1.697\times 10^{-15} & -6.9\times 10^{-15} & -3.126\times 10^{-15} & 2.339\times 10^{-15} & 0.018 & -0.128 \\ -2.285\times 10^{-15} & 1.394\times 10^{-14} & 3.731\times 10^{-15} & -6.083\times 10^{-15} & 0.045 & 0.557 \\ -0.197 & 0.439 & 0.361 & 0.191 & 3.45\times 10^{-3} & -0.109 \\ 0.039 & -0.118 & -0.034 & 0.686 & -6.101\times 10^{-4} & -0.018 \\ 0 & 0 & 0 & 0 & 1.734\times 10^{-3} & 7.696\times 10^{-4} \\ 0 & 1.499\times 10^{-15} & 0 & 0 & 1.759\times 10^{-3} & 0.025 \end{pmatrix}$$

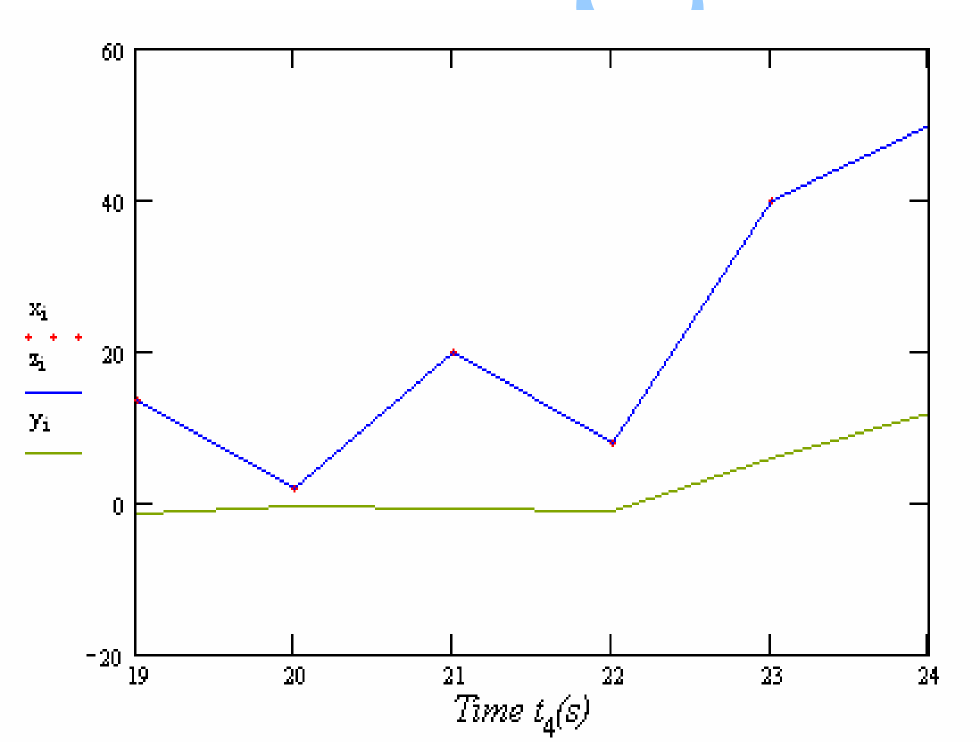

Figure 2.5

- **Fifth part**

$$Y_5 = T_5 X_5$$

$$T_5 = \begin{pmatrix} 0 & 0 & 0 & 2.706\times 10^{-15} & -5.75\times 10^{-15} \\ 0 & 0 & 0 & -3.958\times 10^{-15} & 1.11\times 10^{-14} \\ 0 & 0.011 & -0.017 & -0.161 & 0.492 \\ 0 & -1.764\times 10^{-3} & 2.95\times 10^{-3} & 0.023 & -0.113 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1.188\times 10^{-15} \end{pmatrix}$$

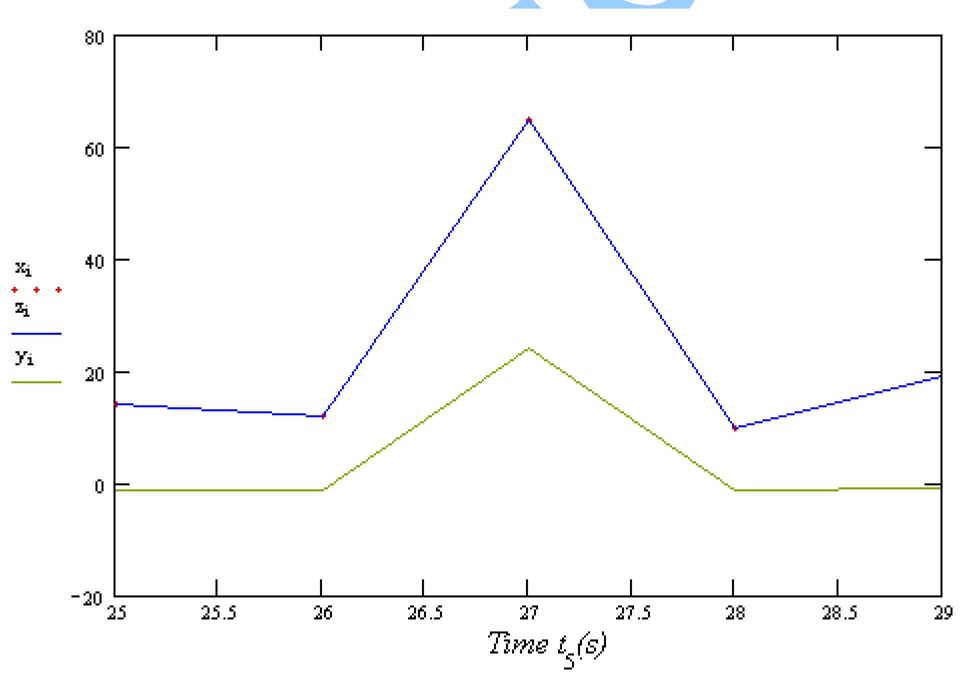

Figure 2.6

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