DEPARTMENT OF INFORMATION AND KNOWLEDGE ENGINEERING

Validation of the approach to discover multi-time interval patterns preserving the temporal information in between

Alessio Bertone

Danube University Krems
Department of Information and Knowledge Engineering (ike)

IKE-TR-2009-03 June 2009

Authors: **Alessio Bertone**

Alessio.Bertone@donau-uni.ac.at
http://www.donau-uni.ac.at/ike

Contact: **Danube University Krems**
Department of Information and Knowledge Engineering (ike)
Dr.-Karl-Dorrek-Str. 30
3500 Krems
Austria, Europe
T +43 (2732) 893 - 2453
F +43 (2732) 893 - 4450
ike@donau-uni.ac.at
http://www.donau-uni.ac.at/ike

Table of Contents

1 Validation and Evaluation

This technical report aims to provide a validation of the approach proposed to find multi-time interval patterns preserving the temporal information in between. The validation is either mathematical, whereas we can demonstrate the correctness of the calculation of the events, or empirical, whereas we can show the exactness of the calculation of the multi-time interval patterns with some test datasets. In detail, we perform a two fold strategy, which will be described in section 1.1 and 1.2 respectively. The first part consists of manually calculating the events, the candidate patterns and the resulting patterns of a simple datasets and compare such results with those obtained using the implemented version of the approach. The second part represents the dual of the previous one: starting from some multi-time interval patterns, we create a synthetic dataset so that such patterns belong to the most frequently occurring ones. After that we run our implemented approach and compare the results with those expected.

Note that, being the approach divided into a first step ("Step 0") whereas events are calculated and which differs from the rest, and some recursive steps ("Step 1", "Step 2", etc.), whereas multi-time interval patterns are calculated, which have length one, two, and so on. Thus, we demonstrate the correctness of the approach for the first step (that is, Step 0), and for the subsequent two steps ("Step 1" and "Step 2"), assuming that, cause of recursion, any further step follows the same rules, and do not require other proofs.

Furthermore, note that the whole approach is based on the events created during the first step and it works independently of the number of attributes of which they are composed (that is, one, two or more attributes). Therefore, we chose the easiest case (one attribute), but both proves still hold in case of more attributes.

1.1 Comparing manual and automatic results

The first part of the validation consists of generating a small dataset, manually calculating the events, the multi-time interval patterns and their support, step by step.

The dataset (see Table 1) contains data spanning from the 1st June 2006 till the 9th June 2009 and the number of employees which are present day by day (*#E*).

Begin	End	#E
01.06.2006 00:00	02.06.2006 00:00	24
02.06.2006 00:00	03.06.2006 00:00	24
03.06.2006 00:00	04.06.2006 00:00	10
04.06.2006 00:00	05.06.2006 00:00	0
05.06.2006 00:00	06.06.2006 00:00	0
06.06.2006 00:00	07.06.2006 00:00	24
07.06.2006 00:00	08.06.2006 00:00	25
08.06.2006 00:00	09.06.2006 00:00	24
09.06.2006 00:00	10.06.2006 00:00	23

Table 1: Test dataset

We are now ready to apply our approach.

Step 0

Associating an event to the occurrence of each unique value of the attribute #E, we have:

Begin	End	#E	Event
01.06.2006 00:00	02.06.2006 00:00	24	e_0
02.06.2006 00:00	03.06.2006 00:00	24	e_0
03.06.2006 00:00	04.06.2006 00:00	10	e_1
04.06.2006 00:00	05.06.2006 00:00	0	e_2
05.06.2006 00:00	06.06.2006 00:00	0	e_2
06.06.2006 00:00	07.06.2006 00:00	24	e_0
07.06.2006 00:00	08.06.2006 00:00	25	e_3
08.06.2006 00:00	09.06.2006 00:00	24	e_0
09.06.2006 00:00	10.06.2006 00:00	23	e_4

Table 2: Creation of the events.

After that, it is possible to count the occurrences of each event and summarize the results into Table 3

Event	# Occurrences
e_0	4
e_1	1
e_2	2
e_3	1
e_4	1

Table 3: Events and their occurrences.

If we assume that no support threshold has been given, all the events will be selected for the second step of the approach, otherwise only those which occur more (less) than the given support will be selected.

Let's assume that the support threshold is 10%, so only the events whose occurrence is greater than 10% are selected. In this case, all the events are selected[1].

[1] Since the whole number of occurrences is 9, the minimal amount of occurrences is 0.9 (10 % of 9). Therefore, even the events which occur once are above the support threshold.

Step 1

Starting from e0, then e_1, e_2, e_3 and e_4 we obtain all the possible candidate patterns. In detail,

from e_0 that occurs 4 times

$e_0I_2e_0$	$e_0I_2e_1$	$e_0I_2e_3$	$e_0I_2e_4$
$e_0I_2e_1$	$e_0I_2e_2$	$e_0I_2e_0$	
$e_0I_2e_2$	$e_0I_2e_2$	$e_0I_2e_4$	
$e_0I_2e_2$	$e_0I_2e_0$		
$e_0I_2e_0$	$e_0I_2e_3$		
$e_0I_2e_3$	$e_0I_2e_0$		
$e_0I_3e_0$	$e_0I_3e_4$		
$e_0I_3e_4$			

Table 4: Multi-time interval patterns derived from e_0.

from e_1 that occurs once

$e_1I_2e_2$
$e_1I_2e_2$
$e_1I_2e_0$
$e_1I_2e_3$
$e_1I_2e_0$
$e_1I_2e_4$

Table 5: Multi-time interval patterns derived from e_1.

from e_2 that occurs 2 times

$e_2I_2e_2$	$e_2I_2e_0$
$e_2I_2e_0$	$e_2I_2e_3$
$e_2I_2e_3$	$e_2I_2e_0$
$e_2I_2e_0$	$e_2I_2e_4$
$e_2I_2e_4$	

Table 6: Multi-time interval patterns derived from e_2.

from e_3 that occurs 2 times

$e_3I_2e_0$
$e_3I_2e_4$

Table 7: Multi-time interval patterns derived from e_3.

from e_4 that occurs once, we do not obtain any further patterns.

Summarizing the results in Table 8

Multi-time interval pattern	**# Occurrences**
$e_0I_2e_0$	5
$e_0I_2e_1$	2
$e_0I_2e_2$	4
$e_0I_2e_3$	3
$e_0I_2e_4$	2
$e_0I_3e_0$	1
$e_0I_3e_4$	2
$e_1I_2e_0$	2
$e_1I_2e_2$	2
$e_1I_2e_3$	1
$e_1I_2e_4$	1
$e_2I_2e_0$	4
$e_2I_2e_2$	1

$e_2I_2e_3$	2
$e_2I_2e_4$	2
$e_3I_2e_0$	1
$e_3I_2e_4$	1

Table 8: Candidate multi-time interval patterns found after Step 1 and their occurrences.

As in the previous step, if we assume that no support threshold has been given, all the multi-time interval patterns will be selected for the next step of, otherwise only those which occur more (less) than the given support will be selected.

Let's assume that the support threshold is 10%, so only the patterns whose occurrence is greater than 10% are selected. In this case, only $e_0I_2e_0$ (which occurs 5 times), $e_0I_2e_2$ and $e_2I_2e_0$ (which occur both 4 times) are selected[2].

Step 2

Starting from the patterns found in the previous step, we obtain all the possible candidate patterns. In detail,

from $e_0I_2e_0$ that occurs 5 times

$e_0I_2e_0I_2e_1$	$e_0I_2e_0I_2e_3$	$e_0I_2e_0I_2e_4$	$e_0I_2e_0I_2e_3$	$e_0I_2e_0I_2e_4$
$e_0I_2e_0I_2e_2$	$e_0I_2e_0I_2e_0$		$e_0I_2e_0I_2e_0$	
$e_0I_2e_0I_2e_2$	$e_0I_2e_0I_2e_4$		$e_0I_2e_0I_2e_4$	
$e_0I_2e_0I_2e_0$				
$e_0I_2e_0I_2e_3$				
$e_0I_2e_0I_2e_0$				
$e_0I_2e_0I_3e_4$				

Table 9: Multi-time interval patterns derived from $e_0I_2e_0$.

[2] Since the whole number of occurrences is 36, the minimal amount of occurrences is 3.6 (10 % of 36). Therefore, only the multi-time interval patterns which occur more than 3.6 times are above the support threshold.

from $e_0I_2e_2$ that occurs 4 times

$e_0I_2e_2I_2e_2$	$e_0I_2e_2I_2e_0$	$e_0I_2e_2I_2e_2$	$e_0I_2e_2I_2e_0$
$e_0I_2e_2I_2e_0$	$e_0I_2e_2I_2e_3$	$e_0I_2e_2I_2e_0$	$e_0I_2e_2I_2e_3$
$e_0I_2e_2I_2e_3$	$e_0I_2e_2I_2e_0$	$e_0I_2e_2I_2e_3$	$e_0I_2e_2I_2e_0$
$e_0I_2e_2I_2e_0$	$e_0I_2e_2I_2e_4$	$e_0I_2e_2I_2e_0$	$e_0I_2e_2I_2e_4$
$e_0I_2e_2I_2e_4$		$e_0I_2e_2I_2e_4$	

Table 10: Multi-time interval patterns derived from $e_0I_2e_2$.

from $e_2I_2e_0$ that occurs 4 times

$e_2I_2e_0I_2e_3$	$e_2I_2e_0I_2e_4$	$e_2I_2e_0I_2e_3$	$e_2I_2e_0I_2e_4$
$e_2I_2e_0I_2e_0$		$e_2I_2e_0I_2e_0$	
$e_2I_2e_0I_2e_4$		$e_2I_2e_0I_2e_4$	

Table 11: Multi-time interval patterns derived from $e_2I_2e_0$.

Summarizing the results in Table 12

Multi-time interval pattern	**# Occurrences**
$e_0I_2e_0I_2e_0$	4
$e_0I_2e_0I_2e_1$	1
$e_0I_2e_0I_2e_2$	2
$e_0I_2e_0I_2e_3$	3
$e_0I_2e_0I_2e_4$	4
$e_0I_2e_0I_3e_4$	1
$e_0I_2e_2I_2e_0$	8
$e_0I_2e_2I_2e_2$	2
$e_0I_2e_2I_2e_3$	4

$e_0I_2e_2I_2e_4$	4
$e_2I_2e_0I_2e_0$	2
$e_2I_2e_0I_2e_3$	2
$e_2I_2e_0I_2e_4$	4

Table 12: Candidate multi-time interval patterns found after Step 2 and their occurrences.

As in the previous steps, if we assume that no support threshold has been given, all the multi-time interval patterns will be selected for the next step of, otherwise only those which occur more (less) than the given support will be selected.

Let's assume that the support threshold is 10%, so only the patterns whose occurrence is greater than 10% are selected. In this case, only $e_0I_2e_2I_2e_0$ which occurs 8 times is selected[3].

As outlined above, since the steps after the Step 2 repeated recursively, we assume that no further steps need to be proved. For such reason, now we can compare these results with those from the implemented version.

Figure 1 show such results. As one can observe, the results of all the steps manually obtained and automatically calculated coincide. As a matter of fact, as result of Step 0, we have e_0 which occurs 4 times, e_2 twice, e_1, e_3 and e_4 once (as in Table 3), as result from Step 1, $e_0I_2e_0$, which occurs 5 times, $e_0I_2e_2$ and $e_2I_2e_0$, which occur both 4 times, and finally as result of Step 2 the pattern $e_0I_2e_2I_2e_0$ which occurs 8 times.

[3] Since the whole number of occurrences is 41, the minimal amount of occurrences is 4.1 (10 % of 41). Therefore, only the multi-time interval patterns which occur more than 4.1 times are above the support threshold.

No.	A begin	B end	C kst	D #employees	E turnover	F day of week	G Event	H CanditatesStep1	I CanditatesStep2	J ResultStep0	K ResultStep1	L ResultStep2
1	01.06.2006 00:00:00	02.06.2006 00:00:00	Baho II	24,00	3.537,00	Donnerstag	e0	e0I2e0 e0I2e1 e0I2e2 e0I2e2 e0I2e0 e0I2e3 e0I3e0 e0I3e4 e0I2e1 e0I2e2 e0I2e2 e0I2e0 e0I2e3 e0I2e0 e0I3e4 e0I2e3 e0I2e0 e0I2e4 e0I2e4 e1I2e2 e1I2e2 e1I2e0 e1I2e3 e1I2e0 e1I2e4 e2I2e2 e2I2e0 e2I2e3 e2I2e0 e2I2e4 e2I2e0 e2I2e3 e2I2e0 e2I2e4 e3I2e0 e3I2e4	e0I2e0I2e1 e0I2e0I2e2 e0I2e0I2e2 e0I2e0I2e0 e0I2e0I2e3 e0I2e0I2e0 e0I2e0I3e4 e0I2e0I2e3 e0I2e0I2e0 e0I2e0I2e4 e0I2e0I2e3 e0I2e0I2e0 e0I2e0I2e4 e0I2e0I2e4 e0I2e0I2e4 e0I2e2I2e2 e0I2e2I2e0 e0I2e2I2e3 e0I2e2I2e0 e0I2e2I2e4 e0I2e2I2e0 e0I2e2I2e0 e0I2e2I2e3 e0I2e2I2e0 e0I2e2I2e4 e0I2e2I2e2 e0I2e2I2e0 e0I2e2I2e3 e0I2e2I2e0 e0I2e2I2e4 e0I2e2I2e0 e0I2e2I2e3 e0I2e2I2e0 e0I2e2I2e4 e0I2e2I2e3 e2I2e0I2e0 e2I2e0I2e4 e2I2e0I2e4 e2I2e0I2e3 e2I2e0I2e0 e2I2e0I2e4 e2I2e0I2e4	e0: 4	e0I2e0: 5 e0I2e2: 4	e0I2e2I2e0: 8
2	02.06.2006 00:00:00	03.06.2006 00:00:00	Baho II	24,00	3.493,00	Freitag	e0	--	--	e1: 1	e2I2e0: 4	--
3	03.06.2006 00:00:00	04.06.2006 00:00:00	Baho II	10,00	535,30	Samstag	e1	--	--	e2: 2	--	--
4	04.06.2006 00:00:00	05.06.2006 00:00:00	Baho II	0,00	0,00	Sonntag	e2	--	--	e3: 1	--	--
5	05.06.2006 00:00:00	06.06.2006 00:00:00	Baho II	0,00	0,00	Montag	e2	--	--	e4: 1	--	--
6	06.06.2006 00:00:00	07.06.2006 00:00:00	Baho II	24,00	3.483,50	Dienstag	e0	--	--	--	--	--
7	07.06.2006 00:00:00	08.06.2006 00:00:00	Baho II	25,00	3.808,70	Mittwoch	e3	--	--	--	--	--
8	08.06.2006 00:00:00	09.06.2006 00:00:00	Baho II	24,00	3.870,70	Donnerstag	e0	--	--	--	--	--
9	09.06.2006 00:00:00	10.06.2006 00:00:00	Baho II	23,00	3.396,40	Freitag	e4	--	--	--	--	--

« Zurück Vor » Gehe zu Seite 1 insg. 1 Anzahl Zeilen: 9 | Spalten: 12

Figure 1: Results of the test dataset. The columns "*CandidateStep1*" and "*CandidateStep2*" show all the possible candidates of Step 1 and Step 2 respectively. The columns *"ResultStep0"*, *"ResultStep1* and *"ResultStep2"* show the result of Step 0 (events) and the results of Step 1 and Step2, that is, multi-time interval patterns (of length 1 and 2) which are above the given support threshold.

1.2 Finding expected patterns

The second part of the validation consists of generating two events, some multi-time interval patterns and creating a synthetic dataset, in which those patterns are the most frequently occurring. After that we compare the expected results with those obtained from the implemented version of the approach.

To this aim, we choose as events the values 18 and 74, which can be identified as e_X and e_Y respectively. We decide that e_X occurs 10 times and e_y 8 times. Then, starting from them we choose to discover the following multi-time interval patterns:

$e_X\ I_2\ e_X$

$e_X\ I_2\ e_y$

$e_X\ I_2\ e_y\ I_3\ e_y$

Given such constraints, we create a synthetic dataset which contains those events and patterns as some of the most frequent ones (Table 13).

Begin	End	Value
01.01.2008 00:00	02.01.2008 00:00	1
02.01.2008 00:00	03.01.2008 00:00	2
03.01.2008 00:00	04.01.2008 00:00	18
04.01.2008 00:00	05.01.2008 00:00	3
05.01.2008 00:00	06.01.2008 00:00	18
06.01.2008 00:00	07.01.2008 00:00	4
07.01.2008 00:00	08.01.2008 00:00	5
08.01.2008 00:00	09.01.2008 00:00	6
09.01.2008 00:00	10.01.2008 00:00	7
10.01.2008 00:00	11.01.2008 00:00	8
11.01.2008 00:00	12.01.2008 00:00	9
12.01.2008 00:00	13.01.2008 00:00	74
13.01.2008 00:00	14.01.2008 00:00	10
14.01.2008 00:00	15.01.2008 00:00	11
15.01.2008 00:00	16.01.2008 00:00	12
16.01.2008 00:00	17.01.2008 00:00	13
17.01.2008 00:00	18.01.2008 00:00	14
18.01.2008 00:00	19.01.2008 00:00	15
19.01.2008 00:00	20.01.2008 00:00	74
20.01.2008 00:00	21.01.2008 00:00	17
21.01.2008 00:00	22.01.2008 00:00	19
22.01.2008 00:00	23.01.2008 00:00	20
23.01.2008 00:00	24.01.2008 00:00	21
24.01.2008 00:00	25.01.2008 00:00	22
25.01.2008 00:00	26.01.2008 00:00	23
26.01.2008 00:00	27.01.2008 00:00	24
27.01.2008 00:00	28.01.2008 00:00	25

28.01.2008 00:00	29.01.2008 00:00	26
29.01.2008 00:00	30.01.2008 00:00	27
30.01.2008 00:00	31.01.2008 00:00	28
31.01.2008 00:00	01.02.2008 00:00	29
01.02.2008 00:00	02.02.2008 00:00	30
02.02.2008 00:00	03.02.2008 00:00	31
03.02.2008 00:00	04.02.2008 00:00	32
04.02.2008 00:00	05.02.2008 00:00	33
05.02.2008 00:00	06.02.2008 00:00	34
06.02.2008 00:00	07.02.2008 00:00	35
07.02.2008 00:00	08.02.2008 00:00	18
08.02.2008 00:00	09.02.2008 00:00	18
09.02.2008 00:00	10.02.2008 00:00	36
10.02.2008 00:00	11.02.2008 00:00	37
11.02.2008 00:00	12.02.2008 00:00	38
12.02.2008 00:00	13.02.2008 00:00	39
13.02.2008 00:00	14.02.2008 00:00	18
14.02.2008 00:00	15.02.2008 00:00	41
15.02.2008 00:00	16.02.2008 00:00	74
16.02.2008 00:00	17.02.2008 00:00	42
17.02.2008 00:00	18.02.2008 00:00	43
18.02.2008 00:00	19.02.2008 00:00	44
19.02.2008 00:00	20.02.2008 00:00	45
20.02.2008 00:00	21.02.2008 00:00	46
21.02.2008 00:00	22.02.2008 00:00	47
22.02.2008 00:00	23.02.2008 00:00	48
23.02.2008 00:00	24.02.2008 00:00	74
24.02.2008 00:00	25.02.2008 00:00	50
25.02.2008 00:00	26.02.2008 00:00	51
26.02.2008 00:00	27.02.2008 00:00	52

27.02.2008 00:00	28.02.2008 00:00	53
28.02.2008 00:00	29.02.2008 00:00	54
29.02.2008 00:00	01.03.2008 00:00	55
01.03.2008 00:00	02.03.2008 00:00	56
02.03.2008 00:00	03.03.2008 00:00	57
03.03.2008 00:00	04.03.2008 00:00	58
04.03.2008 00:00	05.03.2008 00:00	59
05.03.2008 00:00	06.03.2008 00:00	60
06.03.2008 00:00	07.03.2008 00:00	61
07.03.2008 00:00	08.03.2008 00:00	62
08.03.2008 00:00	09.03.2008 00:00	63
09.03.2008 00:00	10.03.2008 00:00	18
10.03.2008 00:00	11.03.2008 00:00	64
11.03.2008 00:00	12.03.2008 00:00	18
12.03.2008 00:00	13.03.2008 00:00	65
13.03.2008 00:00	14.03.2008 00:00	18
14.03.2008 00:00	15.03.2008 00:00	67
15.03.2008 00:00	16.03.2008 00:00	68
16.03.2008 00:00	17.03.2008 00:00	69
17.03.2008 00:00	18.03.2008 00:00	70
18.03.2008 00:00	19.03.2008 00:00	71
19.03.2008 00:00	20.03.2008 00:00	74
20.03.2008 00:00	21.03.2008 00:00	72
21.03.2008 00:00	22.03.2008 00:00	73
22.03.2008 00:00	23.03.2008 00:00	74
23.03.2008 00:00	24.03.2008 00:00	76
24.03.2008 00:00	25.03.2008 00:00	77
25.03.2008 00:00	26.03.2008 00:00	78
26.03.2008 00:00	27.03.2008 00:00	79
27.03.2008 00:00	28.03.2008 00:00	80

28.03.2008 00:00	29.03.2008 00:00	81
29.03.2008 00:00	30.03.2008 00:00	82
30.03.2008 00:00	31.03.2008 00:00	83
31.03.2008 00:00	01.04.2008 00:00	84
01.04.2008 00:00	02.04.2008 00:00	85
02.04.2008 00:00	03.04.2008 00:00	86
03.04.2008 00:00	04.04.2008 00:00	87
04.04.2008 00:00	05.04.2008 00:00	88
05.04.2008 00:00	06.04.2008 00:00	89
06.04.2008 00:00	07.04.2008 00:00	90
07.04.2008 00:00	08.04.2008 00:00	91
08.04.2008 00:00	09.04.2008 00:00	92
09.04.2008 00:00	10.04.2008 00:00	93
10.04.2008 00:00	11.04.2008 00:00	94
11.04.2008 00:00	12.04.2008 00:00	95
12.04.2008 00:00	13.04.2008 00:00	96
13.04.2008 00:00	14.04.2008 00:00	97
14.04.2008 00:00	15.04.2008 00:00	18
15.04.2008 00:00	16.04.2008 00:00	98
16.04.2008 00:00	17.04.2008 00:00	99
17.04.2008 00:00	18.04.2008 00:00	100
18.04.2008 00:00	19.04.2008 00:00	18
19.04.2008 00:00	20.04.2008 00:00	101
20.04.2008 00:00	21.04.2008 00:00	102
21.04.2008 00:00	22.04.2008 00:00	103
22.04.2008 00:00	23.04.2008 00:00	104
23.04.2008 00:00	24.04.2008 00:00	105
24.04.2008 00:00	25.04.2008 00:00	106
25.04.2008 00:00	26.04.2008 00:00	107
26.04.2008 00:00	27.04.2008 00:00	108

27.04.2008 00:00	28.04.2008 00:00	109
28.04.2008 00:00	29.04.2008 00:00	110
29.04.2008 00:00	30.04.2008 00:00	74
30.04.2008 00:00	01.05.2008 00:00	74

Table 13: A synthetic dataset containing the expected events and patterns as some of the most frequent ones.

After that we run our implemented version using this dataset and compare the results[4]. As Figure 2 shows, the e_X (e_2 in the figure) occurs 10 times and the patterns $e_X\ I_2\ e_X$ and $e_X\ I_2\ e_y$ are some of the most expected: as a matter of fact $e_2I_2e_2$ and $e_2I_3e_{10}$ occur 8 and 18 times respectively.

Figure 3 shows the results of Step 2, that is the multi-time interval patterns of length 2. Among them, as expected appears also $e_X\ I_2\ e_y\ I_3\ e_y$ ($e_2I_2e_2I_3e_{10}$ in the figure, which occurs 12 times).

As in the previous section, since the steps after the Step 2 repeated recursively, we assume that no further steps need to be proved. For such reason, we stop the computation after Step 2 and compare these results with those expected.

[4] In order to reduce the number of possible candidates we set the support threshold at a very small value (0.0009).

No.	A Begin	B End	C Value	D Event	E ResultStep0	F ResultStep1
1	01.01.2008 00:00:00	02.01.2008 00:00:00	1	e0	e0: 1	e1013e2: 15 e10I4e10: 17 e10I4e2: 13
2	02.01.2008 00:00:00	03.01.2008 00:00:00	2	e1	e1: 1	e2I2e2: 8 e2I3e10: 18 e2I4e10: 26 e2I4e2: 31
3	03.01.2008 00:00:00	04.01.2008 00:00:00	18	e2	e10: 8	--
4	04.01.2008 00:00:00	05.01.2008 00:00:00	3	e3	e100: 1	--
5	05.01.2008 00:00:00	06.01.2008 00:00:00	18	e2	e101: 1	--
6	06.01.2008 00:00:00	07.01.2008 00:00:00	4	e4	e102: 1	--
7	07.01.2008 00:00:00	08.01.2008 00:00:00	5	e5	e103: 1	--
8	08.01.2008 00:00:00	09.01.2008 00:00:00	6	e6	e104: 1	--
9	09.01.2008 00:00:00	10.01.2008 00:00:00	7	e7	e11: 1	--
10	10.01.2008 00:00:00	11.01.2008 00:00:00	8	e8	e12: 1	--
11	11.01.2008 00:00:00	12.01.2008 00:00:00	9	e9	e13: 1	--
12	12.01.2008 00:00:00	13.01.2008 00:00:00	74	e10	e14: 1	--
13	13.01.2008 00:00:00	14.01.2008 00:00:00	10	e11	e15: 1	--
14	14.01.2008 00:00:00	15.01.2008 00:00:00	11	e12	e16: 1	--
15	15.01.2008 00:00:00	16.01.2008 00:00:00	12	e13	e17: 1	--
16	16.01.2008 00:00:00	17.01.2008 00:00:00	13	e14	e18: 1	--
17	17.01.2008 00:00:00	18.01.2008 00:00:00	14	e15	e19: 1	--
18	18.01.2008 00:00:00	19.01.2008 00:00:00	15	e16	e2: 10	--
19	19.01.2008 00:00:00	20.01.2008 00:00:00	74	e10	e20: 1	--
20	20.01.2008 00:00:00	21.01.2008 00:00:00	17	e17	e21: 1	--

« Zurück Vor » Gehe zu Seite 1 insg. 7 Anzahl Zeilen: 121 | Spalten: 6

Figure 2: First part of the results of the synthetic dataset, where the occurrences of the events (Step 0) and multi-time interval patterns of length 1 are shown

No.	A Begin	B End	C Value	D Event	E ResultStep2
1	01.01.2008 00:00:00	02.01.2008 00:00:00	1	e0	e1013e2I2e2: 14 e1013e2I2e63: 6 e1013e2I2e64: 6 e1013e2I3e10: 27 e1013e2I3e44: 5 e1013e2I3e45: 5 e1013e2I3e46: 5 e1013e2I3e48: 5 e1013e2I3e49: 5 e1013e2I3e50: 5 e1013e2I3e51: 5 e1013e2I3e52: 5 e1013e2I3e53: 5 e1013e2I3e54: 5 e1013e2I3e56: 5 e1013e2I3e57: 5 e1013e2I3e58: 5 e1013e2I3e68: 6 e1013e2I3e69: 6 e1013e2I3e70: 6 e1013e2I3e71: 6 e1013e2I3e73: 6 e1013e2I3e74: 6 e1013e2I3e75: 6 e1013e2I3e76: 6 e1013e2I3e77: 6 e1013e2I3e78: 6 e1013e2I3e79: 6 e1013e2I3e81: 6 e1013e2I3e82: 6 e1013e2I3e83: 6 e1013e2I3e84: 6 e1013e2I3e85: 6 e1013e2I3e86: 6 e1013e2I4e10: 32 e1013e2I4e101: 11 e1013e2I4e102: 11 e1013e2I4e103: 11 e1013e2I4e104: 11 e1013e2I4e2: 35 e1013e2I4e63: 5 e1013e2I4e64: 5 e1013e2I4e66: 5 e1013e2I4e67: 5 e1013e2I4e68: 5 e1013e2I4e69: 5 e1013e2I4e70: 5 e1013e2I4e71: 5 e1013e2I4e72: 5 e1013e2I4e74: 5 e1013e2I4e75: 5 e1013e2I4e76: 5 e1013e2I4e77: 5 e1013e2I4e78: 5 e1013e2I4e79: 5 e1013e2I4e80: 5 e1013e2I4e82: 5 e1013e2I4e83: 5 e1013e2I4e84: 5 e1013e2I4e85: 5 e1013e2I4e86: 5 e1013e2I4e87: 7 e1013e2I4e88: 7 e1013e2I4e90: 9 e1013e2I4e91: 11 e1013e2I4e92: 11 e1013e2I4e93: 11 e1013e2I4e94: 11 e1013e2I4e95: 11 e1013e2I4e96: 11 e1013e2I4e98: 11 e1013e2I4e99: 11 e1014e10I2e10: 7 e1014e10I2e70: 6 e1014e10I2e71: 6 e1014e10I2e72: 6 e1014e10I3e10: 5 e1014e10I3e76: 6 e1014e10I3e77: 6 e1014e10I3e78: 6 e1014e10I3e79: 6 e1014e10I3e80: 6 e1014e10I3e81: 6 e1014e10I3e82: 6 e1014e10I3e84: 6 e1014e10I3e85: 6 e1014e10I3e86: 6 e1014e10I3e87: 6 e1014e10I3e88: 6 e1014e10I3e89: 6 e1014e10I3e90: 6 e1014e10I3e92: 6 e1014e10I3e93: 6 e1014e10I3e94: 6 e1014e10I4e10: 20 e1014e10I4e100: 9 e1014e10I4e101: 9 e1014e10I4e102: 9 e1014e10I4e104: 9 e1014e10I4e2: 6 e1014e10I4e95: 6 e1014e10I4e96: 6 e1014e10I4e97: 6 e1014e10I4e98: 9 e1014e10I4e99: 9 e1014e2I2e63: 6 e1014e2I2e64: 6 e1014e2I2e95: 6 e1014e2I2e96: 6 e1014e2I3e10: 23 e1014e2I3e101: 6 e1014e2I3e102: 6 e1014e2I3e104: 6 e1014e2I3e68: 6 e1014e2I3e69: 6 e1014e2I3e70: 6 e1014e2I3e71: 6 e1014e2I3e72: 6 e1014e2I3e73: 6 e1014e2I3e75: 6 e1014e2I3e76: 6 e1014e2I3e77: 6 e1014e2I3e78: 6 e1014e2I3e79: 6 e1014e2I3e80: 6 e1014e2I3e81: 6 e1014e2I3e83: 6 e1014e2I3e84: 6 e1014e2I3e85: 6 e1014e2I3e86: 6 e1014e2I4e10: 16 e1014e2I4e100: 7 e1014e2I4e101: 7 e1014e2I4e103: 7 e1014e2I4e104: 7 e1014e2I4e2: 15 e1014e2I4e89: 5 e1014e2I4e90: 5 e1014e2I4e91: 7 e1014e2I4e92: 7 e1014e2I4e94: 7 e1014e2I4e95: 7 e1014e2I4e96: 7 e1014e2I4e97: 7 e1014e2I4e98: 7 e1014e2I4e99: 7
2	02.01.2008 00:00:00	03.01.2008 00:00:00	2	e1	e2I2e2I3e10: 12 e2I2e2I4e100: 6 e2I2e2I4e101: 6 e2I2e2I4e102: 6 e2I2e2I4e103: 6 e2I2e2I4e104: 6 e2I2e2I4e2: 23 e2I2e2I4e91: 6 e2I2e2I4e93: 6 e2I2e2I4e94: 6 e2I2e2I4e95: 6 e2I2e2I4e96: 6 e2I2e2I4e97: 6 e2I2e2I4e98: 6 e2I2e2I4e99: 6 e2I3e10I2e71: 5 e2I3e10I2e72: 5 e2I3e10I3e10: 12 e2I3e10I3e2: 35 e2I3e10I3e53: 5 e2I3e10I3e54: 5 e2I3e10I3e55: 5 e2I3e10I3e57: 5 e2I3e10I3e58: 5 e2I3e10I3e59: 5 e2I3e10I3e60: 5 e2I3e10I3e61: 5 e2I3e10I3e62: 5 e2I3e10I3e63: 5 e2I3e10I3e77: 5 e2I3e10I3e78: 5 e2I3e10I3e79: 5 e2I3e10I3e80: 5 e2I3e10I3e81: 5 e2I3e10I3e82: 5 e2I3e10I3e83: 5 e2I3e10I3e85: 5 e2I3e10I3e86: 5 e2I3e10I3e87: 5 e2I3e10I3e88: 5 e2I3e10I3e89: 5 e2I3e10I3e90: 5 e2I3e10I3e91: 5 e2I3e10I3e93: 5 e2I3e10I3e94: 5 e2I3e10I4e10: 38 e2I3e10I4e100: 10 e2I3e10I4e101: 10 e2I3e10I4e102: 10 e2I3e10I4e103: 10 e2I3e10I4e2: 28 e2I3e10I4e64: 6 e2I3e10I4e65: 6 e2I3e10I4e66: 6 e2I3e10I4e67: 6 e2I3e10I4e68: 6 e2I3e10I4e69: 6 e2I3e10I4e71: 9 e2I3e10I4e72: 9 e2I3e10I4e73: 9 e2I3e10I4e74: 9 e2I3e10I4e75: 9 e2I3e10I4e76: 9 e2I3e10I4e77: 9 e2I3e10I4e79: 9 e2I3e10I4e80: 9 e2I3e10I4e81: 9 e2I3e10I4e82: 9 e2I3e10I4e83: 9 e2I3e10I4e84: 9 e2I3e10I4e85: 9 e2I3e10I4e87: 9 e2I3e10I4e88: 9 e2I3e10I4e89: 9 e2I3e10I4e90: 7 e2I3e10I4e91: 7 e2I3e10I4e92: 7 e2I3e10I4e93: 7 e2I3e10I4e95: 7 e2I3e10I4e96: 7 e2I3e10I4e97: 7 e2I3e10I4e98: 10 e2I3e10I4e99: 10 e2I3e10I5e10: 8 e2I4e10I2e10: 11 e2I4e10I2e69: 5 e2I4e10I2e70: 10 e2I4e10I2e71: 10 e2I4e10I2e72: 10 e2I4e10I2e73: 5 e2I4e10I2e74: 5 e2I4e10I2e75: 5 e2I4e10I3e2: 32 e2I4e10I3e73: 5 e2I4e10I3e74: 5 e2I4e10I3e75: 5 e2I4e10I3e76: 10 e2I4e10I3e77: 10 e2I4e10I3e78: 10 e2I4e10I3e80: 10 e2I4e10I3e81: 10 e2I4e10I3e82: 10 e2I4e10I3e83: 10 e2I4e10I3e84: 10 e2I4e10I3e85: 10 e2I4e10I3e86: 10 e2I4e10I3e88: 10 e2I4e10I3e89: 10 e2I4e10I3e90: 10 e2I4e10I3e91: 10 e2I4e10I3e92: 10 e2I4e10I3e93: 10 e2I4e10I3e94: 10 e2I4e10I3e96: 5 e2I4e10I3e97: 5 e2I4e10I4e10: 32 e2I4e10I4e100: 14 e2I4e10I4e101: 14 e2I4e10I4e102: 14 e2I4e10I4e103: 14 e2I4e10I4e2: 8 e2I4e10I4e95: 9 e2I4e10I4e96: 9 e2I4e10I4e97: 9 e2I4e10I4e98: 14 e2I4e10I4e99: 14 e2I4e2I2e10: 7 e2I4e2I2e2: 24 e2I4e2I2e62: 8 e2I4e2I2e63: 13 e2I4e2I2e64: 13 e2I4e2I2e65: 9 e2I4e2I2e66: 9 e2I4e2I2e67: 5 e2I4e2I2e93: 6 e2I4e2I2e94: 6 e2I4e2I2e95: 12 e2I4e2I2e96: 12 e2I4e2I2e97: 6 e2I4e2I2e98: 6 e2I4e2I2e99: 6 e2I4e2I3e100: 6 e2I4e2I3e101: 12 e2I4e2I3e102: 12 e2I4e2I3e103: 12 e2I4e2I3e104: 12 e2I4e2I3e44: 6 e2I4e2I3e45: 6 e2I4e2I3e47: 6 e2I4e2I3e48: 6 e2I4e2I3e49: 6 e2I4e2I3e50: 6 e2I4e2I3e51: 6 e2I4e2I3e52: 6 e2I4e2I3e53: 6 e2I4e2I3e55: 6 e2I4e2I3e56: 6 e2I4e2I3e57: 6 e2I4e2I3e58: 6 e2I4e2I3e67: 8 e2I4e2I3e68: 13 e2I4e2I3e69: 13 e2I4e2I3e71: 13 e2I4e2I3e72: 13 e2I4e2I3e73: 13 e2I4e2I3e74: 13 e2I4e2I3e75: 13 e2I4e2I3e76: 13 e2I4e2I3e77: 13 e2I4e2I3e79: 13 e2I4e2I3e80: 13 e2I4e2I3e81: 13 e2I4e2I3e82: 13 e2I4e2I3e83: 13 e2I4e2I3e84: 13 e2I4e2I3e85: 13 e2I4e2I3e87: 9 e2I4e2I3e88: 9 e2I4e2I3e89: 5 e2I4e2I3e90: 5 e2I4e2I3e97: 6 e2I4e2I3e98: 6 e2I4e2I3e99: 6 e2I4e2I4e100: 19 e2I4e2I4e101: 19 e2I4e2I4e102: 19 e2I4e2I4e103: 19 e2I4e2I4e104: 19 e2I4e2I4e2: 52 e2I4e2I4e63: 6 e2I4e2I4e65: 6 e2I4e2I4e66: 6 e2I4e2I4e67: 6 e2I4e2I4e68: 6 e2I4e2I4e69: 6 e2I4e2I4e70: 6 e2I4e2I4e71: 6 e2I4e2I4e73: 6 e2I4e2I4e74: 6 e2I4e2I4e75: 6 e2I4e2I4e76: 6 e2I4e2I4e77: 6 e2I4e2I4e78: 6 e2I4e2I4e79: 6 e2I4e2I4e81: 6 e2I4e2I4e82: 6 e2I4e2I4e83: 6 e2I4e2I4e84: 6 e2I4e2I4e85: 6 e2I4e2I4e86: 6 e2I4e2I4e87: 10 e2I4e2I4e89: 14 e2I4e2I4e90: 14 e2I4e2I4e91: 19 e2I4e2I4e92: 19 e2I4e2I4e93: 19 e2I4e2I4e94: 19 e2I4e2I4e95: 19 e2I4e2I4e97: 19 e2I4e2I4e98: 19 e2I4e2I4e99: 19
3	03.01.2008 00:00:00	04.01.2008 00:00:00	18	e2	--
4	04.01.2008 00:00:00	05.01.2008 00:00:00	3	e3	--

Figure 3: Second part of the results of the synthetic dataset, where the occurrences multi-time interval patterns of length 2 are shown.