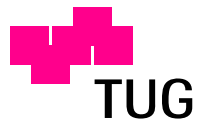


Feasibility Study on Logging User Activity in an Interactive Mathematics System

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Abstract:

ISAC is a system for applied mathematics. This document is a report about the work done in my master practical within the *ISAC*-team.

The main goal of my project was to design and implement a system for logging user activity in *ISAC*. The second was to do a feasibility study on interaction between *ISAC* and different E-Learning systems, such as CompOD or Moodle. In this case *ISAC* should be able to ask a web-service to propose the next most suitable example for the user.

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Chapter 1

Technical Issues

This chapter describes the technical issues for logging user activity and further the premises to connect *ISAC* to an E-Learning application via a web-service.

1.1 Database Model

The database model 1.1 consists of two tables:

- UserLogger: Contains the data that represents the user activity. This data is used for the queries, that are described later in this document.
- UserTest: This table is only used in a few unit-tests for checking the connection to the database and should never be changed.

Physical Data Model	
Model:	ISAC
Package:	
Diagram:	ISAC_UserLog
Author:	Christian Ropposch
Date:	30.07.2007
Version:	1.0

UserLogger			
<u>UserLogger_id</u>	int	<pk>	identity
UserName	varchar(25)		not null
Session	varchar(25)		not null
Dialog	varchar(50)		null
Step	varchar(50)		null
Time	timestamp		not null
Worksheet	varchar(250)		null
Position	varchar(50)		null
FormulaFrom	text		null
FormulaTo	text		null
Argument	varchar(250)		null
Substitution	varchar(250)		null
Success	float		null

UserTest			
<u>UserTest_id</u>	int	<pk>	identity
TestValue	varchar(25)		not null

Figure 1.1: Database model for logging user activity

1.2 Class Diagram

The class diagram 1.2 shows only the classes which are necessary to implement the functionality of logging the user activity.

- **UserRecord**: Holds the data that is saved into the database by the class **UserLogger**.
- **UserLogger**: Holds the member functions that are responsible for storing the user-data in the database.

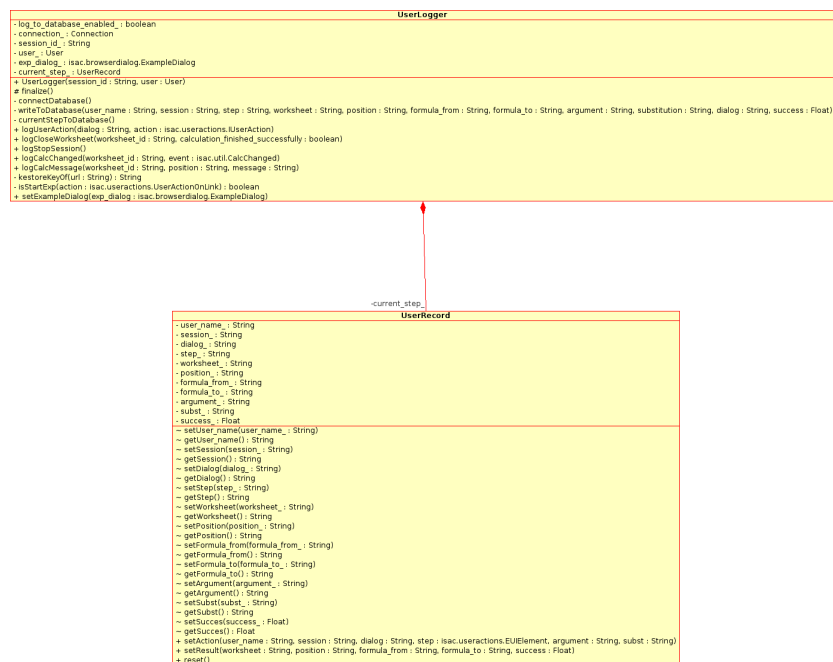


Figure 1.2: Class diagram for logging user activity

1.3 Queries / Statistics

This section gives an overview of already implemented queries to check the activities of the *ISAC*-users.

1.3.1 Query 1

Which users had used *ISAC*? 1.3

Listing 1.1: SQL Listing of Query 1

```

1 select UserName, Argument as UserUrl, Time as Begin,
2 unix_timestamp((select Time from UserLogger
3 where step='UL.STOP.SESSION' and session=ul1.session))
4 - unix_timestamp(ul1.time) as Duration,
5 (select count(*) from UserLogger where step='LO.OPEN.WORKSHEET'
6 and session=ul1.session) as Examples
7 from UserLogger ul1
8 where step='LO.START.SESSION';

```

UserName	UserUrl	Begin	Duration	Examples
x	TODO user-url	2007-10-26 12:00:06.0		1
htl	TODO user-url	2007-10-26 12:01:45.0	211	1

Figure 1.3: Sample output of Query 1

1.3.2 Query 2

Which examples has a user calculated over all his sessions? 1.4

Listing 1.2: SQL Listing of Query 2

```

1 select session, Argument as ID, FormulaTo as Example, Time as Begin,
2 unix_timestamp((select Time from UserLogger where step='LO.STOP.EXAMPLE'
3 and session=ul1.session limit 1)) - unix_timestamp(ul1.time) as Duration,
4 (select Success from UserLogger where step='LO.STOP.EXAMPLE'
5 and session=ul1.session limit 1) as Success,
6 (select count(*) from UserLogger where step like 'UL.SOLVE%'
7 and session=ul1.session limit 1) as Calc.Steps,
8 (select count(*) from UserLogger where step not like 'UL.SOLVE%'
9 and session=ul1.session limit 1) as Other.Steps
10 from UserLogger ul1
11 where UserName='x' and Step='LO.OPEN.WORKSHEET';

```

Session	ID	Example	Begin
0	exp_IsacCore_Tests_1a.xml	solve (1 + -1 * 2 + x = 0, x)	2007-10-26 12:00:56.0
2	exp_IsacCore_Tests_1b.xml	solve (x + 1 = 2, x)	2007-10-26 12:38:15.0

Duration	Success	Calc_Steps	Other_Steps
7 1.0		4	3
5 1.0		2	4

Figure 1.4: Sample output of Query 2

1.3.3 Query 3

What did a user do during a certain session? 1.5

Listing 1.3: SQL Listing of Query 3

```

1 select Dialog, Step, Time, Worksheet, Position, FormulaFrom,
2 FormulaTo, Argument, Substitution, Success

```

```

3  from UserLogger
4  where Session=0
5  order by Time;

```

Dialog	Step	Time	Worksheet	Position
	LO_START_SESSION	2007-10-26 12:00:06.0		
exp	LO_OPEN_WORKSHEET	2007-10-26 12:00:56.0	0_0	([],Pbl)
worksheet	UI_SOLVE_CALCULATE_1	2007-10-26 12:00:59.0	0_0	([],Met)
worksheet	UI_SOLVE_CALCULATE_1	2007-10-26 12:01:00.0	0_0	([1],Frm)
worksheet	UI_SOLVE_CALCULATE_1	2007-10-26 12:01:01.0	0_0	([1],Res)
worksheet	UI_SOLVE_CALCULATE_ALL	2007-10-26 12:01:03.0	0_0	([2],Res)
worksheet	LO_STOP_EXAMPLE	2007-10-26 12:01:03.0	0_0	

FormulaFrom	FormulaTo	Argument	Substitution	Success
		TODO user-url		0.0
solve (1 + -1 * 2 + x = 0, x)	solve (1 + -1 * 2 + x = 0, x)	exp_IsacCore_Tests_1a.xml		1.0
solve (1 + -1 * 2 + x = 0, x)	1 + -1 * 2 + x = 0			1.0
1 + -1 * 2 + x = 0	x = 0 + -1 * (1 + -1 * 2)			1.0
x = 0 + -1 * (1 + -1 * 2)	x = 1			1.0
x = 1	[x = 1]			1.0
				1.0

Figure 1.5: Sample output of Query 3

1.3.4 Query 4

What did a user do during a certain example? 1.6

Listing 1.4: SQL Listing of Query 4

```

1  select Dialog, Step, Time, Worksheet, Position, FormulaFrom,
2  FormulaTo, Argument, Substitution, Success
3  from UserLogger
4  where Worksheet='1.0'
5  order by Time;

```

Dialog	Step	Time
exp	LO_OPEN WORKSHEET	2007-10-26 12:01:53.0
worksheet	UI SOLVE CALCULATE 1	2007-10-26 12:02:23.0
worksheet	UI SOLVE CALCULATE 1	2007-10-26 12:02:24.0
worksheet	UI SOLVE CALCULATE 1	2007-10-26 12:02:25.0
worksheet	UI SOLVE CALCULATE 1	2007-10-26 12:02:27.0
worksheet	UI SOLVE CALCULATE 1	2007-10-26 12:02:28.0
worksheet	UI SOLVE CALCULATE 1	2007-10-26 12:02:28.0
worksheet	UI SOLVE CALCULATE 1	2007-10-26 12:02:29.0
worksheet	UI SOLVE CALCULATE 1	2007-10-26 12:02:30.0
worksheet	UI SOLVE CALCULATE 1	2007-10-26 12:02:32.0
worksheet	UI SOLVE CALCULATE 1	2007-10-26 12:02:32.0
worksheet	LO_STOP EXAMPLE	2007-10-26 12:02:32.0

FormulaFrom	FormulaTo	Argument
solve (x + 1 = 2, x)	solve (x + 1 = 2, x)	exp IsacCore Tests 1b.xml
solve (x + 1 = 2, x)	x + 1 = 2	
x + 1 = 2	x + 1 + -1 * 2 = 0	
x + 1 + -1 * 2 = 0	-1 + x = 0	
-1 + x = 0	solve (-1 + x = 0, x)	
solve (-1 + x = 0, x)	-1 + x = 0	
-1 + x = 0	x = 0 + -1 * -1	
x = 0 + -1 * -1	x = 1	
x = 1	[x = 1]	
[x = 1]	[x = 1]	
[x = 1]	[x = 1]	

Figure 1.6: Sample output of Query 4

1.3.5 Query 5

How difficult are the example? 1.7

Listing 1.5: SQL Listing of Query 5

```

1  select Dialog,
2  select Argument as ID, FormulaTo as Example, Success,

```

```

3 Success-1 as Failure
4 from UserLogger
5 where Step='LO.OPEN.WORKSHEET'
6 order by Success, Failure;

```

ID	Example	Success	Failure
exp_IsacCore_Tests_1a.xml	solve (1 + -1 * 2 + x = 0, x)	1.0	0
exp_IsacCore_Tests_1b.xml	solve (x + 1 = 2, x)	1.0	0
exp_IsacCore_Tests_1b.xml	solve (x + 1 = 2, x)	1.0	0

Figure 1.7: Sample output of Query 5

1.3.6 Query 6

Who are the most frequent users of *ISAC*? 1.8

Listing 1.6: SQL Listing of Query 6

```

1 select UserName, Argument as UserUrl,
2 (select count(*) from UserLogger where step='LO.OPEN.WORKSHEET'
3 and session=ul1.session limit 1) as Examples,
4 (select Success from UserLogger where step='LO.STOP.EXAMPLE'
5 and session=ul1.session limit 1) as Success,
6 (select count(*) from UserLogger where step like 'UI.SOLVE%'
7 and session=ul1.session limit 1) as Calc_Steps,
8 (select count(*) from UserLogger where step not like 'UI.SOLVE%'
9 and session=ul1.session limit 1) as Other_Steps
10 from UserLogger ul1
11 where Step='LO.START.SESSION'
12 order by Examples, UserName;

```

UserName	UserUrl	Examples	Success	Calc_Steps	Other_Steps
htl	TODO user-url	1	1.0	10	4
x	TODO user-url	1	1.0	4	3
x	TODO user-url	1	1.0	2	4

Figure 1.8: Sample output of Query 6

Bibliography