1. User Manual of the refactorer

1.1. Installation

1.1.1. Windows

We have an install tool to make it just a few click to enjoy the refactorer. You should follow the following steps:

1. Start setup.exe
2. Choose your language (at the moment english and hungarian)
3. Follow the instructions, read and accept the license agreement.
4. After finishing the setup, you can try your tool by opening an .erl file in your emacs editor (do not forget, that you need a live erlang node).

1.1.2. Linux, MacOS, Solaris

1. First make sure that all required software components are properly installed and working:

   (a) Erlang/OTP R11B (http://www.erlang.org/download.html)

   (b) GNU Emacs 21 (ftp://ftp.gnu.org/gnu/emacs/) or Aquamacs 1.1 (http://aquamacs.org/) for MacOS

   (c) MySQL 5.0 (http://dev.mysql.com/downloads/mysql/5.0.html)

   Newer versions will most probably work, older versions have not been tried.

2. Unpack the RefactorErl release (probably you have already done that if you are reading this file), we will refer to the resulting RefactorErl-VER directory as the "base directory".

3. Create a dedicated MySQL database for the refactorer, and set up a database user to access it. Refer to the MySQL documentation to find out details on how to do that, but if you don't care about the details, here are the commands you need to type at the MySQL command line:

   create database parse; grant all on parse.* to 'USER'@localhost identified by 'PASSWORD';

where USER and PASSWORD are your choices of a username and a suitable password.

4. Update the file `db.config` in the base directory using a text editor, fill in the username and password you entered in the previous step. You may update the name of the database as well.

5. Check the path settings at the beginning of the file "build.sh" in the base directory. You need to provide the path to the base directory, and the path of your Erlang/OTP installation.

6. Run the script `build.sh` in the base directory. This will compile the neccessary Erlang modules and generates startup scripts. After this step, you can use the generated script file "runerl.sh" to start the backend of the refatorer, and the frontend of the refactorer will be loaded the next time you start Emacs.

7. The last step to complete the installation is to initialise the database. For this, you need to start up the refactorer:

   (a) run `runerl.sh`, which starts the backend

   (b) then start Emacs, which will load the frontend

   Refactoring operations are accessible only for Erlang files, so open an arbitrary file with .erl extension (or create a new, empty one). Then type `C-c C-e i` (or select Erlang->Refactor->Initialise database in the menu) to complete the installation. From this point, the refactorer is usable.

1.2. Starting the applications

You have to start the application and initialise the database before you start to put the source code into the database.

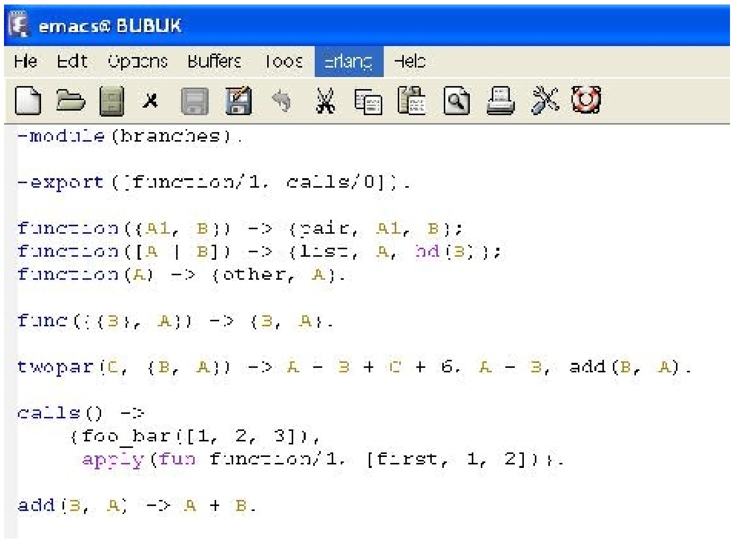
Starting the tool is depends on your operational system:

Windows systems: You just have to start the application with `runerl.bat` or just double clicking on the `RefactorErl` icon.

Linux, MacOS, Solaris: You have to

- run `runerl.sh` which starts the backend
- then start Emacs, which will load the frontend

In Emacs **open the .erl** file, which you want to put into the database (You can find a basic Emacs tutorial in the Section 2, if you are not familiar with it). If an Erlang source code is open, an Erlang menu appears in Emacs as shown in the Figure 1.



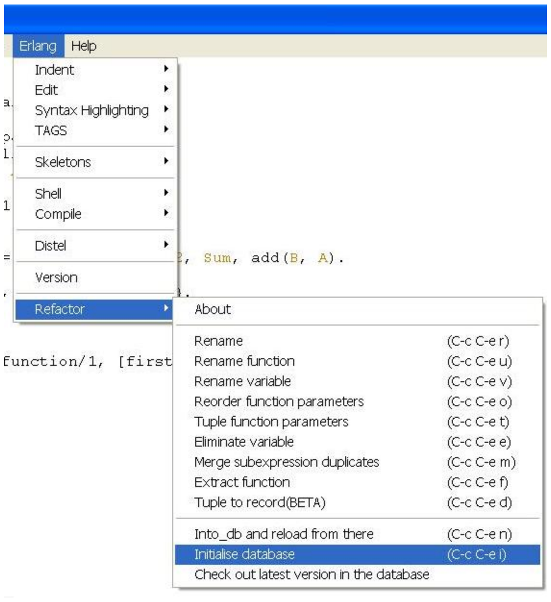
```
-module(branches).

-export([function/1, calls/0]).

function({A1, B}) -> {pair, A1, B};
function([A | B]) -> {list, A, hd(B)};
function(A) -> {other, A}.

func({{B}, A}) -> {B, A}.

twopar(C, {B, A}) -> A - B + C + 6, A - B, add(B, A).

calls() ->
    {foo_bar([1, 2, 3]),
     apply(fun function/1, [first, 1, 2])}.

add(B, A) -> A + B.
```

1. ábra. The Erlang menu in Emacs

1.3. Initialise the database

You have to choose the *Initialise database* command from the Erlang/Refactor menu point as shown in the Figure 2 or use the shortcut(C-c C-e i, which means Control-c Control-e and than i (without Control) buttons).

When the initialisation is ready the following message appears in the minibar: *Initialised*.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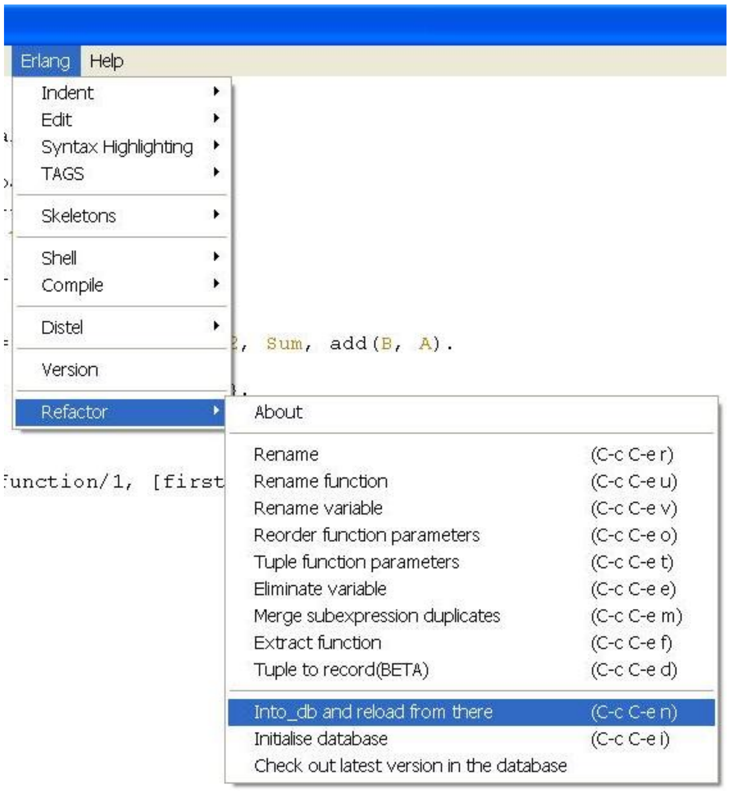
Rename function (C-c C-e u)
Rename variable (C-c C-e v)
Reorder function parameters (C-c C-e o)
Tuple function parameters (C-c C-e t)
Eliminate variable (C-c C-e e)
Merge subexpression duplicates (C-c C-e m)
Extract function (C-c C-e f)
Tuple to record(BETA) (C-c C-e d)
Into_db and reload from there (C-c C-e n)
Initialise database (C-c C-e i)
Check out latest version in the database
, Sum, add(B, A).
function/1, [first

2. ábra. Initialise the database

1.4. Loading the source into the database and checkout it

After you opened the .erl file, which you want to put into the database, you have to choose the *Into_ db and reload from there* command from the Erlang/Refactor menu point as shown in the Figure 3 or use the shortcut (C-c C-e n). When the initialisation is successfully done, the following message appears in the minibar: *Reloaded*. In the same time the program displays the pretty-printed version of the source code in the same window. The current file/module remains in the database until the next initialisation. If you put the newer version of the same file into the database, the previous version will be deleted, and the new file will be parsed. If you want to put more than one file into the database, you can open them and put them into the database in the same way. The database will contain and handle all files until the next initialisation.

If you once have put the source into the database at any time you can ask for the latest version of the source by choosing the *Check out latest version*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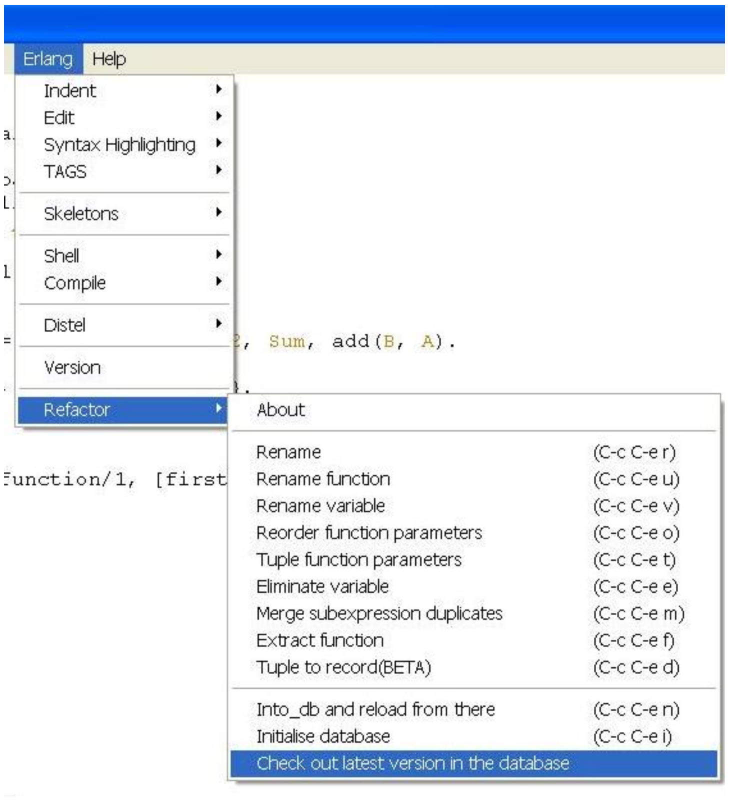
Into_db and reload from there (C-c C-e n)
Initialise database (C-c C-e i)
Check out latest version in the database

3. ábra. Into_db and reload from there

in the database command from the Erlang/Refactor menu point as shown in the Figure 4. When the checkout is successfully done, the following message appears in the minibar: *Reloaded*.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Initialise database (C-c C-e i)
Check out latest version in the database

4. ábra. Check out latest version in the database

1.5. Executing the refactorings

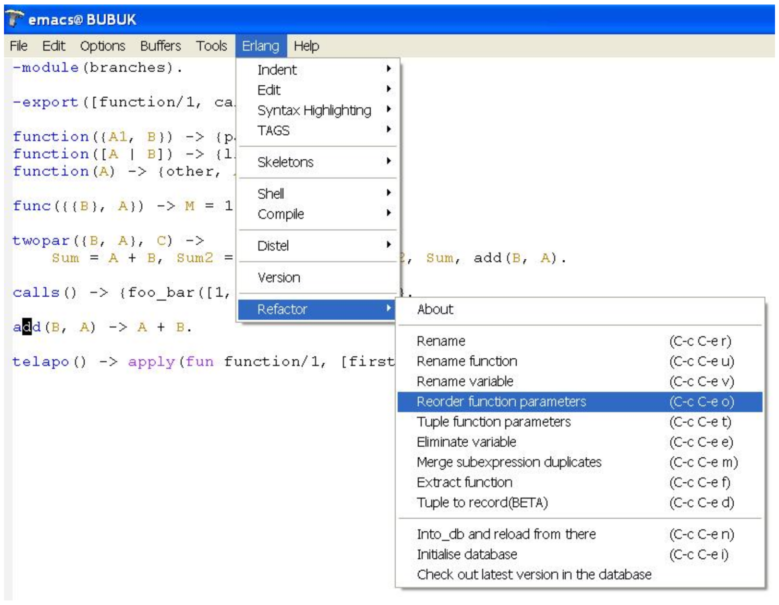
Before you want to execute a refactoring make sure, that the source is already in the database. For example, if you previously edited the source, **save** the changes and **put the source into the database**.

When you are executing several refactoring after each other with no editing between them, you do should not put the source into the database again.

The refactoring is executing inside the database, and just check out the source in the end.

You can start a refactoring by choosing its command from the menu or using its shortcut. NOTE! Make sure, that you are on the needed position or you selected the needed expression(s).

For example the starting of the reorder function parameters refactoring can be seen in the Figure 5.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Initialise database (C-c C-e i)
Check out latest version in the database

```
-module(branches).

-export([function/1, ca

function({A1, B}) -> {p
function([A | B]) -> {l
function(A) -> {other,

func({{B}, A}) -> M = 1

twopar({B, A}, C) ->
    Sum = A + B, Sum2 =                    , Sum, add(B, A).

calls() -> {foo_bar([1,                    }.

add(B, A) -> A + B.

telapo() -> apply(fun function/1, [first
```

5. ábra. Reorder the function parameters refactoring

The result message of the refactoring can be seen in the minibar. If there is a warning, the refactoring was executed, just you get this warning.

1.5.1. Rename variable

The aim of the refactoring. Find and rename all occurrences of the pointed variable to the new name.

Parameters. You have to stand on the needed position, when you choose the refactoring from the menu (Rename variable or Rename) or start it with shortcut (C-c C-e r). The other parameter will be asked during the execution in the minibar.

- Position of the cursor: Somewhere inside in one occurrence of the variable.
- New name: The new name of the variable.

Preconditions and restrictions. The new name can not be a reserved word in Erlang, in that case the tool returns with an error message. If the new name causes some binding problems with already existing variables in the same scope, the tool will return with the error message and the position of the caused problem.

1.5.2. Rename function

The aim of the refactoring. Find the definition and every call of the function and rename to the new name.

Parameters. You have to stand on the needed position, when you choose the refactoring from the menu (Rename function or Rename) or start it with shortcut (C-c C-e r). The other parameter will be asked during the execution in the minibar.

- Position of the cursor: Somewhere inside the name of the function.
- New name: The new name of the function.

Preconditions and restrictions. The new name has to be a legal function name (starting with capital letter and not the name of a built in Function), in other case the tool returns with an error message. The new name can not cause name clash neither in the current module (existing functions, import list) nor in other modules, if the function is exported.

1.5.3. Reorder function parameters

The aim of the refactoring. Change the order of the function parameters in the definition and in every call of the function

Parameters. You have to stand on the needed position, when you choose the refactoring from the menu (Reorder function parameters) or start it with shortcut (C-c C-e o). The other parameter will be asked during the execution in the minibar.

- Position of the cursor: Somewhere inside the name of the function.
- New order: The new order of the parameters as a permutation of the natural numbers of 1 .. arity separated by spaces or commas.

Preconditions and restrictions. None

1.5.4. Tuple function parameters

The aim of the refactoring. Change the way of using some arguments at the definition and at every place of call for a given function by grouping some arguments into one tuple argument.

Parameters. You have to stand on the needed position, when you choose the refactoring from the menu (Tuple function parameters) or start it with shortcut (C-c C-e t). The other parameter will be asked during the execution in the minibar.

- Position of the cursor: Somewhere inside the starting parameter of the tuple
- Number of the tuple elements: The integer number of the new tuple's elements.

Preconditions and restrictions.

- The given position must be within a formal argument of a function definition.
- The function must be a declared function, not a fun-expression.
- The given number must not be too large.
- No name clash if the arity is changing (not only in the current module if the function is exported).

1.5.5. Eliminate variable

The aim of the refactoring. All instances of a variable are replaced with its bound value in that region where the variable is visible. The variable can be left out where its value is not used.

Parameters. You have to stand on the needed position, when you choose the refactoring from the menu (Eliminate variable) or start it with shortcut (C-c C-e e). The other parameter will be asked during the execution in the minibar.

- Position of the cursor: Somewhere inside in one occurrence of the variable.

Preconditions and restrictions.

- It has exactly one binding occurrence on the left hand side of a pattern matching expression, and not a part of a compound pattern.
- The expression bound to the variable has no side effects.
- Every variable of the expression is visible (that is, not shadowed) at every occurrence of the variable to be eliminated.

1.5.6. Merge subexpression duplicates

The aim of the refactoring. The chosen expression is bound to a variable of the user's choice and all instances of the original subexpression are changed to the variable.

Parameters. You have to stand on the needed position, when you choose the refactoring from the menu or start it with shortcut. The other parameter will be asked during the execution in the minibar.

- Selected code part: it should be the extractable code part (expression or sequence of expressions).
- Name: the name of the new function.

Preconditions and restrictions.

- The selected expression has to be valid.
- The given name cannot clash with one that already exists in the given context and has the same scope.
- The transformation cannot be executed of the expression is
  - in the head of list comprehension,
  - in a generator pattern,
  - in a clause guard,
  - in a clause pattern or
  - in a macro.

1.5.7. Extract function

The aim of the refactoring. An alternative of a function definition might contain an expression (or a sequence of expressions) which can be considered as a logical unit, hence a function definition can be created from it. The extracted function is lifted to the module level, and it is parameterised with the „free" variables of the original expression(s): those variables which are bound outside of the expression(s), but the value of which is used by the expression(s).

Parameters. You have to stand on the needed position, when you choose the refactoring from the menu (Extract function) or start it with shortcut (C-c C-e f). The other parameter will be asked during the execution in the minibar.

- Selected code part: it should be the extractable code part (expression or sequence of expressions).
- Name: the name of the new function.

Preconditions and restrictions.

- The name of the function to introduce should not conflict with another function, either defined in the same module, or imported from another module (overloading). Furthermore, the name should be a legal function name.
- The starting and ending positions should delimit a sequence of expressions.
- Variables with possible binding occurrences in the selected sequence of expressions should not appear outside of the sequence of expressions.
- The extracted sequence of expressions cannot be part of a guard sequence.
- The extracted sequence of expressions cannot be part of a pattern.
- The extracted sequence of expressions cannot be part of macro definition.
- The extracted sequence of expressions cannot be part of a list_comprehension node.
- If the selected sequence of expression started with brackets, you should drop out these brackets.

1.5.8. Tuple to record

The aim of the refactoring. Change the same tuples in a function clause into a record. If one of the transformed tuple is in the pattern of the clause or it is the last expression of the clause's body than function calls are affected as well. Where the transformation can not be directly applied - the transformed expression is not a tuple - conversion macros are used. Later releases will support propagation of the refactoring, therefore reducing the need of the macros.

Parameters. You have to stand on the needed position, when you choose the refactoring from the menu (Tuple to record) or start it with shortcut (C-c C-e d). The other parameter will be asked during the execution in the minibar.

- Selected code part: should be a tuple.
- Record name: the name of the new record.
- Record field name: the name of the new record's fields.

Preconditions and restrictions.

- The number of specified record fields must be equal to the number of elements in the selected tuple.
- The tuple must not be embedded into a list, or a list comprehension or into an another tuple.
- If you use an already exisiting record, the record field names must match the defined record fields. Otherwise the result will not work. Later versions will merge the new fields and the already existing ones.

2. Basic Emacs tutorial

All the basic functionality which an editor provides are available through the File, Edit, Buffers menus' menu points:

These basic functionalities are for example

- **Open File**: File/Open File...
- **Close File**: File/Close(current buffer)
- **Quit**: File/Exit Emacs

You can select an area with a mouse, and you can make the following editings:

- **Copy**: Edit/Copy
- **Cut**: Edit/Cut
- **Paste**: Edit/Paste

Switch between opened files: In the Buffers menu point all the currently opened files are listed. Selecting one of them immediately shows that in the editor.

If you are comfortable with these methods you can try to use the **keyboard shortcut**s too:

- Open File: Control-X and after that Control-F (C-x C-f)
- Quit: Control-X and after that Control-C (C-x C-c)
- Copy: Alt - W (A-w)
- Cut: Control - W (C-w)
- Paste: Control - Y (C-y)
- Switch between opened files: Control - B Switch back to the last edited file, or type in the name of the opened file (Tab auto complete is available) and press ENTER.