

Questionnaire

Dear Friend,

We are PhD students of the Complex System and Data Processing (CSDP) research institute in the Northeastern University, and we have carried out a series of studies regarding the subject on the software refactoring. Our research group developed a system level refactoring algorithm to generate Move Method/Field and Extract Class refactoring suggestions automatically according to the principle of “high cohesion and low coupling”. Would you like to spare a few minutes to analysis the refactoring suggestions obtained by our approach for the open source systems and answer the following questions in the questionnaire carefully and authentically! For each question, you can assign a score on a three point Likert scale: 1(no), 2(maybe), 3(yes). With the help of your answers, we can evaluate and improve our algorithm. Thank you very much for your support and cooperation!

Question 1: “Does each of the restructured classes encapsulate a single function?”

Question 2: “With the help of a tool to generate the suggestion automatically, would you apply the proposed refactoring?”

Question 3: “Does it improve the maintainability of the codes?”

Note: All the detailed descriptions of refactoring suggestions and source codes of original software systems can be downloaded at:

Source Code:

<https://github.com/wangying8052/source-code>

① JEdit Non-Inheritance Extract Class Refactoring Results

https://github.com/wangying8052/Thotdraw-Refactoring-Results/blob/master/JEdit_Non-Inheritance%20Extract%20Class%20Refactoring%20Suggestions.pdf

② JEdit Non-Inheritance Move Method/Field Refactoring Results

https://github.com/wangying8052/Thotdraw-Refactoring-Results/blob/master/JEdit_Move%20Method%20or%20Field%20Refactoring%20Suggestions.pdf

③ JEdit Inheritance Refactoring Results

https://github.com/wangying8052/Thotdraw-Refactoring-Results/blob/master/JEdit_Inheritance%20Extract%20Class%20Refactoring%20Suggestions.pdf

④ Jmol Non-Inheritance Extract Class Refactoring Results

https://github.com/wangying8052/Thotdraw-Refactoring-Results/blob/master/Jmol_Non-Inheritance%20Extract%20Class%20Refactoring%20Suggestions.pdf

⑤ Jmol Non-Inheritance Move Method/Field Refactoring Results

https://github.com/wangying8052/Thotdraw-Refactoring-Results/blob/master/Jmol_Move%20Method%20or%20Field%20Refactoring%20Suggestions.pdf

⑥ Jmol Inheritance Refactoring Results

https://github.com/wangying8052/Thotdraw-Refactoring-Results/blob/master/Jmol_Inheritance%20Extract%20Class%20Refactoring%20Suggestions.pdf

Software system: JHotDraw

Non-Inheritance Refactoring

Move Method Refactoring				
<i>Method/Field</i>	<i>Q₁</i>	<i>Q₂</i>	<i>Q₃</i>	<i>Comment</i>
TaskFigure.addDependency(DependencyFigure)				
TaskFigure.removeDependency(DependencyFigure)				
TriangleRotationHandler.getLocation()				
DiamondFigure.isQuadratic()				
DiamondFigure.IS_QUADRATIC				
DiamondFigure.static {}				
DiamondFigure.setQuadratic(boolean)				
Methods.invoke(Object, String)				
Methods.invokeIfExists(Object, String)				
SVGUtil.getDimension(DOMInput, String)				
SVGUtil.getTransform(DOMInput, String)				
TriangleFigure.chop(Point2D\$Double)				
SVGUtil.getTransform(String)				
LoadRecentAction.fileOpened(Project, File, Object)				

Extract Class Refactoring				
<i>Class</i>	<i>Q₁</i>	<i>Q₂</i>	<i>Q₃</i>	<i>Comment</i>
nanoxml.XMLElement				
draw.DefaultDrawingView				
draw.TriangleFigure				
action.ToggleProjectPropertyAction				
geom.BezierPath				
draw.ConnectionHandle				
gui.JSheet				
undo.UndoRedoManager				
draw.MoveHandle				
action.ToolBarButtonFactory				
draw.FigureEvent				

Inheritance Refactoring

Extract Class Refactoring				
<i>Class</i>	<i>Q₁</i>	<i>Q₂</i>	<i>Q₃</i>	<i>Comment</i>
draw.AbstractHandle				
draw.BezierNodeHandle				
draw.ChangeConnectionHandle				
draw.AbstractFigure				
draw.MoveHandle				
draw.AbstractCompositeFigure				
draw.AttributedFigure				
draw.LineConnectionFigure				
draw.AbstractAttributedCompositeFigure				

draw.GraphicalCompositeFigure				
draw.BezierFigure				
draw.RoundRectangleFigure				
figures.TaskFigure				
draw.LineFigure				

Software system: JFreeChart

Non-Inheritance Refactoring

Move Method Refactoring				
<i>Method/Field</i>	<i>Q1</i>	<i>Q2</i>	<i>Q3</i>	<i>Comment</i>
CategoryDatasetHandler.addItem(Comparable, Comparable, Number)				
CategoryDatasetHandler.startElement(String, String, String, Attributes)				
Day.DATE_FORMAT_LONG				
Day.DATE_FORMAT_MEDIUM				
Day.DATE_FORMAT				
Day.parseDay(String)				
Day.DATE_FORMAT_SHORT				
MeterLegend.updateInformation(MeterPlot, MeterDataset, int, int, LegendItem[], Paint[])				
MeterLegend.createLegendItem(Graphics, LegendItem, double, double)				
MeterLegend.showWarning				
MeterLegend.showNormal				
MeterLegend.showCritical				
TimeSeries.update(int, Number)				
DatasetUtilities.sampleFunction2D(Function2D, double, double, int, String)				
Year.parseYear(String)				

Extract Class Refactoring

<i>Class</i>	<i>Q1</i>	<i>Q2</i>	<i>Q3</i>	<i>Comment</i>
chart.ChartPanel				
plot.ThermometerPlot				
plot.ContourPlot				
time.DynamicTimeSeriesCollection				
time.Hour				
time.TimeSeries				
data.DefaultIntervalCategoryDataset				
renderer.AreaXYRenderer				
chart.JFreeChart				

plot.MeterPlot				
axis.VerticalSymbolicAxis				
axis.HorizontalSymbolicAxis				
time.Week				
data.XYSeries				
chart.ChartUtilities				

Inheritance Refactoring

Extract Class Refactoring				
<i>Class</i>	<i>Q1</i>	<i>Q2</i>	<i>Q3</i>	<i>comment</i>
axis.Axis				
axis.VerticalNumberAxis				
plot.CategoryPlot				
plot.XYPlot				
axis.CategoryAxis				
plot.PiePlot				
axis.VerticalLogarithmicAxis				
plot.CombinedXYPlot				
axis.DateAxis				
axis.NumberAxis				
plot.Pie3DPlot				
renderer.AbstractRenderer				
renderer.AbstractCategoryItemRenderer				
renderer.MinMaxCategoryRenderer				
entity.ChartEntity				
needle.MeterNeedle				
data.DefaultKeyedValues2DDataset				

Software system: JEdit

Non-Inheritance Refactoring

Move Method Refactoring				
<i>Method/Field</i>	<i>Q1</i>	<i>Q2</i>	<i>Q3</i>	<i>Comment</i>
VFSFileChooserDialog.ok				
VFSFileChooserDialog.cancel				
VFSFileChooserDialog.filenameField				
EditPane.close()				
VFSFileChooserDialog.filename				
VFSFileChooserDialog.getSelectedFiles()				
VFSFileChooserDialog.isOK				
Macros.browseSystemMacros(View)				
Macros.browseUserMacros(View)				

View.setMacroRecorder(Macros\$Recorder)				
View.getMacroRecorder()				
View.recorder				
FileVFS.backup(Buffer,File)				
Autosave.actionPerformed(ActionEvent)				
BufferSwitcher.getSelectedItemAt()				
BufferSwitcher.setSelectedItemAt(Object)				
TextUtilities.regionMatches(boolean,Segment, int, char[])				
WorkThread.start()				
Autosave.Autosave()				
Autosave.setInterval(int)				
VFSManager.error(Component,String,Object[])				
VFSManager.error				
Autosave.stop()				
VFSManager.errorOccurred()				
SearchAndReplace.showSearchDialog(View,String)				
Buffer.createPosition(int)				
Autosave.timer				

Extract Class Refactoring				
<i>Class</i>	<i>Q1</i>	<i>Q2</i>	<i>Q3</i>	<i>Comment</i>
xml.XmlParser				
textarea.TextAreaPainter				
textarea.JEditTextArea				
textarea.Gutter				
bsh.Primitive				
syntax.TokenMarker				
util.WorkThreadPool				
bsh.Interpreter				
jedit.View				
jedit.jEdit				
jedit.Buffer				
bsh.InterpreterTokenManager				
jedit.Mode				
jedit.EditPane				
jedit.GUIUtilities				
jedit.Macros				
browser.VFSBrowser				
gui.HistoryTextField				
jedit.MiscUtilities				
regexp.RE				

Inheritance Refactoring

Extract Class Refactoring				
<i>Class</i>	<i>Q₁</i>	<i>Q₂</i>	<i>Q₃</i>	<i>Comment</i>
io.VFS				
io.FileVFS				

Software system: Jmol

Non-Inheritance Refactoring

Move Method Refactoring				
<i>Method/Field</i>	<i>Q₁</i>	<i>Q₂</i>	<i>Q₃</i>	<i>Comment</i>
GuiMap.newJMenu(String)				
GuiMap.newJCheckBoxMenuItem(String, boolean)				
AtomTypesModel.setValueAt(Object, int, int)				
AtomTypesModel.getValueAt((int, int)				
LabelManager.getLabelAtom(String, Atom)				
GuiMap.newJMenuItem(String)				
GuiMap.newJRadioButtonMenuItem(String)				
DisplayPanel.print(Graphics)				

Extract Class Refactoring				
<i>Class</i>	<i>Q₁</i>	<i>Q₂</i>	<i>Q₃</i>	<i>Comment</i>
jdbc.jdbcDatabaseMetaData				
hsqldb.Parser				
util.DatabaseManagerSwing				
hsqldb.Tokenizer				
hsqldb.Session				
hsqldb.Select				
hsqldb.Expression				
jdbc.jdbcConnection				
jdbc.jdbcResultSet				
hsqldb.Index				
hsqldb.Column				
util.TableSorter				
hsqldb.Result				
hsqldb.DINamespace				
util.SqlFile				
util.Grid				
util.Tree				
lib.HsqlTimer				
hsqldb.ServerConfiguration				
lib.ArrayUtil				
jmol.DisplayControl				
script.Compiler				

app.Vibrate				
app.DisplayPanel				
jmol.Atom				
script.Eval				
jmol.UnitCellBox				
jmol.ModelManager				
jmol.BaseAtomType				
app.Jmol				
render.AtomShape				

Inheritance Refactoring

Extract Class Refactoring				
<i>Class</i>	<i>Q₁</i>	<i>Q₂</i>	<i>Q₃</i>	<i>Comment</i>
hsqldb.Node				
hsqldb.Table				
hsqldb.TextTable				
jdbc.jdbcPreparedStatement				
jdbc.jdbcCallableStatement				
lib.BaseList				
lib.HsqlArrayList				
lib.HsqlDeque				
rowio.RowOutputBase				
rowio.RowOutputBinary				
rowio.RowOutputText				
rowio.RowOutputTextLog				
persist.DataFileCache				
persist.TextCache				
persist.HsqlProperties				
persist.HsqlDatabaseProperties				
persist.LockFile				
scriptio.ScriptReaderBase				
util.ValidatingResourceBundle				
util.SqltoolRB				

Software system: HSQLDB

Non-Inheritance Refactoring

Move Method Refactoring				
<i>Method/Field</i>	<i>Q₁</i>	<i>Q₂</i>	<i>Q₃</i>	<i>Comment</i>
Constraint.hasReferencedRow(Session,Object[],int[],Index)				
Constraint.checkReferencedRows(Session,Table,int[],Index)				

jdbcResultSetMetaData.init(jdbcResultSet,HsqlProperties)				
jdbcResultSetMetaData.jdbcResultSetMetaData(jdbcResultSet,HsqlProperties)				
Grantee.isRole				
jdbcBlob.setBytes(long, byte[], int, int)				
jdbcBlob.setBinaryStream(long)				
jdbcBlob.setBytes(long, byte[])				
jdbcDriver.getConnection(String,Properties)				
Types.getTypeName(int)				
JavaSystem.CompareIgnoreCase(String,String)				
SqlFile.execute(Connection,Boolean)				
jdbcDriver.connect(String,Properties)				
HsqlDeque.addLast(Object)				
StringUtil.split(String,String)				
StringUtil.isEmpty(String)				
StringUtil.getList(String[],String,String)				
DatabaseManagerCommon.testStatement(Statement,String, int)				

Extract Class Refactoring

<i>Class</i>	<i>Q₁</i>	<i>Q₂</i>	<i>Q₃</i>	<i>Comment</i>
jdbc.jdbcDatabaseMetaData				
hsqldb.Parser				
util.DatabaseManagerSwing				
hsqldb.Tokenizer				
hsqldb.Session				
hsqldb.Select				
hsqldb.Expression				
jdbc.jdbcConnection				
jdbc.jdbcResultSet				
hsqldb.Index				
hsqldb.Column				
util.TableSorter				
hsqldb.Result				
hsqldb.DINamespace				
util.SqlFile				
util.Grid				
util.Tree				
lib.HsqlTimer				
hsqldb.ServerConfiguration				
lib.ArrayUtil				

Inheritance Refactoring

Extract Class Refactoring

<i>Class</i>	<i>Q1</i>	<i>Q2</i>	<i>Q3</i>	<i>Comment</i>
hsqldb.Node				
hsqldb.Table				
hsqldb.TextTable				
jdbc.jdbcPreparedStatement				
jdbc.jdbcCallableStatement				
lib.BaseList				
lib.HsqlArrayList				
lib.HsqlDeque				
rowio.RowOutputBase				
rowio.RowOutputBinary				
rowio.RowOutputText				
rowio.RowOutputTextLog				
persist.DataFileCache				
persist.TextCache				
persist.HsqlProperties				
persist.HsqlDatabaseProperties				
persist.LockFile				
scriptio.ScriptReaderBase				
util.ValidatingResourceBundle				
util.SqltoolRB				