Table1 The original class JEditTextArea in JEidt

Attributes Methods vertical ve	Original Class JEditTextAr	•
vertical yerticalBox		
verticalBox view add(String, Component) visibleLines add(String, Component) visibleLines addExplicitFold() BOTTOM addFocusListener(FocusListener) CENTER addLeftOfScrollBar(Component) ELECTRIC_SCROLL addMarker() LEFT addMouseWheelListener(MouseWheelListener) NORMAL_SCROLL addNotify() NO_SCROLL addStrilListener(ScrollListener) RIGHT addStructureMatcher(StructureMatcher) TOP addToSelection(Selection) blink addToSelection(Selection) blink addToSelection(Selection) caret backspace() caret backspace() caret backspace() caret backspace() caretEvent blinkCaret() caretScreenLine centerCaret() caretGreenLine delete() caretTimer delete() charWidth delete(boolean) chunkCache delete(Dackache) dadLeback deleteParagraph() dndEnabled delete(Dackache) dndEnabled delete(Dackache) dndEnabled delete(Dackache) dradEnabled delete(Dackache		
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maxLineLen fireCaretEvent() mouseHandler fireScrollEvent(boolean)	match	extendSelection(int, int, int)
mouseHandler fireScrollEvent(boolean)	maxHorizontalScrollWidth	finishCaretUpdate(boolean, boolean)
` '	maxLineLen	fireCaretEvent()
	mouseHandler	fireScrollEvent(boolean)
overwrite foldStructureChanged()	overwrite	foldStructureChanged()

formatParagraph() painter physLastLine getBorder() popup getBuffer() popupEnabled getBufferLength() queued Caret UpdategetCaretLine() queuedFireCaretEvent getCaretPosition() queuedScrollToElectric getDisplayManager() quickCopy getDragAndDropCallback() trace getDropTarget() tabSize getElectricScroll() multi getFirstLine() lastLinePartial getFirstPhysicalLine() structureMatchers getFocusCycleRoot() structureTimer getFocusTraversalKeysEnabled() selection getGutter() getHorizontalOffset() getLastPhysicalLine() getLineCount() getLineEndOffset(int) getLineLength(int) getLineOfOffset(int) getLineStartOffset(int) getLineText(int) getLineText(int, text.Segment) getMagicCaretPosition() getMarkLine() getMarkPosition() getPainter() getPhysicalLineOfScreenLine(int) getRectParams(int, int) getRightClickPopup() getScreenLineEndOffset(int) getScreenLineOfOffset(int) getScreenLineStartOffset(int) getSelectedLines() getSelectedText() getSelectedText(String) getSelectedText(Selection) getSelection() getSelectionAtOffset(int) getSelectionCount() getSelectionEnd() getSelectionEnd(int) getSelectionEndLine()

```
getSelectionStart()
getSelectionStart(int)
getSelectionStartAndEnd(int, int, Selection)
getSelectionStartLine()
getStructureMatch()
getText()
getText(int, int)
getText(int, int, text.Segment)
getToolkit()
getTransferHandler()
getView()
getVisibleLines()
getWidth()
goToBufferEnd(boolean)
goToBufferStart(boolean)
goToEndOfLine(boolean)
goToEndOfWhiteSpace(boolean)
goToFirstVisibleLine(boolean)
goToLastVisibleLine(boolean)
goToMarker(char, boolean)
goToMatchingBracket()
goToNextBracket(boolean)
goToNextCharacter(boolean)
goToNextFold(boolean)
goToNextLine(boolean)
goToNextMarker(boolean)
goToNextPage(boolean)
goToNextParagraph(boolean)
goToNextWord(boolean)
goToNextWord(boolean, boolean)
goToParentFold()
goToPrevBracket(boolean)
goToPrevCharacter(boolean)
goToPrevFold(boolean)
goToPrevLine(boolean)
goToPrevMarker(boolean)
goToPrevPage(boolean)
goToPrevParagraph(boolean)
goToPrevWord(boolean)
goToPrevWord(boolean, boolean)
goToStartOfLine(boolean)
goToStartOfWhiteSpace(boolean)
handlePopupTrigger(MouseEvent)
hasFocus()
```

indentSelectedLines() insertEnterAndIndent() insertTab() insertTabAndIndent() insideSelection(int, int) invalidateLine(int) invalidateLineRange(int, int) invalidateScreenLineRange(int, int) invalidateSelectedLines() invertSelection() isCaretBlinkEnabled() isCaretVisible() isDragEnabled() isDragInProgress() isEditable() isMultipleSelectionEnabled() isOverwriteEnabled() isQuickCopyEnabled() is Rectangular Selection Enabled ()isRightClickPopupEnabled() isSelectionRectangular() isShowing() isStructureHighlightVisible() joinLines() lineComment() lineInStructureScope(int) moveCaretPosition(int) moveCaretPosition(int, boolean) moveCaretPosition(int, int) narrowToFold() narrowToSelection() offsetToXY(int) offsetToXY(int, int, Point) processKeyEvent(KeyEvent) propertiesChanged() rangeComment() recalculateLastPhysicalLine() recalculateVisibleLines() rectangularSelectionMode remove(Component) removeCaretListener(CaretListener)removeFromSelection(int) removeFromSelection(Selection) removeLeftOfScrollBar(Component)

```
removeNotify()
removeScrollListener(ScrollListener)
removeStructureMatcher(StructureMatcher)
removeTopComponent(Component)
removeTrailingWhiteSpace()
repaint()
requestFocus()
resizeSelection(int, int, int, boolean)
returnValue
revalidate()
screenLastLine
scrollBarsInitialized
scrollDownLine()
scrollDownPage()
scrollTo(int, boolean)
scrollTo(int, int, boolean)
scrollToCaret(boolean)
scrollUpLine()
scrollUpPage()
select(int, int)
select(int, int, boolean)
selectAll()
selectBlock()
selectFold()
selectFold(int)
selectLine()
selectNone()
selectParagraph()
selectToMatchingBracket()
selectToMatchingBracket(int, boolean)
selectWord()
setBorder(border.Border)
setBuffer(Buffer)
setCaretBlinkEnabled(boolean)
setCaretPosition(int)
setCaretPosition(int, boolean)
setDragAndDropCallback(reflect.Method)
setDragEnabled(boolean)
setDragInProgress(boolean)
setElectricScroll(int)
setFirstLine(int)
setFirstPhysicalLine(int)
setFirstPhysicalLine(int, int)
setHorizontalOffset(int)
```

```
setLayout(LayoutManager)
setMagicCaretPosition(int)
setMultipleSelectionEnabled(boolean)
setOverwriteEnabled(boolean)
setQuickCopyEnabled(boolean)
setRectangularSelectionEnabled(boolean)
setRightClickPopup(JPopupMenu)
setRightClickPopupEnabled(boolean)
setSelectedText(String)
setSelectedText(String, boolean)
setSelectedText(Selection, String)
setSelection(Selection)
setSelection(Selection[])
setSelectionEnd(int)
setSelectionStart(int)
setText(String)
setTransferHandler(TransferHandler)
shiftIndentLeft()
shiftIndentRight()
shiftTallCaretLeft(Selection$Rect)
showGoToLineDialog()
showSelectLineRangeDialog()
showStructureStatusMessage(boolean)
showWordCountDialog()
smartEnd(boolean)
smartHome(boolean)
spacesToTabs()
startDragAndDrop(InputEvent, boolean)
swapMarkerAndCaret(char)
tabsToSpaces()
tallCaretDelete(Selection$Rect, boolean)
toLowerCase()
toUpperCase()
toggleMultipleSelectionEnabled()
toggleOverwriteEnabled()
toggleRectangularSelectionEnabled()
updateBracketHighlightWithDelay()
updateMaxHorizontalScrollWidth()
updateScrollBars()
updateStructureHighlight()
userInput(char)
xToScreenLineOffset(int, int, boolean)
xyToOffset(int, int)
xyToOffset(int, int, boolean)
```

Table2 The new classes extracted by developers

Class Extracted by the Developers - 1	
Attributes	Methods
selection	getSelectionStart()
	getSelectionStart(int)
	getSelectionStartLine()
	setSelectionStart(int)
	getSelectionEnd()
	getSelectionEnd(int)
	getSelectionEndLine()
	setSelectionEnd(int)
	getSelectionCount()
	setSelection(Selection[])
	setSelection(Selection)
	addToSelection(Selection[])
	addToSelection(Selection)
	getSelectionStartAndEnd(int, int)
	extendSelection(int , int)
	extendSelection(int, int, int, int)
Class Extracted by the Devel	lopers - 2
Attributes	Methods
NO_SCROLL	getFoldPainterName()
mouseHandler	getFocusTraversalKeysEnabled()
scrollBarsInitialized	getFocusCycleRoot()
wrap	
Class Extracted by the Devel	lopers - 3
Attributes	Methods
NORMAL_SCROLL	dispose()
ELECTRIC_SCROLL	getPainter()
view	getGutter()
lineSegment	getDisplayManager()
chunkCache	isCaretBlinkEnabled()
displayManager	setCaretBlinkEnabled(boolean)
bufferChanging	getElectricScroll()
max Horizontal Scroll Width	setElectricScroll(int)
hardWrap	isQuickCopyEnabled()
tabSize	setQuickCopyEnabled(boolean)
charWidth	getBuffer()
maxLineLen	setBuffer(Buffer)
lastLinePartial	isEditable()
caretTimer	isDragInProgress()
structureTimer	setDragInProgress(boolean)
focused Component	isDragEnabled()
gutter	setDragEnabled(boolean)

painter getFirstLine()
popup setFirstLine(int)
popupEnabled getFirstPhysicalLine()
listenerList setFirstPhysicalLine(int)
caretEvent setFirstPhysicalLine(int, int)

caretBlinks getLastPhysicalLine()
blink getVisibleLines()
physLastLine getHorizontalOffset()
screenLastLine setHorizontalOffset(int)

visibleLines scrollUpLine()
electricScroll scrollUpPage()
horizontalOffset scrollDownLine()
quickCopy scrollDownPage()
verticalBox scrollToCaret(boolean)
vertical scrollTo(int, boolean)
horizontal scrollTo(int, int, boolean)

buffer addScrollListener(ScrollListener)
caret removeScrollListener(ScrollListener)
caretLine getPhysicalLineOfScreenLine(int)
caretScreenLine getScreenLineOfOffset(int)

structureMatchers getScreenLineStartOffset(int)
match getScreenLineEndOffset(int)

magicCaret xyToOffset(int , int)

multi xyToOffset(int , int , boolean)

overwrite xToScreenLineOffset(int, int, boolean)

rectangularSelectionMode offsetToXY(int)

dndEnabled offsetToXY(int, int, Point)

dndInProgress invalidateScreenLineRange(int, int)

queuedCaretUpdate invalidateLine(int)

queuedFireCaretEvent invalidateLineRange(int, int)

getBufferLength()
getLineCount()
getLineOfOffset(int)
getLineStartOffset(int)
getLineEndOffset(int)
getLineLength(int)

getText()

getText(int, int)

getText(int, int, Segment)

getLineText(int)

getLineText(int, Segment)

setText(String)
selectAll()
selectLine()

```
selectParagraph()
selectWord()
selectToMatchingBracket(int, boolean)
selectToMatchingBracket()
selectBlock()
lineInStructureScope(int)
selectNone()
getSelectedText(Selection)
getSelectedText(String)
getSelectedText()
setSelectedText(Selection, String)
setSelectedText(String)
setSelectedText(String, boolean)
addStructureMatcher(StructureMatcher)
remove Structure Matcher (Structure Matcher) \\
getStructureMatch()
blinkCaret()
centerCaret()
setCaretPosition(int)
setCaretPosition(int, boolean)
moveCaretPosition(int)
moveCaretPosition(int, boolean)
moveCaretPosition(int, int)
getCaretPosition()
getCaretLine()
getMagicCaretPosition()
setMagicCaretPosition(int)
addCaretListener(CaretListener)
removeCaretListener(CaretListener)
goToNextBracket(boolean)
goToNextCharacter(boolean)
goToNextLine(boolean)
goToNextPage(boolean)
goToNextParagraph(boolean)
goToNextWord(boolean)
goToNextWord(boolean)
goToPrevBracket(boolean)
goToPrevCharacter(boolean)
goToPrevLine(boolean)
goToPrevPage(boolean)
goToPrevParagraph(boolean)
goToPrevWord(boolean)
goToPrevWord(boolean, boolean)
goToStartOfLine(boolean)
```

```
goToEndOfLine(boolean)
goToStartOfWhiteSpace(boolean)
goToEndOfWhiteSpace(boolean)
goToFirstVisibleLine(boolean)
goToLastVisibleLine(boolean)
goToMatchingBracket()
isOverwriteEnabled()
toggleOverwriteEnabled()
backspace()
backspaceWord()
backspaceWord(boolean)
delete()
deleteToEndOfLine()
deleteLine()
deleteToStartOfLine()
deleteWord()
deleteWord(boolean)
isMultipleSelectionEnabled()
toggleMultipleSelectionEnabled()
is Rectangular Selection Enabled ()\\
goToParentFold()
goToNextFold(boolean)
goToPrevFold(boolean)
collapseFold()
expandFold(boolean fully)
selectFold()
selectFold(int line)
narrowToFold()
narrowToSelection()
lineComment()
rangeComment()
spacesToTabs()
tabsToSpaces()
toUpperCase()
toLowerCase()
removeTrailingWhiteSpace()
insertEnterAndIndent()
insertTabAndIndent()
indentSelectedLines()
shiftIndentLeft()
shiftIndentRight()
addLeftOfScrollBar(Component)
remove Left Of Scroll Bar (Component) \\
addNotify()
```

```
removeNotify()
addTopComponent(Component)
removeTopComponent(Component)
getMarkPosition()
getMarkLine()
isCaretVisible()
isStructureHighlightVisible()
updateMaxHorizontalScrollWidth()
recalculateVisibleLines()
foldStructureChanged()
_finishCaretUpdate()
invalidateSelectedLines()
fireCaretEvent()
fireScrollEvent(boolean vertical)
insertTab()
doWordWrap(boolean spaceInserted)
updateBracketHighlightWithDelay()
updateStructureHighlight()
showStructureStatusMessage(boolean)
recalculateLastPhysicalLine()
getRectParams(int, int)
delete()
tallCaretDelete(Selection.Rect, boolean)
shiftTallCaretLeft(Selection.Rect)
isRightClickPopupEnabled()
setRightClickPopupEnabled(booleanEnabled)
getRightClickPopup()
setRightClickPopup(JPopupMenu)
getSelectionAtOffset(int)
removeFromSelection(Selection)
resizeSelection(int, int, int, boolean)
invertSelection()
insideSelection(int, int)
smartHome(boolean)
smartEnd(boolean)
goToBufferEnd(boolean)
goToBufferStart(boolean)
showGoToLineDialog()
userInput(char ch)
addExplicitFold()
formatParagraph()
doWordCount(View, String text)
showWordCountDialog()
select(int, int end)
```

select(int, int end, boolean)
handlePopupTrigger(MouseEvent)

Table3 The new classes extracted by our approach

Class Extracted our approac	7 11
Attributes	Methods
caretBlinks	scrollUpLine()
screenLastLine	scrollDownLine()
scrollBarsInitialized	isCaretVisible()
electricScroll	isCaretBlinkEnabled()
lastLinePartial	scrollDownPage()
lineSegment	scrollUpPage()
chunkCache	setMagicCaretPosition(int)
displayManager	extendSelection(int, int)
caret	moveCaretPosition(int)
buffer	updateMaxHorizontalScrollWidth()
caretLine	handlePopupTrigger(MouseEvent)
visibleLines	recalculateLastPhysicalLine()
popupEnabled	setFirstLine(int)
verticalBox	getFirstPhysicalLine()
dndEnabled	getFirstLine()
popup	foldStructureChanged()
	getPhysicalLineOfScreenLine(int)
	setCaretPosition(int)
	isStructureHighlightVisible()
	getDisplayManager()
	toggleMultipleSelectionEnabled()
	narrowToSelection()
	blinkCaret()
	lineInStructureScope(int)
	selectFold()
	invalidateSelectedLines()
	selectToMatchingBracket()
	updateStructureHighlight()
	getCaretLine()
	getMarkPosition()
	getCaretPosition()
	getMarkLine()
	goToPrevBracket(boolean)
	goToLastVisibleLine(boolean)
	goToNextParagraph(boolean)
	goToFirstVisibleLine(boolean)
	getMagicCaretPosition()
	goToEndOfLine(boolean)
	goToEndOfWhiteSpace(boolean)

```
goToStartOfLine(boolean)
goToPrevParagraph(boolean)
goToPrevCharacter(boolean)
goToNextPage(boolean)
goToPrevPage(boolean)
expandFold(boolean)
_finishCaretUpdate()
getRectParams(int, int)
rangeComment()
recalculateVisibleLines()
goToNextCharacter(boolean)
setBuffer(Buffer)
invalidateScreenLineRange(int, int)
invalidateLine(int)
doWordWrap(boolean)
goToStartOfWhiteSpace(boolean)
collapseFold()
goToPrevLine(boolean)
goToNextLine(boolean)
goToPrevFold(boolean)
goToNextFold(boolean)
deleteLine()
addNotify()
set CaretBlinkEnabled (boolean) \\
goToParentFold()
insertTabAndIndent()
deleteToStartOfLine()
deleteToEndOfLine()
goToNextBracket(boolean)
narrowToFold()
goToMatchingBracket()
insertTab()
invalidateLineRange(int, int)
scrollToCaret(boolean)
showStructureStatusMessage(boolean)
getScreenLineOfOffset(int)
getScreenLineStartOffset(int)
getScreenLineEndOffset(int)
lineComment()
insertEnterAndIndent()
selectWord()
getBuffer()
getLineOfOffset(int)
getBufferLength()
```

	getLineCount()
	getLineEndOffset(int)
	getLineStartOffset(int)
	getLineLength(int)
	scrollTo(int, boolean)
	shiftTallCaretLeft(Selection\$Rect)
	tallCaretDelete(Selection\$Rect, boolean)
	offsetToXY(int)
	shiftIndentLeft()
	getLineText(int)
	shiftIndentRight()
	isEditable()
	removeTrailingWhiteSpace()
	getText()
	setText(java.lang.String)
	spacesToTabs()
	tabsToSpaces()
	toLowerCase()
	toUpperCase()
	xToScreenLineOffset(int, int, boolean)
	xyToOffset(int, int)
	centerCaret()
	getVisibleLines()
	addLeftOfScrollBar(Component)
	removeLeftOfScrollBar(Component)
	isDragEnabled()
	setDragEnabled(boolean)
	getElectricScroll()
	setElectricScroll(int)
	getRightClickPopup()
	setRightClickPopup(JPopupMenu)
	isRightClickPopupEnabled()
	setRightClickPopupEnabled(boolean)
Class Extracted our approac	h - 2
1	

Attributes	Methods
match	addTopComponent(java.awt.Component)
horizontalOffset	backspace()
physLastLine	backspaceWord()
painter	backspaceWord()
overwrite	delete(boolean)
multi	delete()
dndInProgress	deleteWord()
quickCopy	deleteWord(boolean)
selection	dispose()

```
view
                             getStructureMatch()
                            isMultipleSelectionEnabled()
                            isOverwriteEnabled()
                            getPainter()
                            getLastPhysicalLine()
                            isRectangularSelectionEnabled()
                            rectangularSelectionMode
                            removeTopComponent(Component)
                            select(int, int)
                            select(int, int, boolean)
                            isDragInProgress()
                             setDragInProgress(boolean)
                            setFirstPhysicalLine(int)
                            getHorizontalOffset()
                            setHorizontalOffset(int)
                            isQuickCopyEnabled()
                            setQuickCopyEnabled(boolean)
                            getSelectionCount()
                            doWordCount(View, String)
                            getSelectedText()
                             setSelectedText(String)
                            add Structure Matcher (Structure Matcher) \\
                            removeStructureMatcher(StructureMatcher)
                            structure Matchers
                            toggleOverwriteEnabled()
                             showGoToLineDialog()
                            smartEnd(boolean)
                            smartHome(boolean)
                             goToBufferStart(boolean)
                             goToBufferEnd(boolean)
                            userInput(char)
                            addExplicitFold()
                            formatParagraph()
                             showWordCountDialog()
                             getSelectionEndLine()
                            getSelectionStartLine()
                             getSelectionEnd()
                             getSelectionStart()
                             getSelectionStart (int line)
                             getSelectionEnd(int line)
                             getSelectionStartAndEnd(int, int, Selection)
                             setSelectionEnd(int)
                             setSelectionStart(int)
                             getFoldPainterName()
```

_	
	setSelection(Selection)
	setSelection(Selection[])
	addToSelection(Selection)
	addToSelection(Selection[])
	getSelectionAtOffset(int)
	removeFromSelection(int)
	resizeSelection(int, int, int, boolean)
	invertSelection()
	insideSelection(int, int)
	indentSelectedLines()
	selectLine()
	selectParagraph()
	selectNone()
	selectAll()
	selectBlock()

Class Extracted our approach - 3

Attributes	Methods
maxHorizontalScrollWidth	removeNotify()
gutter	getGutter()
charWidth	fireCaretEvent()
maxLineLen	removeCaretListener(CaretListener)
bufferChanging	fireScrollEvent(boolean)
magicCaret	addCaretListener(CaretListener)
horizontal	addScrollListener(ScrollListener)
focusedComponent	removeScrollListener(ScrollListener)
mouseHandler	updateBracketHighlightWithDelay()
caretEvent	
caretScreenLine	
blink	
caretTimer	
ELECTRIC_SCROLL	
NORMAL_SCROLL	
NO_SCROLL	
structureTimer	
queuedCaretUpdate	
queuedFireCaretEvent	
vertical	
hardWrap	
tabSize	
wrap	
listenerList	