*Project Manual*

*ToDo++*

**

October 15, 2012

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| --- | --- | --- | --- |
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User Guide   
For v0.1 software



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# Section 1: The Basics

## Introduction

ToDo++ is the to-do application of your choice. Take control of your life like never before, with keyboard shortcut keys and intuitive natural-language-like text commands. Personalize the way you want to interact with the app. Be alerted of your events, and never lose track of your tasks again.

## At a Glance



## Quick Start

Upon launching ToDo++, you are presented with a minimalistic and intuitive screen. The first time you launch ToDo++, a simple help animation will introduce you to the many wonders of ToDo++! Find it superfluous? Then simply type away! That is all all that you have to do to start creating your to-do list!

* Create your first task/event by typing the keyword “add” followed by your task/event name into the input box, followed by the event time or deadline if any.
* For example, to add your Mom’s birthday brunch this Sunday, simply type in *“add mom’s bday this sunday”*. Hit *Enter* and the item is added!
* To view what you have added, just key in “display” and your list, ordered by date and time (or however you have customized it in the Settings C:\Users\Jenna\Desktop\Project Repo\ToDo++\Resources\gearButton.png panel), will be displayed!

*Note: If you have a task/event name that includes a date, time, or keyword, such as ‘Thank God It’s Friday' or 'delete ex-girlfriend’s number', use quotation mark or brackets around the task/event name to prevent ToDo++ from messing up your instruction.*

You can search for, modify and delete your tasks from the list using these very words as the keywords. Alternative keywords can be found in the *Appendix*.

Remember the order of what you enter does not matter! Take a look at section *3.1.* *FlexiCommands* to find out more and learn how to customize ToDo++ to your needs.

The following sections will describe basic ToDo++ operations in more detail.

# Section 2: Creating Your ToDo++ List

## Types of Tasks

There are three basic types of tasks you can add to your list.

**Event tasks :** items that have a start time (and possibly an end time).  
**Deadline tasks :** items that have to be done before a specific time.  
**Floating tasks :** items that have no timings attached to them.

As always, there is no fixed way to add a certain type of task. Simply type in what makes sense to you, and ToDo++ will know what type of task to add! See the next section, “Adding an Item” for more information.

## Basic Operation

The order of input of all required fields is flexible. Date input is context sensitive. For more information, please see section *3.1.* *FlexiCommands*.

For a complete list of default keywords and more details on how to use bracketing, please see section *3.1.2. Using Reserved Keywords*.

You can easily sort your tasks by name and date, schedule your task to be happening at your earliest free time slot and quickly undo a wrongly input command using the “undo” command. For more information, please see section *3.2.5. Undoing a Command*.

The following sections detail the basic operations.

## Adding a Task

Using the default add keyword, you can add all types of items to your list easily in a structured format similar to natural language. The task type will depend on the inclusion or omission of start/end times/deadlines. You can add your tasks in the following ways:

|  |  |
| --- | --- |
| Adding a floating task | Enter “add [task name]” eg. add finish project |
| Adding an event (timed) task | Enter “add [task name] [start time] {end time} {day/date}“ eg. add max birthday 4pm tomorrow  eg. add team meeting 2pm-4pm next wed |
| Adding a deadline item | Enter “add [task name] by [deadline]“ eg. add do cs2103 CE2 by saturday midnight |

*Note: Optional keywords are in curly braces. See Appendix for a full list of keywords and defaults.*

## Searching & Viewing

Using the default display or search keyword, you can search, filter and view your list of to-do items. ToDo++ has a powerful sort and search algorithm that will help you find your tasks with intuitive commands in consummate ease.

A search request may be made up of more than one search requirement. Below are examples of how you can use this feature to its full potential. Optional commands are in curly braces.

|  |  |
| --- | --- |
| Display all tasks | Enter “display/search” |
| Search for and display all or some of the tasks scheduled on, before or, after a specific day or date | Enter “display/search [day/date]{before/after}{time}” eg. display 06/09/2012 eg. display Sunday after 1500hrs eg. display 6 sept before 10pm eg. display next Saturday eg. display tomorrow eg. display June |
| Search for and display tasks by task names or descriptions | Enter “display/search [name]” eg. display buy milk |

*Note: Optional keywords are in curly braces. See Appendix for a full list of keywords and defaults.*

Search results will be displayed in the feedback window as an indexed list. Each task will be given a numbered ID for easy reference. From here, you can do further operations, such as modifying or deleting an item. See the following sections for more information.

## Updating & Modifying

Using the default modify keyword, you can easily modify and edit your task details. For example, you may wish to change the scheduled date for a task or rename it to correct a typographical error.

Note that in order to modify a task name, you must first call for the task by its name and then modify it by calling its reference index. The input should not contain any date/time input. Otherwise, it will be regarded as a request to modify the task’s start/end times/deadlines.

|  |  |
| --- | --- |
| Modifying task name | Enter “modify [task index] [new name]” eg, *(User)* modify milk  *(ToDo++)* 1. milk Stevv for more info  2. buy more milk  *(User)* modify 1 milk Steve for more info |
| Modifying task time | Enter “modify [task index] [new start time/deadline] {end time} {day/date} “ eg, *(User)* modify buy car tomorrow  *(ToDo++)* 1. buy toy car, 5pm  2. buy car parking coupon today  *(User)* modify 2 tomorrow |

*Note: Optional keywords are in curly braces. See Appendix for a full list of keywords and defaults.*

## Removing Task(s)

Using the default delete keyword, you can remove previously added tasks from your ToDo++ list. You can call for a task and delete it in the 2 following ways:

**By task name** Call the task by its name.

Note that if more than one task matches the input name, all matching tasks will be reflected in the feedback window. Each task will be given a numbered index for easy reference.

**By task index** Call the task by its given index, as displayed in the feedback window.

|  |  |
| --- | --- |
| Deleting a single task | Enter “delete [task name/index]” eg. delete 3 eg, delete buy more milk (only one task matching specified task name) eg, *(User)* delete milk  *(ToDo++)* 1. milk Steven for more info  2. buy more milk  *(User)* delete 2 |
| Deleting all tasks displayed | Enter “delete all” |
| Deleting all tasks on a specific date | Enter “delete all [day/date]” eg. delete all tmr eg. delete all friday eg. delete all 3 dec |

*Note: Optional keywords are in curly braces. See Appendix for a full list of keywords and defaults.*

# Section 3: Advanced Features

## FlexiCommands

ToDo++ is an intelligent software that allows you to input commands in a way that is natural to you. Your input is therefore not case sensitive and not order specific. What this means is that the following commands are both equivalent and valid!

|  |  |
| --- | --- |
| add max’s birthday 25th oct | add 25/10 max’s birthday |
| add movie outing 3pm to 5pm today | 3pm – 5pm movie outing add |
| add breakfast tmr with family 5am | ADD breakfast with family 5am *[past 5am today]* |
| add party lunch tmr afternoon | party lunch tmr 12pm – 5pm add *[default settings]* |
| add project REMAKE by midnight | add project REMAKE by 12am |

### Custom Keywords

ToDo++ is a to-do list made to be familiar and intuitive to the individual user. If you do not wish to use the default keywords provided, you may easily set your own custom keywords for the various basic operations in Settings C:\Users\Jenna\Desktop\Project Repo\ToDo++\Resources\gearButton.png > FlexiCommands.



*Adding the remove keyword for command delete*

### Using Reserved Keywords

There may be times when you wish to use a keyword (a command, day, date or time keyword) as part of your task name. Simply enclose the keyword within any of the following delimiters to do so:

* Quotation marks
  + add **“**add hot girl on facebook**”**
  + delete **‘***delete* issue**’**
* Brackets/Braces
  + modify 2 **{***remove* hot girl from facebook**}**
  + add **(**go to *2am* Bar**)** 2am tomorrow
  + display **[***21st* birthday**]**

## Important Features for Power Users

### Sorting Tasks

Using the default sort keyword, you can sort the items in your list easily in the following ways:

|  |  |  |
| --- | --- | --- |
| By task date | Enter “sort date” eg. (User) search tomorrow  (ToDo++) 1. lunch with colleagues  2. breakfast  3. morning run  4. supper  (User) sort name  (ToDo++) 1. morning run   2. breakfast  3. lunch with colleagues  4. Supper | 11 Nov, 1:00PM 11 Nov, 5:00AM 11 Nov, 3:00AM – 4:30AM 11 Nov, 11:00PM  11 Nov, 3:00AM – 4:30AM 11 Nov, 5:00AM 11 Nov, 1:00PM 11 Nov, 11:00PM |
| By task name | Enter “sort name” eg. (User) display  (ToDo++) 1. peter asked me out! DATE!  2. richard asked me out! DATE!  3. simon asked me out! DATE!  4. david asked me out! DATE!  (User) sort name  (ToDo++) 1. david asked me out! DATE!  2. peter asked me out! DATE!  3. richard asked me out! DATE!  4. simon asked me out! DATE! | |

Note that “date” and “name” are keywords that must be used in conjunction with the sort command.

### Marking Task(s)

**[SIMILAR TO THE DELETE AND POSTPONE COMMAND]**

Using the default done and undone keyword, you can easily mark the tasks/items in your to-do list as complete (aka done) or incomplete (aka undone). Your task will then be displayed as [DONE] and [UNDONE] respectively.

You can call for a task and mark it as done or undone in the 2 following ways:

**By task name** Call the task by its name.

Note that if more than one task matches the input name, all matching tasks will be reflected in the feedback window. Each task will be given a numbered index for easy reference.

**By task index** Call the task by its given index, as displayed in the feedback window.

|  |  |
| --- | --- |
| Marking a single task | Enter “done/undone [task name/index]” eg. done 3 eg, done buy more milk (only one task matching specified task name) eg, *(User)* done milk  *(ToDo++)* 1. milk Steven for more info  2. buy more milk  *(User)* done 2 |
| Marking all tasks displayed | Enter “done/undone all” |
| Marking all tasks on a specific date | Enter “done/undone all [day/date]” eg. done all today eg. undone all tomorrow eg. done all june |

### Postponing Task(s)

**[SIMILAR TO THE DELETE AND DONE COMMAND]**

Using the default postpone keyword, you can easily postpone your deadline or timed event task by a duration specified in hours, days or weeks. For example, you may wish to postpone a dinner date by an hour due to unforeseen heavy traffic or unplanned overtime.

Some points to note:

1. A task with no specific time cannot be postponed by a number of hours and a task with no specific date cannot be postponed by a number of days.
2. If a duration is not specified, the task will be automatically postponed by the default postpone duration specified in Settings C:\Users\Jenna\Desktop\Project Repo\ToDo++\Resources\gearButton.png > FlexiCommands > Postpone.

You can call for a task and postpone it in the 2 following ways:

**By task name** Call the task by its name.

Note that if more than one task matches the input name, all matching tasks will be reflected in the feedback window. Each task will be given a numbered index for easy reference.

**By task index** Call the task by its given index, as displayed in the feedback window.

|  |  |  |
| --- | --- | --- |
| Postponing a single task | Enter “postpone [task name/index] {duration}” eg. postpone 3 1 hour eg, postpone buy more milk 2 days (only one task matching specified task name) eg, *(User)* postpone milk  *(ToDo++)* 1. milk Steven for more info  2. buy more milk  *(User)* postpone 2 2 days | 11 Nov, 1:00PM 11 Nov |
| Postponing all tasks displayed | Enter “postpone all” | |
| Postponing all tasks on a specific date | Enter “postpone all [day/date] {duration}” eg. postpone all tmr 1 hour eg. postpone all Friday 1 day eg. postpone all 3 dec eg. postpone all june, 1 week | |

*Note: Optional keywords are in curly braces. See Appendix for a full list of keywords and defaults.*

### Scheduling a Task

Using the default schedule keyword, you can schedule your event task to be automatically allocated your earliest free time slot within your specified time range. For example, you may wish to schedule a short 1 hour dental appointment on Friday but find it a pain to look through your Friday schedule for a suitable time slot.

Tasks duration may be specified in hours, days, weeks, or months. For example, a task may be 3 hours long or 5 days long in duration. Schedule time ranges may be specified by dates (days or months) or keywords like morning, afternoon, evening and night.

Some points to note:

1. If there is no time slot available within the specified time range, the task will not be scheduled.
2. If the task duration is not specified, the default task duration specified in Settings C:\Users\Jenna\Desktop\Project Repo\ToDo++\Resources\gearButton.png > FlexiCommands > Schedule.
3. If no time range is specified, the task will be scheduled at your earliest fitting free time slot.

|  |  |
| --- | --- |
| Scheduling an event task | Enter “schedule [task name] {task duration} {time range}” eg. schedule dental appointment 1 hour Friday afternoon eg. schedule dental appointment Friday afternoon eg. schedule dental appointment eg. schedule chalet 3 days, june |

*Note: Optional keywords are in curly braces. See Appendix for a full list of keywords and defaults.*

### Undoing a Command

In order to undo a mistyped command, simply enter undo to revert to the state before the last undoable entered command.

Note that commands such as search and sort cannot be undone.

eg, *(User)* display  
 *(ToDo++)* 1. milk Steven for more info  
 2. buy more milk  
 3. buy car coupon  
 4. visit supermarket to enter lucky draw ticket  
 *(User)* delete 4  
 *(ToDo++)* 1. milk Steven for more info  
 2. buy more milk  
 3. buy car coupon  
 *(User)* sort name  
 *(ToDo++)* 1. buy car coupon  
 2. buy more milk  
 3. milk Steven for more info  
 *(User)* undo *[late undoable commandwas delete]*  
 *(ToDo++)* 1. buy car coupon  
 2. buy more milk  
 3. milk Steven for more info  
 4. visit supermarket to enter lucky draw ticket

### Redoing a Command

In order to redo an undone command, simply enter redo to revert to the state before the last undone.

### Exiting ToDo++

To exit ToDo++, you can simply click on the cross in the top right hand corner or enter exit. Alternatively, you can also use the *CTRL+Q* keyboard shortcut to exit the program.

### Minimizing to TaskBar

Simply click on C:\Users\Jenna\Desktop\Project Repo\ToDo++\Resources\minimizeButton.png to minimize ToDo++ to the system trya.Alternatively, you can also use the *ALT+Q* keyboard shortcut. You will stil be able to see the ToDo++ icon in the taskbar notification area while it runs in the background.

To restore the ToDO++ window, simply double-click on the icon or use the same minimizing *ALT+Q* keyboard shortcut.

*Icon minimized to notification area*

### Autorun & Other Settings

You can get ToDo++ to run automatically on Windows startup by simply checking the Settings C:\Users\Jenna\Desktop\Project Repo\ToDo++\Resources\gearButton.png > Load on Startup option. Additonally, you can also check Settings C:\Users\Jenna\Desktop\Project Repo\ToDo++\Resources\gearButton.png > Start Minimized if you wish for ToDo++ to start running in the minimized state.

If you wish for ToDo++ to always be placed floating on top of all your other programs, simply check Settings C:\Users\Jenna\Desktop\Project Repo\ToDo++\Resources\gearButton.png > Stay On Top.

### Hotkeys

A list of default hotkeys such as *ALT-Q* to toggle between the minimized and restored states can be found in the *Appendix*.

# Appendix

Note: Optional keywords are in {curly braces}. Inputs in [square brackets] must be valid in order for the keywords to work.

#### COMMAND KEYWORDS

|  |  |
| --- | --- |
| **ADD:** add  **SEARCH/VIEW:** display, search  **MODIFY:** modify  **DELETE:** delete  **SORT**: sort  **DONE**: done | **UNDONE**: undone  **POSTPONE:** postpone  **SCHEDULE:** schedule  **UNDO:** undo  **REDO:** redo  **EXIT**: exit |

#### GENERAL COMMAND KEYWORDS

**DATE SEPARATOR**: hyphen (-), period (.), forward slash (/)

**DAY:** mon, monday, tues, tuesday, wed, wednesday, thurs, thursday, fri, friday, sat, saturday, sun, sunday, today, tomorrow

**MONTH:** jan, feb, mar, apr, may, jun, jul, aug, sep, sept, oct, nov, dec, january, february, march, april, may, june, july, august, september, october, november, december

**DATE:** {1-31}[DATE SEPARATOR]{1-12}[DATE SEPARATOR]{valid year} **DATE:** {1-31}{st/nd/rd/th}{MONTH}{valid year}  
*\* accepted partial dates must be a combination of suffixed day, day and month or month and year (see below for more information)*

**TIME:** [1-12] am/pm  
*\* spaces are optional*  
**TIME**: midnight, noon  
**TIME RANGES:** morning, afternoon, evening, night

**CONDITIONAL ADJECTIVES:** [next/following] [DAY/MONTH]

#### QUASI-GENERAL COMMAND KEYWORDS

**INDEX:** all integer numbers are reserved if and only if it is used with a relevant command that may require an index *\* such as modify, delete, postpone, done and undone*

**ALL:** the all keyword is reserved if and only if it is used with a relevant command  
*\* such as modify, delete, postpone, done and undone*

**DURATION**: hr, hrs, wk, wks, hours, hours, day, days, week, weeks  
duration keywords are reserved if and only if used with relevant commands  
*\* such as postpone and schedule* ; *must be used with a preceding integer*

#### SPECIFICALLY ADD COMMAND KEYWORDS

**TIME:** [0000-2359] hrs/hours  
*\* spaces are optional*

**EVENT SEPARATOR**: hyphen (-), to

**SIGNIFY EVENT (TIMED) TASK:**  
{from} [DATE/DAY/TIME] {EVENT SEPARATOR} {DATE/DAY/TIME}  
*\* omission of time/month keyword for start time is valid as long as it is present in the end time  
(e.g. 2-4pm)*

**SIGNIFY DEADLINE TASK:** by [DATE/DAY/TIME]

#### SPECIFICALLY SCHEDULE COMMAND KEYWORDS

**DURATION**: mth, mths, month, months  
these duration keywords are reserved if and only if used with the schedule command  
*\* must be used with a preceding integer*

#### ADD COMMAND DEFAULT BEHAVIOR

* A task must be given a valid name that consists of at least non-space character.
* Not specifying any fields in date or time will cause the software to assume the most upcoming date which fits the entered fields. For example, “add event 2nd" will set the event to be on 2nd October if today’s date is 3rd September but 2nd September if today’s date is 1st September.
* The valid partial date inputs include inputs consisting of only the  
  (1) day with suffixes i.e. 15th  
  (2) day and month i.e. 15/10  
  (3) month and year i.e. 10/2012 (requires full year input of YYYY)
* Not specifying the by keyword will create an event (timed) task instead of a deadline task even if only one date/time is specified. The date/time specified will be the event’s start time.
* Omission of both time and month keyword when creating an event task will cause ToDo++ to assume that the numbers refer to month by default.

#### SEARCH/DISPLAY COMMAND DEFAULT BEHAVIOR

* All possible results will be displayed when keywords are omitted. For more specific results, try to enter a more specific search string.
* When searching by date or day, as long as the specified search date or day falls within the time window of an event task, the event task will also be displayed as a search result.

#### MODIFY COMMAND DEFAULT BEHAVIOR

* When the modify operation is called with an input that includes a date/day/time, it will be automatically considered to be a request for modification of the start/end times/deadline of the relevant task. If there is only one task found to match the input, its start/end times/deadline will thus be automatically modified. Otherwise, the modify operation functions like a search/view operation and returns a list of matching hits.
* In order to modify a task name, the task must be called by its index. Otherwise, the request will not be recognized.

#### POSTPONE COMMAND DEFAULT BEHAVIOR

* In order to postpone a deadline or timed event task by a specific duration type, the task must be accordingly time-specific.
* If a duration is not specified, the task will be automatically postponed by the default postpone duration specified in Settings C:\Users\Jenna\Desktop\Project Repo\ToDo++\Resources\gearButton.png > FlexiCommands > Postpone.

#### SCHEDULE COMMAND DEFAULT BEHAVIOR

* If there is no time slot available within the specified time range, the task will not be scheduled.
* If the task duration is not specified, the default task duration specified in Settings C:\Users\Jenna\Desktop\Project Repo\ToDo++\Resources\gearButton.png > FlexiCommands > Schedule.
* The tasssssk duration must be specified in full i.e. with a specified amount and valid duration type.
* If no time range is specified, the task will be scheduled at your earliest fitting free time slot.
* A scheduled task will only begin at the start of every hour.
* If a time is specified in conjunction with a time range keyword such as morning and afternoon, it will be taken to be the end time and will override the time range’s end time. Therefore, by default, “schedule task tomorrow morning 1pm” will attempt to schedule the task some time tomorrow from 5am to 1pm.
* If both the start time and end time are specified in conjunction with a time range keyword such as morning and afternoon, the specified times will override the time range’s start time and end time. Therefore, by default, “schedule task tomorrow morning 4am to 1pm” will attempt to schedule the task some time tomorrow from 4am to 1pm.

#### UNDO COMMAND DEFAULT BEHAVIOR

* The last undoable command will be undone. This means that previously entered commands that did not result in any changes as well as search and sort commands will simply be disregarded.

#### HOTKEYS AND KEYBOARD SHORTCUTS

|  |  |
| --- | --- |
| **CTRL+A**  **CTRL+Q**  **ALT+H**  **ALT+S**  **ALT+SPACE**  **ALT+UP/DOWN**  **ALT + BACKSPACE**  **CTRL/ALT+LEFT**  **CTRL/ALT+RIGHT**  **UP/DOWN** | select all text in ionput box  exit ToDo++  togle between main window and help panel  toggle between main window and settings panel  return cursor to input box  toggle between expanded and collapsed state  delete previous word or current word till selection position  move to start of curernt word in input field  move to start of next word in input field  retrieve previous/next input |

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# Section 1: An Overview

## Where We Are Now

### Basic Features

The basic features of ToDo++ include support for 3 types of tasks, as follows:

**Event tasks :** items that have a start time (and possibly an end time).  
**Deadline tasks :** items that have to be done before a specific time.  
**Floating tasks :** items that have no timings attached to them.

They include the following:

1. Add, Display/Search, Modify, Delete (CRUD)
2. Undo
3. Redo
4. Schedule
5. Postpone
6. Mark (as done/undone)
7. Sort

### Extra Feature

The focus good-to-have feature is FlexiCommand. This means to say that the user is allowed high flexibility in his command format; highly ordered/structured input is not required. A simple GUI has also been implemented such that keyboard shortcuts/hotkeys and user customization of command keywords are also available.

**Architecture Diagram**

****

## Class Diagram



## User Sequence Diagram



## General Class Descriptions

### Important Attributes

|  |  |
| --- | --- |
| **Variable** | **Description** |
| enum CommandType | Enumerates the various command types (add, delete, display, sort, search, modify, undo, redo, invalid) |
| enum ContextType | Enumerates the various context types (starttime, endtime, deadline, current, next, following) |
| enum Month | Enumerates the 12 months, starting from index 1 (jan, feb, mar, apr, may, jun, jul, aug, sep, oct, nov, dec) |

### Main Class

|  |  |
| --- | --- |
| **Class** | **Description** |
| Program (static) | The main entry point for the application |

### Logger Class

|  |  |
| --- | --- |
| **Class** | **Description** |
| Logger |  |

### Logic Class

|  |  |
| --- | --- |
| **Class** | **Description** |
| Logic | Takes in and processes user input Executes the command Returns feedback |

### Response Class

|  |  |
| --- | --- |
| **Class** | **Description** |
| Response |  |

### Storage Class

|  |  |
| --- | --- |
| **Class** | **Description** |
| Storage | Handles the storage of tasks information Takes in a Task object and writes it to an XML file |

### User Interface Classes

|  |  |
| --- | --- |
| **Class** | **Description** |
| UI | Takes in all user input Displays returned feedback |
| Menu | Displays the menu strip and handles all things related |
| SettingsInformation |  |
| SettingsUI | Handles the display of the settings menus and takes in the settings changes |
| Settings | Takes in and implements the settings |

### Parser Classes (Parsers)

|  |  |
| --- | --- |
| **Class** | **Description** |
| CommandParser | Takes in and parses command string Returns an Operation object |
| CustomDictionary |  |
| OperationGenerator |  |
| StringParser | Takes in and parses the command string into tokens Returns a List of generated Tokens |
| TokenGenerator |  |

### Token Classes

|  |  |
| --- | --- |
| **Class** | **Description** |
| Token (abstract) | An abstract class from which all the other Token classes inherit from |
| TokenCommand : Token | Stores the details pertaining to the command information of a task |
| TokenContext : Token | Stores the details pertaining to the context information of a task |
| TokenDate : Token | Stores the details pertaining to the date information of a task |
| TokenDay : Token | Stores the details pertaining to the day information of a task |
| TokenIndexRange : Token | Stores the details pertaining to the index(es) information of a task |
| TokenLiteral : Token | Stores the details pertaining to the literal information of a task |
| TokenSortType : Token | Stores the details pertaining to the sort type information of a task |
| TokenTime : Token | Stores the details pertaining to the time information of a task |
| TokenTimeRange : Token | Stores the details pertaining to the time range information of a task (specified by duration keywords) |

### Task Classes

|  |  |
| --- | --- |
| **Class** | **Description** |
| Specificity | Stores the date and time specificity of a task |
| Task (abstract) | An abstract class from which all the other Task classes inherit from |
| TaskFloating : Task | Stores the task details of a floating task |
| TaskDeadline : Task | Stores the task details of a deadline task |
| TaskEvent : Task | Stores the task details of an event (timed) task |

### Operation Classes (Operations)

|  |  |
| --- | --- |
| **Class** | **Description** |
| Operation (abstract) | An abstract class from which all the other Operation classes inherit from |
| OperationAdd : Operation | Stores the operation details for an add operation |
| OperationDelete : Operation | Stores the operation details for a delete operation |
| OperationDisplayDefault: Operation | Stores the operation details for the default display operation |
| OperationMarkAsDone : Operation | Stores the operation details for a mark as done operation |
| OperationMarkAsUndone : Operation | Stores the operation details for a mark as undone operation |
| OperationModify : Operation | Stores the operation details for a modify operation |
| OperationPostpone : Operation | Stores the operation details for a postpone operation |
| OperationRedo : Operation | Stores the operation details for a redo operation |
| OperationSchedule : Operation | Stores the operation details for a schedule operation |
| OperationSearch : Operation | Stores the operation details for a search operation |
| OperationSort : Operation | Stores the operation details for a sort operation |
| OperationUndo : Operation | Stores the operation details for an undo operation |
| OperationHandler | Takes in an Operation object and executes it by calling the relevant methods |

*\* not yet implemented / only partially implemented*

# User Interface Classes

## UI

### Summary

High-level class that handles all the user interaction and allows access to the customization settings menus, displays feedback and calls on the other classes to handle the command processing

[DIAGRAM]

### Detailed Description

Provides the method for user customization of keyboard shortcuts  
Handles all direction interaction with the user

Methods: PrepareSystemTray, PrepareSettingsManager, PrepareMenu, PrepareOutputBox, PrepareLogic, MinimiseMaximiseTray, RegisterInStartup, MinimiseToTrayWhenChecked, RegisterLoadOnStartupWhenChecked, ProcessText, *ProcessCmdKey*

### Test History

Some testing has been done with regards to the testing user interaction (testing of hotkeys, keyboard shortcuts, user customized settings etc) with little overall system testing (testing of input and feedback etc).

### Important Attributes

|  |  |
| --- | --- |
| **Variable** | **Description** |
| Hotkeys.GlobalHotKey ghk; | Global Hotkey to minimize to the system tray |
| SettingsManagers mainSettingsManager; | Instance of SettingsMangers that stores all settings data, including the user customized commands (FlexiCommands) |
| Logic logic; | Instance of Logic that handles the data structure and file operations; needed for use by text processing |

### Constructor

|  |  |
| --- | --- |
| UI(); | Calls the PrepareSystemTray, PrepareSettingsManager, PrepareMenu, PrepareOutputBox and PrepareLogic methods, which loads the minization code, initial settings, menu strip and output box respectively |

### Important API (Private Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| void PrepareSystemTray(); | Registers the hotkey (Alt+Q) to be used for minimizing/maximizing to/from System Tray |
| void PrepareSettingsManager(); | Creates an Instance of Settings Manager |
| void PrepareMenu(); | Prepares the menu bar by passing in an instance of SettingsManager and loading the relevant settings |
| void PrepareOutputBox(); | Prepares the output box by passing in an instance of SettingsManager and loading the relevant settings |
| void PrepareSettingsManager(); | Creates an Instance of Logic |
| void MinimizeMaximizeTray(); | Minimize/Maximizes ToDo++ from system tray |
| void RegisterInStartup(bool isChecked); | Detects the user setting and determines if ToDo++ is to be open at startup or not |

### Important API (Protected Method)

|  |  |
| --- | --- |
| **Method** | **Description** |
| override bool ProcessCmdKey(ref Message msg, Keys keyData) | Processes the user customized keyboard shorcut to override the default/current keyboard shortcuts Takes note that ALT+Q is reserved for minimization |

## SettingsUI

### Summary

The class that handles the input of all user settings changes/modifications regarding ToDo++ Startup options and user customized command keywords (FlexiCommands) and calls on the Settings class to implement and store the user defined settings

### Detailed Description

Methods: **LoadPersonalSettingsTab**, **LoadFlexiCommandTab**

### Test History

Testing has been done to verify that the user is able to customize and define additional command keywords and start ToDo++ on Startup minimized.



### Important Attributes

|  |  |
| --- | --- |
| **Variable** | **Description** |
| Settings settings; | Contains the instance of settings passed in |
| CommandType currentCommand; | Specifies the type of command that is currently selected |
| Settings tempSettings; | Temporary copy of the user defined settings during customization that are copied from when Apply or OK are hit |

### Important API (Public Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| void LoadPersonalSettingsTab(); | Loads the Personal Settings Tab |
| void LoadFlexiCommandTab(); | Loads the Flexi Commands Tab |

## 

## Settings

### Summary

The class that implements, stores and manages all user defined settings

### Detailed Description

Stores the following public attributes: booleans loadOnStartup and startMinimized, integer textSize, Lists of Strings customKeywords\_ADD, customKeywords\_DELETE, customKeywords\_MODIFY, customKeywords\_UNDO and customKeywords\_REDO

Provides the methods to change the font size  
Provides the methods to add and remove user defined command keywords

Methods: **SetTextSize**, **GetTextSize**, **IncreaseTextSize**, **DecreaseTextSize**, **AddCommand**, **RemoveCommand**, **GetCommandList**, **AddCommandsToStringParser**, **OpenFile**, **WriteToFile**, **CopyUpdatedCommandsFrom**, **CloneObj**

### Test History

Testing has been done to verify that the user is able to customize and define additional command keywords and start ToDo++ on Startup minimized.

### Important API (Public Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| List<string> GetCommandList(CommandType commandType); | Returns a list of all added/available user commands |
| void AddCommandsToStringParser(); | Pushes new set of FlexiCommands into the StringParser |
| void CopyUpdatedCommandsFrom(Settings passedSettings); | Copies the new user defined command keywords from a copy of the stored temporary settings |
| Settings CloneObj(); | Clones an instance of Settings (deep copy) |

# Logic Class

### Summary

High-level class that calls the other appropriate class methods to process and execute the commands as well as update the settings; where the user input is passed in and processed

### Detailed Description

Provides the methods for processing and executing the commands  
Provides the methods for calling the command parser to parse the commands and for calling the operation handler to execute the commands  
Provides the method to update settings \*

Methods: **ProcessCommand**, **UpdateSettings \***, **ExecuteCommand**, ParseCommand

### Test History

No testing has been done for the Logic class as yet.

### Constructor

|  |  |
| --- | --- |
| Logic(); |  |

### Important API (Public Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| Response ProcessCommand (string input); | Processes a input string command and returns the processed Response which contains the result of the operation which can be displayed to the user.  Returns a Response object containing the list of tasks to be displayed and the result of the operation. |

# Parser Classes

## CommandParser

### Summary

Calls the parsing methods to make sense of the command string and create the relevant operation object

### Detailed Description

Provides the method to parse the command string into tokens and then generate an operation object containing the relevant task object based on these tokens

Methods: **ParseOperation**, GenerateOperation, CreateOperation \*, CombineDateAndTime, GenerateNewTask, GetDateFromDay, GetDaysToAdd, WarnUsersOfMultipleCommands, GetPositionsOfDelimiters, RemoveBadIndexes, SortIndexes, CompareBasedOnZerothIndex

### Test History

Black box testing has been employed in setting up test methods to test and validate ParseOperation method. The various following situations/cases have been tested: addition of valid deadline task, addition of invalid task, addition of valid timed event task with only one single specified start time, addition of valid timed event task with both start and end times specified.

### Constructor

|  |  |
| --- | --- |
| CommandParser(); |  |

### Important API (Public Method)

|  |  |
| --- | --- |
| **Method** | **Description** |
| Operation ParseCommand (string input); | Parses a input string and returns the Operation that can be executed.  Returns an operation object representing the input command. |

### Important API (Private Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| Operation GenerateOperation (List<Tokens> tokens); | This method uses the given list of tokens to generate a corresponding Operation.  Returns the generated operation object. |
| Operation CreateOperation (CommandType commandType, …); | Create operation based on derived values and whether they have been used by creating the relevant Task and adding it to an instance of the relevant Operation class |
| DateTime? CombineDateAndTime (string taskName, …); | Returns a combined DateTime consisting of date and time inputs If only the time is defined, the DateTime returned is specified to be tomorrow If only the date is defined, the default DateTime constructed is returned |
| Task GenerateNewTask (string taskName, …); | Creates and returns the new relevant Task object based on the input startTime and endTime, which are optional |
| DateTime GetDateFromDay (…); | Takes in a day of the week and returns the corresponding date depending on what the preposition is |
| int GetDaysToAdd (…); | Calculates the number of days to add to the given day of the week in order to return the next occurrence of the desired day of the week. |
| int[] GetPositionsOfDelimiters (string input); | Combs the input string for all delimiters Returns the positions of all matching delimiters |
| void RemoveBadIndexes(ref List<int[]> indexOfDelimiters); | Checks each pair of indexes removes those that overlaps with the previous pair |

## 

## StringParser

### Summary

The class that does most of the actual command parsing

### Detailed Description

Provides the method for thorough command parsing and the generation of tokens, which are then subsequently used to create the actual task object in the CommandParser class  
Provides the method for addition of user customized keywords

Stores CommandType enum, ContextType enum, Month enum, delimitingCharacters, commandKeywords Dictionary, contextKeywords Dictionary, dayKeywords Dictionary, monthKeywords Dictionary, timeSpecificKeywords Dictionary, timeGeneralKeywords Dictionary, timeSuffixes Dictionary and regexes (see Attributes)

Methods: **StringParser**, AddUserCommand, ResetCommandKeywords, FindPositionOfDelimiters, ParseStringIntoTokens, SplitStringIntoSubstrings, MergeCommandAndIndexKeywords, MergeDateAndTimeWords, MergeTimeWords, MergeWord\_IfValidTime, MergeDateWords, MergeWord\_IfValidAlphabeticDate, GenerateTokens, GenerateCommandTokens, GenerateDayTokens, GenerateDateTokens, GetDateMatch, GetMatchTagValues, ConvertMatchTagValuesToInts, ConvertToNumericMonth, RemoveSuffixesIfRequired, GenerateTimeTokens, GenerateContextTokens, GenerateLiteralTokens, AddLiteralToken, CompareByPosition, IsValidTime, IsValidNumericDate, IsValidAlphabeticDate, IsValidDate, GetTokenAtPosition

### Test History

White box testing has been employed in setting up test methods to test and validate all date and time parsing methods (MergeDateWords, MergeWord\_IfValidAlphabeticDate, GenerateDateTokens etc.), including the testing of all the date and time regexes.

Invalid date inputs such as 31 Feb are currently just ignored; they do not flag or call exceptions to notify the user of the erroneous date input.

### Important Attributes

|  |  |
| --- | --- |
| **Variable** | **Description** |
| char[] delimitingCharacters | Specifies all delimiting characters ([, ], (, ), {, }, ‘, “) |
| Dictionary<string, CommandType> commandKeywords | Specifies the relevant strings to be the keys for various relevant CommandTypes i.e. add, delete etc. |
| Dictionary<string, ContextType> contextKeywords | Specifies the relevant strings to tbe keys for the various ContextTypes i.e. by, on, from etc. |
| Dictionary<string, DayOfWeek> dayKeywords | Specifies the relevant strings to tbe keys for the various DayOfWeeks i.e. mon, monday, tues, weekend etc. |
| Dictionary<string, Month> monthKeywords | Specifies the relevant strings to tbe keys for the various Months i.e. jan, january, feb, february etc. |
| Regex time\_24HourFormat | Find all time inputs in the 24 hour format |
| Regex time\_12HourFormat | Find all time inputs in the 12 hour format |
| Regex date\_numericFormat | Find all date inputs in the numeric format i.e. DD/MM/YYYY, MM/DD/YYYY |
| Regex date\_alphabeticFormat | Find all date inputs in the numeric format i.e. DD/MMM/YYYY, MMM/DD/YYYY |
| Regex date\_daysWithSuffixes | Find all date inputs that only consist of days with suffixes |

### Constructor

|  |  |
| --- | --- |
| StringParser(); | Calls the InitializeDefautKeywords method (see below) |

### Important API (Public Method)

|  |  |
| --- | --- |
| **Method** | **Description** |
| List<string> ParseStringIntoWords (string input); | This method parses a string of words into a list of substrings determined by their meaning, by spacing, or by delimiting characters.  Returns the list of tokens. |
| string MarkWordsAsAbsolute (string absoluteSubstr); | This method marks each and every word within the input string (as absolute) with a pair of inverted commas at the start and end of the word.  Returns the marked string of words. |
| string UnwarkWordsAsAbsolute (string absoluteSubstr); | This method unmarks each and every word within the input string. The words were originally marked by a pair of inverted commas.  Returns the unmarked string of words. |

### Initialization Methods

|  |  |
| --- | --- |
| **Method** | **Description** |
| void InitializeDefaultKeywords (); | Calls all the other initialization methods |
| void InitializeCommandKeywords (); | Sets up the commandKeywords Dictionary |
| void InitializeDateTimeKeywords (); | Sets up the dayKeywords Dictionary Creates String Lists storing time specific keywords, time general keywords and time suffixes |
| void InitializeMonthKeywords (); | Sets up the monthKeywords Dictionary |
| void InitializeContextKeywords (); | Sets up the contextKeywords Dictionary |

### Important API (Internal Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| void AddUserCommand (string userCommand, CommandType commandType) | Adds a user defined/customized keyword to the list of defualt operation keywords |
| List<int[]> FindPositionsOfDelimiters (string input); | Searches the input string against the set delimiters' and return the positions of the delimiters as a list of integer pairs |
| List<Token> ParseStringIntoTokens (string input. List<int[]> = null); | Parses a string of words into a list of tokens, each containing a token representing the meaning of each word or substring By inputting a list of integer pairs to mark delimiting characters, multiple words can be taken as a single absolute substring (word). |

### Important API (Private Methods)

|  |  |
| --- | --- |
| **Methods** | **Description** |
| List<string> SplitStringIntoSubstrings (string input. List<int[]> indexOfDelimiters); | Splits a string and returns a list of substrings, each containing either a word delimited by a space, or a substring delimited by positions in the parameter indexOfDelimiters |
| List<string> MergeCommandAndIndexKeywords (List<string> words); | Checks to see if the command is followed by an index and if positive, merges the command with the index |
| List<string> MergeDateAndTimeKeywords (List<string> words); | Detects and merges all the date and time words into a single string while keeping the other words separate and unmerged by calling the MergeTimeWords and MergeDateWords methods i.e. input "add", "task", "friday", "5", "pm", "28", "sept", "2012" returns "add", "task", "friday", "5pm", "28 sept 2012" |
| bool MergeWord\_IfValidTime (ref List<string> output, List<string> input, int position); | Checks if the indicated word in a list of string is part of a time phrase and if positive, merges it with the other words constituting the time phrase into one string |
| bool MergeWord\_IfValidAlphabeticDate(ref List<string> output, List<string> input, int position, …); | Checks if the indicated word in a list of string is part of an alphabetic date phrase and if positive, merges it with the other words constituting the date phrase into one string |

## OperationGenerator

### Summary

### Detailed Description

### Test History

### Constructor

|  |  |
| --- | --- |
| OperationGenerator(); |  |

### Important API (Public Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| void FinalizeGenerator (); | Finalizes the generator so that it can begin generating operations with the correct time ranges. |
| Operation CreateOperation (); | This operation generates an operation based on how this generator has been configured.  Returns the generated operation object. |

## TokenGenerator

### Summary

### Detailed Description

### Test History

### Important API (Public Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| List<Token> GenerateAllTokens (List<string> input); | This method searches an input list of strings and generates the relevant tokens representing the meaning of each string.  Returns the list of matched phrases as tokens. |
| List<TokenCommand> GenerateCommandTokens (List<string> input); | This method searches an input list of strings against the set list of command keywords and returns a list of tokens corresponding to the matched command keywords.  Returns a list of the generated command tokens. |
| List<Token> GenerateCommandTokens (List<string> input, List<TokenCommand> commandTokens); | This method checks an input list of strings for index range words and generates a list of tokens based on the found index range words.  Returns a list of the generated index range tokens. |
| List<Token> GenerateSortTypeTokens (List<string> input, List<TokenCommand> commandTokens); | This method checks an input list of strings for sort type keywords (name or date) and generates a list of tokens based on the found sort type keywords.  Returns a list of the generated sort type tokens. |
| List<Token> GenerateTimeRangeTokens (List<string> input, List<TokenCommand> commandTokens); | This method checks an input list of strings for time range words and generates a list of tokens based on the found time range words.  Returns a list of the generated time range tokens. |
| List<Token> GenerateDayTokens (List<string> input); | This method searches an input list of strings against the set list of day keywords and returns a list of tokens corresponding to the matched day keywords  Returns a list of the generated day tokens. |
| List<Token> GenerateDateTokens (List<string> input); | This method searches an input list of strings for all valid dates and generates a list of date tokens corresponding to all the found matched date strings using regexes.  Returns a list of the generated date tokens. |
| List<Token> GenerateTimeTokens (List<string> input); | This method searches an input list of strings for all valid times and generates a list of time tokens corresponding to all the found matched time strings using regexes.  Returns a list of the generated time tokens. |
| List<Token> GenerateContextTokens (List<string> input, List<Token> parsedTokens); | This method searches an input list of strings against the set list of context keywords and returns a list of tokens corresponding to the matched context keywords.  Returns a list of the generated context tokens. |
| List<Token> GenerateLiteralTokens (List<string> input, List<Token> parsedTokens); | This method compares an input list of strings against a list of parsed Tokens, and returns a list of Tokens representing all strings which have not been been parsed as Tokens. The purpose of this method is to assign all unparsed strings as LiteralTokens.  Returns a list of the generated literal tokens. |

## CustomDictionary

### Summary

### Detailed Description

### Test History

# Token Classes

## Token

### Summary

Abstract class that cannot be instantiated

Subclasses: TokenCommand, TokenDate, TokenTime, TokenDay, TokenContext, TokenLiteral

The various token objects from the different subclasses are differentiated with the attribute type.

### Detailed Description

Enumerates the various token types, which have differing storage details information of tokens according to the type. All subclasses inherit the attributes position and type.

Each subclass object stores the details of a relevant task.  
For example, a TokenCommand object stores the details pertaining to the command information of a task an operation is to execute.

### Test History

No testing has been done for the Token class and subclasses as yet.

### Important Attributes

|  |  |
| --- | --- |
| **Variable** | **Description** |
| enum TokenType | Enumerates the various token types (command, date, time, day, context, literal) |
| int position | Stores the index of the token in the input List of Strings |
| TokenType type | Stores the token type |

## TokenCommand : Token

### Constructor

|  |  |
| --- | --- |
| TokenCommand(int position, CommandType val, int taskIndex = 0) : base(position) | Sets the command type, token index and task index (The task index will be the same for all tokens generated for the same task) |

### Important API (Internal Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| CommandType Value | Getter method retrieves the command type stored |
| int TaskIndex | Getter method retrievs the task index |

## TokenDate : Token

### Constructor

|  |  |
| --- | --- |
| TokenDate(int position, DateTime date, Boolean specific\_flag) : base(position) | Sets the date value, information regarding the date specificity and token index |

### Important API (Internal Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| DateTime Value | Getter method retrieves the date information stored |
| bool IsSpecific | Getter method retrieves the specificity information of the stored date |

## TokenTime : Token

### Constructor

|  |  |
| --- | --- |
| TokenTime(int position, TimeSpan val) : base(position) | Sets the time value and token index |

### Important API (Internal Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| TimeSpan Value | Getter method retrieves the time information stored |

## TokenDay : Token

### Constructor

|  |  |
| --- | --- |
| TokenDay(int position, DayOfWeek val) : base(position) | Sets the day value and token index |

### Important API (Internal Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| DayOfWeek Value | Getter method retrieves the day information stored |

## TokenContext : Token

### Constructor

|  |  |
| --- | --- |
| TokenContext(int position, ContextType val) : base(position) | Sets the context type and token index |

### Important API (Internal Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| ContextType Value | Getter method retrieves the context type stored |

## TokenLiteral : Token

### Constructor

|  |  |
| --- | --- |
| TokenLiteral(int position, string val) : base(position)) |  |

### Important API (Internal Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| string Value | Getter method retrieves the literal information stored |

# Storage Class

### Summary

The class that handles the storage and retrieval of tasks information

### Detailed Description

Provides the method for writing of tasks information to an XML file for storage

For floating tasks, only the task name will be recorded and stored  
For deadline and event (timed) tasks, both the task name and relevant specified time information will be recorded and stored

Methods: **WriteXML**, AddTask \*, RemoveTask \*

### Test History

Some testing has been done to verify that the tasks information can be successfully written in a fixed formatting to a standard XML file.

### Constructor

|  |  |
| --- | --- |
| Storage(); | No argument is needed |

### Important API (Public Method)

|  |  |
| --- | --- |
| **Method** | **Description** |
| bool WriteXML(Task task); | Writes task information to an XML file Returns true if writing process succeeded and false if otherwise |

# Task Classes

## Task

Abstract class that cannot be instantiated

Subclasses: TaskFloating, TaskDeadline, TaskEvent

### Detailed Description

All subclasses inherit the attribute taskname.

Each subclass object stores the details of a relevant task.  
For example, an TaskFloating object stores the details of a floating task that has no date and time specification.

### Test History

No testing has been done for the Task class and subclasses as yet.

### Important Attribute

|  |  |
| --- | --- |
| **Variable** | **Description** |
| string taskname | Stores the name of the task |

## TaskFloating : Task

### Constructors

|  |  |
| --- | --- |
| TaskFloating(); | Default constructor that requires no argument |
| TaskFloating(string TaskName); | Sets name of task as TaskName |

## TaskDeadline : Task

### Constructors

|  |  |
| --- | --- |
| TaskDeadline(); | Default constructor that requires no argument |
| TaskDeadline(string TaskName, DateTime EndTime) | Sets name of task as TaskName and task deadline as EndTime. |

## TaskEvent : Task

### Constructors

|  |  |
| --- | --- |
| TaskDeadline(); | Default constructor that requires no argument |
| TaskDeadline(string TaskName, DateTime StartTime, DateTime EndTime) | Sets name of task as TaskName, starting time of the task as StartTime and ending time of the task as EndTime, thereby specified the time range of the event (timed) task |

# Operation Classes

## Operation

### Summary

Abstract class that cannot be instantiated

Subclasses: OperationAdd, OperationDelete, OperationDisplay, OperationSearch, OperationModify, OperationUndo

### Detailed Description

Each subclass object stores the details of a relevant operation to be executed.  
For example, an OperationAdd object stores the details of the new task to be added in a Task object.

### Test History

The various operation subclasses have been validated by the verification of the ParseOperation method as auxilliary storage objects used in the testing methods.

## OperationAdd : Operation

### Constructor

|  |  |
| --- | --- |
| OperationAdd(Task setTask); | Sets the new task to be setTask |

## OperationDelete : Operation

### Constructor

|  |  |
| --- | --- |
| OperationDelete(int index); | Stores the index of the task to be deleted in index |

## OperationSearch : Operation

### Constructor

|  |  |
| --- | --- |
| OperationSearch(string searchString); | Sets the search string to be searchString By default, the stored search string is an empty string |

## OperationModify : Operation

### Constructor

|  |  |
| --- | --- |
| OperationModify(int Previous, Task Revised); | Stores the previous task index in oldTaskIndex and the new revised task in newTask |

## OperationHandler

### Summary

The class that handles the operations execution

### Detailed Description

Provides the method for operation execution given an Operation object

Stores feedback strings  
Creates and stores lastListedTask (list of Task objects), undoStack (stack of Operation objects and storageXML (Storage object)

Methods: **OperationHandler**, **Execute**, Add, Delete, DisplayAll, TrackOperation

### Important Attributes

|  |  |
| --- | --- |
| **Variable** | **Description** |
| List<Task> lastListedTasks; | List of the most recent tasks for ready retrieval when required |
| Stack<Operation> undoStack; | Stack of Operation objects that store the latest executed operations for ready retrieval when user chooes to undo an operation |
| Stack<Operation> redoStack; | Stack of Operation objects that store the undone operations for ready retrieval when user chooes to redo an operation |
| Storage storageXML; | An instance of storage |

### Constructor

|  |  |
| --- | --- |
| OperationHandler(); | Creates a List of Tasks, Stack of Operations and an instance of Storage |

### Important API (Public Methods)

|  |  |
| --- | --- |
| **Method** | **Description** |
| string Execute(Operation operation, ref List<Task> taskList) | Processes command from UI Returns the feedback string |