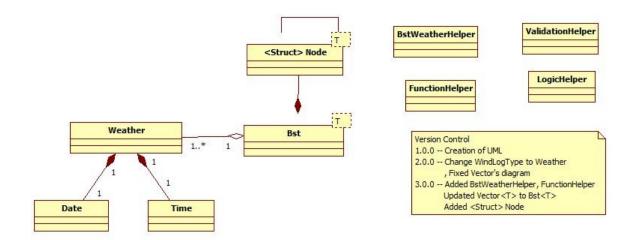
ICT 283 Assignment 2

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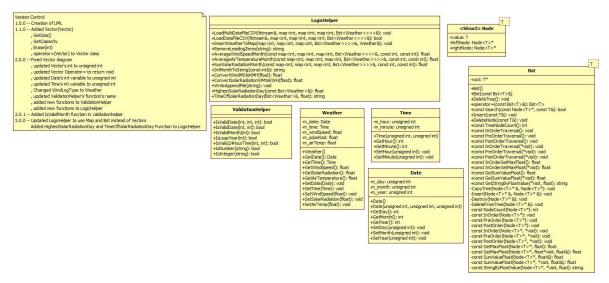
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UML



LOW-LEVEL UML



Data Dictionary

Refer to the excel document "DataDictionary.xlsx"

Algorithm

High Level

- 1. Get .txt file with list of data file names to read (met_index.txt)
- 2. Read Index File line by line
 - 1) Get .csv file with weather data
 - 2) Read .csv file line by line
 - 1) Read column by column
 - 2) Get DateTime (WAST)
 - a) Split DateTime into data and time

- b) Store Date in Date class
- c) Store Time in Time Class
- 3) Get WindSpeed (S)
- 4) Get Solar Radiation (SR)
- 5) Get Ambient Air Temperature (T)
- 3) Repeat for each line
- 3. Repeat for each file name in Index File
- 4. Store each line of extracted data into Weather object
- 5. For each Weather of a year
 - 1) Store in Map<Year, Map<Month, Map<Day, Bst<Weather>* >* >* > (Bst sort by time)
- 6. Display menu
- 7. If option 1 is chosen
 - 1) Ask user for month and year input
 - 2) Go to corresponding year and month of Maps and get all Weather object
 - 3) Sum all the WindSpeed and Air Temperature and count the number of Weather objects
 - 4) Divide WindSpeed and Air Temperature by count to get average
 - 5) Convert windspeed from m/s to km/h
 - 6) Print result
- 8. If Option 2 is chosen
 - 1) Ask user for year input
 - 2) Go to corresponding year of Maps and get all weather object
 - 3) Sum all wind speed and air temperature and count the number of Weather that matches
 - 4) Divide wind speed and air temperature by count to get average
 - 5) Convert wind speed from m/s to km/h
 - 6) Print result
- 9. If option 3 is chosen
 - 1) Ask user for year input
 - 2) Go to corresponding year of maps and get all weather object
 - 3) Sum all solar radiation
 - 4) Convert W/m^2 to kWh/m^2
 - 5) Print result
- 10. If option 4 is chosen
 - 1) Ask user for year input
 - 2) Go to corresponding year of maps and get all weather object
 - 3) Get average wind speed, average air temperature and total solar radiation
 - 4) Print result
- 11. If option 5 is chosen
 - 1) Ask user for date input (d/m/yyyy)
 - 2) Go to corresponding map for that date and get all weather objects
 - 3) Find the weather objects with the highest Solar Radiation
 - 4) Get the time for those weather objects
 - 5) Print result
- 12. If option 6 is chosen

1) Exit program

Low Level

Refer to the txt document "Pseudocode.txt"

Rationale

Weather Log data are stored in map(year) of map(month) of map(day) of BST of Weather data that is inserted based on time. The rationale for the above structure is to emulate a calendar when storing data. A particular date will only be inserted into the maps only if a log data with that date exist. Since all the current functions are searching by date, we can improve search time of the functions by storing it separated by date at the cost of increasing data loading time.

Another method would be to store Weather Log data in a map with datetime as key while storing the datetime in BSTs with one BST per year. This will improve loading time at the cost of longer search time instead as the program would have to search through the BST to look for if data with that date exist before finding the actual Weather data in map by searching through the map for the date again.

Test plan

Date Unit Test

Test	Description	Expected Output	Passed
1	Check constructor correctly	Default Constructor	Pass
	initializes the data and all getters	Day: -1	
	are able to retrieve the data	Month: -1	
		Year: -1	
		Constructor	
		Day: 1	
		Month: 1	
		Year: 1	
2	Check that day setter are working	Test Day setter	Pass
	correctly	Day: 3	
3	Check that month setter are	Test Month setter	Pass
	working correctly	Month: 3	
4	Check that year setter are	Test Year setter	Pass
	working correctly	Year: 3	

Time Unit Test

Test	Description	Expected Output	Passed

1	Check constructor correctly	Default Constructor	Pass
	initializes the data, and all	Hour: -1	
	getters can retrieve the data	Minute: -1	
		Constructor	
		Hour: 1	
		Minute: 1	
2	Check that hour setter are	Test Hour setter	Pass
	working correctly	Hour: 3	
3	Check that minute setter are	Test Minute setter	Pass
	working correctly	Minute: 3	
4	Check that < operator overload	Test < operator	Pass
	function can correctly compare 2	Test Time 1: 05:05	
	Time objects	Test Time 2: 03:03	
		Compare testTime1 <	
		testTime2: 0	
5	Check that > operator overload	Test > operator	Pass
	function can correctly compare 2	Test Time 1: 05:05	
	Time objects	Test Time 2: 03:03	
		Compare testTime1 >	
		testTime2: 1	

Weather Unit Test

Test	Description	Expected Output	Passed
1	Check that constructor correctly	Check constructor	Pass
	initialize the data and all getters	Date: -1/-1/-1	
	can retrieve the data	Time: 0-1:0-1	
		Wind Speed: -1	
		Solar Radiation-1	
		Air Temperature: -1	
2	Check that Date setter are	Date: 16/3/2016	Pass
	working correctly		
3	Check that Time setter are	Time: 09:15	Pass
	working correctly		
4	Check that Wind Speed setter	Wind Speed: 23.1	Pass
	are working correctly		
5	Check that Solar Radiation setter	Solar Radiation: 53.15	Pass
	are working correctly		
6	Check that Air Temperature	Air Temperature: 53.25	Pass
	setter are working correctly		
7	Check that < operator can	Test < operator	Pass
	correctly compare the time of	Time of weather 1: 0-1:0-1	
	weather object	Time of weather 2: 09:15	
		Compare weather1 < weather2:	
		1	
8	Check that > operator can	Test > operator	Pass
	correctly compare the time of	Time of weather 1: 0-1:0-1	
	weather object	Time of weather 2: 09:15	

	Compare weather1 > weather2:	
	0	

BstWeatherHelper Unit Test

Test	Description	Expected Output	Passed
1	Check that	Test GetWeatherWindSpeed	Pass
	GetWeatherWindSpeed function	23.1	
	can correctly get the wind speed		
	data from given weather object		
2	Check that GetWeatherAirTemp	Test GetWeatherAirTemp	Pass
	function can correctly get the air	53.25	
	temperature data from given		
	weather object		
3	Check that GetWeatherSolarRad	Test GetWeatherSolarRad	Pass
	function can correctly get the	53.15	
	solar radiation data		
4	Check that	Test	Pass
	GetWeatherTimeBySolarRad	GetWeatherTimeBySolarRad	
	function can correctly get the	Found match: 09:15	
	time data from given weather		
	object based on given solar	Match not found:	
	radiation value		

BST Unit Test

Test	Description	Expected Output	Passed
1	Check that Constructor can	Test Constructor	Pass
	correctly initialize an empty BST	0	
	and TreeNodeCount function		
	would return 0		
2	Check that the copy constructor	Test Copy constructor	Pass
	can correctly deep copy another	Tree1 values: 1	
	Vector	Tree2 values after copying	
		Tree1 and deleting Tree1: 1	
3	Check that the deconstructor can	Test deconstructor	Pass
	successfully delete the Vector	Tree1 values:	
		Tree2 values: 1	
		Tree2 values after	
		decontructed:	
4	Check that BST is correctly	Test DeleteTree function	Pass
	deleted using deleteTree function	Tree1 values:	
		Tree1 values after deleting tree:	
5	Check that Operator= can	Test = operator	Pass
	correctly deep copy another	Tree1 values: 1	
	Vector		

		Tree2 values after copying	
		Tree1 and deleting Tree1: 1	
6	Check that Search function can	Test Search function	Pass
	correctly determine if a value	Value found: 1	
	exist in BST	Value not found: 0	
7	Check that Insert function can	Test Insert function	Pass
	correctly insert into BST	Tree1 values:	
		After insert	
		Tree1 values: 1 2 3 4 5	
8	Check that DeleteNode function	Test DeleteNode function	Pass
	can correctly delete a node in	Tree1 values: 1 2 3 4 5	
	BST by value given	Deletes node	
		Tree1 values after delete: 2 3 4	
		5	
9	Check that TreeNodeCount	Test TreeNodeCount function	Pass
	function can return the correct	Count: 4	
	number of node in BST		
10	Check that InOrderTraversal	Test InOrderTraversal function	Pass
	function can traverse the BST in	1 2 3 4 5	
	an in order way		
11	Check that PreOrderTraversal	Test PreOrderTraversal	Pass
	function can traverse the BST in	function	
	a pre order way	21543	
12	Check that PostOrderTraversal	Test PostOrderTraversal	Pass
	function can traverse the BST in	function	
	a post order way	2 1 5 4 3	
13	Check that InOrderGetMaxFloat	Test InOrderGetMaxFloat	Pass
	function can correctly get the	function	
	largest value in BST	5	
		Test InOrderGetMaxFloat with	
		function as parameter	
		33.1	
14	Check that GetSumValueFloat	Test GetSumValueFloat	Pass
	function can correctly get the	function	
	total value of all nodes in BST	15	
		Test GetSumValueFloat with	
		function as parameter	
		69.3	
15	Check that	Test GetStringByFloatValue	Pass
	GetStringByFloatValue function	with function as parameter	
	can return correct string based on	09:15	
	given float value	09:15	
	-	09:15	

LogicHelper Unit Test

Te	Description	Expected Output	Pass
st			ed
1	Check that	Test LoadMultiDataFileCSV function	Pass
	LoadMultiDataFileCSV can	Loading file: dataFile1.csv	

file into map using a index file file file Loading file: dataFile2.csv Loaded data file: dataFile2.csv 1/1/2012 08:20 1/1/2012 08:30 1/1/2012 08:50 1/1/2012 08:50 1/1/2012 09:00 Check that LoadDataFileCSV can correctly load a data file into map using a index file 17/8/2010 19:10 17/8/2010 19:20 17/8/2010 19:30 17/8/2010 19:40 17/8/2010 19:50 Check that InsertWeatherToMap can correctly insert a Weather Object into map Check that RemoveLeadingZeros function can correctly remove the leading zeros when given a string Check that IntMonthToString function can correctly return the month in string when provided with a month in integer Loading file: dataFile2.csv Loaded data file into map using a index file 17/8/2010 19:20 17/8/2010 19:30 17/8/2010 19:40 17/8/2010 19:50 Test InsertWeatherToMap function 16/3/2016 09:15 Fast RemoveLeadingZeros(08): 8 Test RemoveLeadingZeros(08): 8 Test RemoveLeadingZeros(08): 8 Test IntMonthToString(unsigned int) Test IntMonthToString(8): August Test IntMonthToString file Enror converting int month to string ERROR			T	
file		correctly load multiple data	Loaded data file: dataFile1.csv	
1/1/2012 08:20		<u> </u>		
1/1/2012 08:30 1/1/2012 08:40 1/1/2012 09:00		file	Loaded data file: dataFile2.csv	
1/1/2012 08:40 1/1/2012 08:50 1/1/2012 08:50 1/1/2012 09:00			1/1/2012 08:20	
1/1/2012 08:50			1/1/2012 08:30	
Check that LoadDataFileCSV can correctly load a data file into map using a index file 17/8/2010 19:10 17/8/2010 19:30 17/8/2010 19:50 17/8/2010 19:50 17/8/2010 19:50 17/8/2010 19:50 17/8/2010 19:50 17/8/2010 19:50 17/8/2010 19:50 17/8/2010 19:50 17/8/2010 19:50 17/8/2010 19:50 17/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:40 17/8/2010 19:30 17/8/2010 19:30 17/8/2010 19:30 17/8/2010 19:40 17/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:50 18/8/2010 19:40 17/8/2010 19:30 18/8/2010 19:40 17/8/2010 19:30 18/8/2010 19:40 17/8/2010 19:30 18/8/2010 19:30 18/8/2010 19:40 18/8/2010 19:30 18/8/2			1/1/2012 08:40	
Check that			1/1/2012 08:50	
LoadDataFileCSV can correctly load a data file into map using a index file into into map using a index file into into index that Into into a to into into a test RemoveLeadingZeros(thing) and into into into into into into into into			1/1/2012 09:00	
LoadDataFileCSV can correctly load a data file into map using a index file into into map using a index file into into index that Into into a to into into a test RemoveLeadingZeros(thing) and into into into into into into into into	2	Check that		Pass
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17/8/2010 19:50		into map using a mack me		
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ConvertSolarRadiationWMtoKWH(12		LO K VV II/ III	,	
0.42): 0.02007			,	
		Cl. 1 d	,	D
	8			Pass
AverageWindSpeedMonth AverageWindSpeedMonth(vector,int,in				
function can correctly find t)		_	1 ^	
and calculate the average Test		_		
windspeed for a month AverageWindSpeedMonth(TestLog,3,2		windspeed for a month		
016): 5.4			016): 5.4	
		windspeed for a month		

		Test	
		AverageWindSpeedMonth(TestLog,1,2	
		020): -1	
9	Check that	Test	Pass
	AverageAirTemperatureMo	AverageAirTemperatureMonth(vector,i	
	nth function can correctly	nt,int)	
	find and calculate the	Test	
	average ambient air	AverageAirTemperatureMonth(TestLo	
	temperature for a month	g,3,2016): 21.33	
		Test	
		AverageAirTemperatureMonth(TestLo	
		g,1,2020): -1	
10	Check that	Test	Pass
	SumSolarRadiationMonth	SumSolarRadiationMonth(vector,int,in	
	function can correctly find	<u>t)</u>	
	and calculate the total solar	Test	
	radiation for a month	SumSolarRadiationMonth(TestLog,3,2	
		016): 2891	
		Test	
		SumSolarRadiationMonth(TestLog,1,2	
1.1	Cl. 1 d.	020): -1	D
11	Check that	Test WriteAppendFile(string)	Pass
	WriteAppendFile able to	*I ask for the test say file	
	correctly write to	*Look for the test.csv file	
	"WindTempSolar.csv"	tostatrina	
		teststring	
12	Check that	teststring2 Test HighestSolarRadiationDay	Pass
12	HighestSolarRadiationDay	function	rass
	function can find the largest	906	
	solar radiation value in a	700	
	map of weather		
13	Check that	Test TimeOfSolarRadiationDay	Pass
	TimeOfSolarRadiationDay	function	1 433
	function can find the list of	09:20	
	time of weather object that	09:30	
	has the same solar radiation		
	value as the given value		
			i

ValidationHelper Unit Test

Test	Description	Expected Output	Passed
1	Check that IsValidDate function	Checking IsValidDate(int day,	Pass
	can correctly determine if a date is	int month, int year)	
	valid when given the day, month	Positive case (29/2/2020): 1	
	and year	Negative case, wrong day	
		(31/2/2020): 0	
		Negative case, wrong month	
		(29/13/2020): 0	

		I ·	 _
		Negative case, wrong year (29/2/99): 0	
		Negative case, not leap year (29/2/2022): 0	
2	Check that IsValidDate function	Checking IsValidDate(int	Pass
	can correctly determine if a date is	month, int year)	
	valid when given the month and	Positive case (2/2020): 1	
	year only	Negative case, wrong month	
		(13/2020): 0	
		Negative case, wrong year	
3	Check that IsValidMonth function	(2/99): 0 Checking IsValidMonth(int	Pass
3	can correctly determine if a int is	month)	rass
	valid month	Positive case (2): 1	
	varia month	Negative case, wrong month	
		(13): 0	
4	Check that IsLeapYear function	Checking IsLeapYear(int	Pass
	can correctly determine if a year is	year)	
	a leap year	Positive case (2020): 1 Negative case (2022): 0	
5	Check that IsValid24HourTime	Checking	Pass
3	function can correctly determine if	IsValid24HourTime(int hour,	1 488
	a given hour and minute is valid	int minute)	
	24 hour time	Positive case (8,50): 1	
	2 i nour time	Negative case, wrong hour	
		(25,50): 0	
		Negative case, wrong minute	
		(24,60): 0	
6	Check that IsNumber function can	Checking IsNumber(string	Pass
	correctly determine if a provided	input)	
	string is positive int/float	Positive case (415): 1	
		Positive case (63.41): 1	
		Negative case, negative int (-1): 0	
		Negative case, negative float	
		(-1.2): 0	
		Negative case, too many decimal points	
		(123456.123456789012345):	
		(123 1 30.123 1 30/070123 1 3).	
		Negative case, octal numbers	
		(08): 0	
7	Check that IsInteger function can	Checking IsInteger(string	Pass
	correctly determine if a provided	input)	
	string is a positive integer	Positive case (415): 1	
		Negative case (45.21): 0 Negative case (-1): 0	
		Negative case (-1): 0 Negative case (08): 0	
		INEGALIVE CASE (UO). U	

FunctionHelper Unit Test

Te	Description	Expected Output	Passe d
1	Check that DisplayMenu function can successfully display the menu	Test DisplayMenu function 1. The average wind speed and average ambient air temperature for a specified month and year. 2. Average wind speed and average ambient air temperature for each month of a specified year. 3. Total solar radiation in kWh/m2 for each month of a specified year. 4. Write average wind speed (km/h), average ambient air temperature and total solar radiation in kWh/m2 for each month of a specified year to CSV. 5. Show the times for the highest solar radiation for a date (d/m/yyy/) 6. Exit the program.	Pass
2	Check that FindAverageWindTempMonth can correctly carry out the function of option 1 of menu given map, month and year input	Test FindAverageWindTempMonth function for option 1 January 2010: 22.500000 km/h, 21.709999 degrees C	Pass
3	Check that FindAverageWindTempMonth can correctly carry out the function of option 2 of menu given map and year input	Test FindAverageWindTempMonth function for option 2 January 2010: 22.500000 km/h, 21.709999 degrees C February 2010: No Data March 2010: 21.600000 km/h, 18.940001 degrees C April 2010: No Data May 2010: No Data June 2010: No Data July 2010: No Data July 2010: No Data August 2010: 7.200000 km/h, 11.366000 degrees C September 2010: No Data October 2010: No Data November 2010: No Data December 2010: No Data	Pass

4	Check that	Test FindSumSolarRadMonth	Pass
'	FindSumSolarRadMonth can	function for option 3	1 435
	correctly carry out the function of	January 2010: 0.014473 kWh/m ²	
	option 3 of menu given map and	February 2010: No Data	
	year input	March 2010: 0.015783 kWh/m ²	
	year mpac	April 2010: No Data	
		May 2010: No Data	
		June 2010: No Data	
		July 2010: No Data	
		August 2010: 0.009472 kWh/m ²	
		September 2010: No Data	
		October 2010: No Data	
		November 2010: No Data	
		December 2010: No Data	
5	Check that	2010	Pass
	OutputFileAverageWindTempSol	January,22.500000,21.709999,0.	1 ass
	arMonth can correctly carry out	014473	
	the function of option 4 of menu	March,21.600000,18.940001,0.0	
	given map and year input	15783	
	grow map and your mpac	August,7.200000,11.366000,0.0	
		09472	
		02.112	
		*in WindTempSolar.csv	
6	Check that	Test	Pass
	FindHighestSolarTimeByDate can	FindHighestSolarTimeByDate	
	correctly carry out the function of	function for option 5	
	option 5 of menu given map, day,	Date: 1/1/2010	
	month and year input	High solar radiation for the day:	
		0.151000W/m2	
		Time:	
		09:20	
		09:30	

Main SIT (Using Test.csv)

Test	Description	Expected Output	Passed
1	Check that if user entered	Error while opening file: notfound.csv	Pass
	invalid file name in the		
	index file the program		
	will print error and		
	continue with available		
	data		
2	Check that invalid month	Error: invalid month. Expects integer.	Pass
	or year input while using		
	function 1, it will result		
	in error		
3	Check that invalid month	Error : invalid date.	Pass
	and year combination		

	will result in error and		
	stopping of program		
4	Check that function 1 can print correctly average wind speed and average	January 2010: 22.500000 km/h, 21.709999 degrees C	Pass
	air temperature when data is found for the		
	specific month and year		
	in km/h and degrees C respectively		
5	Check that function 1	February 2010: No Data	Pass
	will show no data if no data is found for the		
	specific month and year		
6	Check that if user entered	Error: invalid year. Expects integer.	Pass
	invalid year while using function 2, it will result		
	in error		
7	Check that function 2 can correctly print the	January 2010: 22.500000 km/h, 21.709999 degrees C	Pass
	average wind speed and	February 2010: No Data	
	average air temperature	March 2010: 21.600000 km/h,	
	of all 12 months in the	18.940001 degrees C	
	specific year in km/h and	April 2010: No Data	
	degrees C respectively and no data if no data is	May 2010: No Data June 2010: No Data	
	found for the month	July 2010: No Data	
	Tourist for the month	August 2010: 7.200000 km/h,	
		11.366000 degrees C	
		September 2010: No Data	
		October 2010: No Data	
		November 2010: No Data	
		December 2010: No Data	
8	Check that if user entered invalid year while using function 3, it will result in error	Error: invalid year. Expects integer.	Pass
9	Check that function 3 can	2016	Pass
	correctly print the total	January 2016: No Data	
	solar radiation for each	February 2016: No Data	
	month for a specific year	March 2016: 0.481833 kWh/m ²	
	in kWh/m ² and no data if no data is found for the	April 2016: No Data	
	month	May 2016: No Data June 2016: No Data	
	ПОПШ	July 2016: No Data	
		August 2016: No Data	
		September 2016: No Data	
		October 2016: No Data	
		November 2016: No Data	
		December 2016: No Data	

10	Check that if user entered	Error: invalid year. Expects integer.	Pass
10	invalid year while using	Error. invalid year. Expects integer.	1 433
	function 4, it will result		
	in error		
1.1	Check that function 4 can	*C11- W' - 1T C -1	D
11		*Check WindTempSolar.csv	Pass
	correctly output the	2010	
	average wind speed,	2010	
	average temperature and	January,22.500000,21.709999,0.014473	
	total solar radiation for	March,21.600000,18.940001,0.015783	
	each month of a specific	August,7.200000,11.366000,0.009472	
	year in km/h, degrees C		
	and kWh/m2 and no line		
	for months with no data		
12	Check that if user entered	Error: Invalid date	Pass
	an invalid	Error Data: 31/31/31	
	date(dd/mm/yyyy) while	Accepted date format: dd/mm/yyyy	
	using function 5, it will		
	result in error		
13	Check that function 5 can	Date: 1/1/2010	Pass
	correctly output the	High solar radiation for the day:	
	highest solar radiation	0.151000W/m2	
	level of a given date and		
	return a list of time with	Time:	
	that solara radiation level	09:20	
		09:30	
14	Check that function 6 can	*Program exits	Pass
	quit the program		
15	Check that inputting any	Error: Unknown command. Only	
	function other than 1-6	numbers 1-6 accepted.	
	will return in error and	F	
	repeatedly display the		
	menu		
L	1110110		l .

```
Default Constuctor
     Day: -1
     Month: -1
     Year: -1
    Constructor
    Day: 1
    Month: 1
     Year: 1
  2)
     Test Day setter
     Day: 3
  3)
    Test Month setter
    Month: 3
  4)
    Test Year setter
    Year: 3
Time Unit Test
  1)
     Default Constructor
     Hour: -1
     Minute: -1
  2)
     Constructor
     Hour: 1
     Minute: 1
  3)
     Test Hour setter
    Hour: 3
  4)
    Test Minute setter
    Minute: 3
  5)
```

```
Test < operator
     Test Time 1: 05:05
     Test Time 2: 03:03
     Compare testTime1 < testTime2: 0
  6)
     Test > operator
     Compare testTime1 > testTime2: 1
Weather Unit Test
  1)
     Check constructor
     Date: -1/-1/-1
     Time: 0-1:0-1
     Wind Speed: -1
     Solar Radiation-1
     Air Temperature: -1
  2)
     Test Date setter
     Date: 16/3/2016
  3)
     Test Time setter
     Time: 09:15
  4)
     Test Wind Speed Setter
     Wind Speed: 23.1
  5)
     Test Solar radiation Setter
     Solar Radiation53.15
  6)
     Test Air temp setter
     Air Temperature: 53.25
  7)
```

```
Test < operator
     Time of weather 1: 0-1:0-1
     Time of weather 2: 09:15
     Compare weather1 < weather2: 1
  8)
     Test > operator
     Time of weather 1: 0-1:0-1
     Time of weather 2: 09:15
     Compare weather1 > weather2: 0
BstWeatherHelper Unit Test
  1)
    Test GetWeatherWindSpeed
    23.1
  2)
     Test GetWeatherAirTemp
     53.25
  3)
     Test GetWeatherSolarRad
     53.15
  4)
     Test GetWeatherTimeBySolarRad
     Found match: 09:15
     Match not found:
BST Unit Test
  1)
     Test Constructor
    0
  2)
```

```
Test Copy constructor
  Tree1 values: 1
  Tree2 values after copying Tree1 and deleting Tree1: 1
3)
  Test deconstructor
  Tree1 values:
  Tree2 values: 1
  Tree2 values after decontructed:
4)
  Test DeleteTree function
  Tree1 values:
  Tree1 values after deleting tree:
5)
  Test = operator
  Tree1 values: 1
  Tree2 values after copying Tree1 and deleting Tree1: 1
6)
  Test Search function
  Value found: 1
  Value not found: 0
7)
   Test Insert function
   Tree1 values:
   After insert
  Tree1 values: 1 2 3 4 5
8)
   Test DeleteNode function
  Tree1 values: 1 2 3 4 5
  Deletes node
  Tree1 values after delete: 2 3 4 5
9)
  Test TreeNodeCount function
  Count: 4
10)
  Test InOrderTraversal function
  1 2 3 4 5
```

```
11)
  Test PreOrderTraversal function
  2 1 5 4 3
12)
  Test PostOrderTraversal function
  2 1 5 4 3
13)
  Test InOrderGetMaxFloat function
  Test InOrderGetMaxFloat with function as parameter
  33.1
14)
  Test GetSumValueFloat function
  Test GetSumValueFloat with function as parameter
  69.3
15)
  Test GetStringByFloatValue with function as parameter
  09:15
  09:15
  09:15
```

LogicHelper Unit Test

1)

```
Test LoadMultiDataFileCSV function
Loading file: dataFile1.csv
Loaded data file: dataFile1.csv
Loading file: dataFile2.csv
Loaded data file: dataFile2.csv
1/1/2012 08:20
1/1/2012 08:30
1/1/2012 08:40
1/1/2012 09:00
```

```
2)
         Test LoadDataFileCSV function
         17/8/2010 19:10
         17/8/2010 19:20
         17/8/2010 19:30
         17/8/2010 19:40
         17/8/2010 19:50
      3)
         Test InsertWeatherToMap function
         16/3/2016 09:15
      4)
         Test RemoveLeadingZeros(string)
         Test RemoveLeadingZeros(08): 8
         Test RemoveLeadingZeros(08.9): 8.9
      5)
         Test IntMonthToString(unsigned int)
         Test IntMonthToString(8): August
         Test IntMonthToString(13):
         Error converting int month to string
         ERROR
      6)
         Test ConvertWindMStoKMH(float)
         Test ConvertWindMStoKMH(10): 36
         Test ConvertWindMStoKMH(10.5): 37.8
      7)
Test ConvertSolarRadiationWMtoKWH(float)
Test ConvertSolarRadiationWMtoKWH(120): 0.02
Test ConvertSolarRadiationWMtoKWH(120.42): 0.02007
      8)
    Test AverageWindSpeedMonth(vector,int,int)
    Test AverageWindSpeedMonth(TestLog, 3, 2016): 6.25
    Test AverageWindSpeedMonth(TestLog,1,2020): -1
      9)
```

```
Test AverageAirTemperatureMonth(vector,int,int)
     Test AverageAirTemperatureMonth(TestLog,3,2016): 21.71
     Test AverageAirTemperatureMonth(TestLog,1,2020): -1
  10)
    Test SumSolarRadiationMonth(vector,int,int)
    Test SumSolarRadiationMonth(TestLog, 3, 2016): 86.84
     Test SumSolarRadiationMonth(TestLog,1,2020): -1
  11)
     TESTLOGICHELPER.CPP
                                              ■ test.csv
      test.csv
            teststring
        2
            teststring2
  12)
    Test HighestSolarRadiationDay function
    906
  13)
     Test TimeOfSolarRadiationDay function
     09:20
     09:30
ValidationHelper Unit Test
  1)
Checking IsValidDate(int day, int month, int year)
Positive case (29/2/2020): 1
Negative case, wrong day (31/2/2020): 0
Negative case, wrong month (29/13/2020): 0
Negative case, wrong year (29/2/99): 0
Negative case, not leap year (29/2/2022): 0
  2)
```

X

```
Checking IsValidDate(int month, int year)
  Positive case (2/2020): 1
  Negative case, wrong month (13/2020): 0
  Negative case, wrong year (2/99): 0
3)
  Checking IsValidMonth(int month)
  Positive case (2): 1
  Negative case, wrong month (13): 0
  Checking IsLeapYear(int year)
  Positive case (2020): 1
  Negative case (2022): 0
4)
  Checking IsValid24HourTime(int hour, int minute)
   Positive case (8,50): 1
   Negative case, wrong hour (25,50): 0
   Negative case, wrong minute (24,60): 0
5)
  Checking IsNumber(string input)
  Positive case (415): 1
  Positive case (63.41): 1
  Negative case, negative int (-1): 0
  Negative case, negative float (-1.2): 0
  Negative case, octal numbers (08): 0
6)
  Checking IsInteger(string input)
  Positive case (415): 1
  Negative case (45.21): 0
  Negative case (-1): 0
  Negative case (08): 0
```

FunctionHelper Unit Test

Test DisplayMenu function

- 1. The average wind speed and average ambient air temperature for a specified month and year.
- 2. Average wind speed and average ambient air temperature for each month of a specified year.
- 3. Total solar radiation in kWh/m2 for each month of a specified year.
- 4. Write average wind speed (km/h), average ambient air temperature and total solar radiation in kWh/m2 for eac h month of a specified year to CSV.
- 5. Show the times for the highest solar radiation for a date (d/m/yyy/)
- 6. Exit the program.

2)

Test FindAverageWindTempMonth function for option 1 January 2010: 22.500000 km/h, 21.709999 degrees C

3)

Test FindAverageWindTempMonth function for option 2 January 2010: 22.500000 km/h, 21.709999 degrees C

February 2010: No Data

March 2010: 21.600000 km/h, 18.940001 degrees C

April 2010: No Data May 2010: No Data June 2010: No Data July 2010: No Data

August 2010: 7.200000 km/h, 11.366000 degrees C

September 2010: No Data October 2010: No Data November 2010: No Data December 2010: No Data

4)

Test FindSumSolarRadMonth function for option 3

January 2010: 0.014473 kWh/m²

February 2010: No Data

March 2010: 0.015783 kWh/m²

April 2010: No Data May 2010: No Data June 2010: No Data July 2010: No Data

August 2010: 0.009472 kWh/m²

September 2010: No Data October 2010: No Data November 2010: No Data December 2010: No Data

```
WindTempSolar.csv
            2010
       1
            January, 22.500000, 21.709999, 0.014473
       2
            March, 21.600000, 18.940001, 0.015783
            August, 7.200000, 11.366000, 0.009472
  6)
     Test FindHighestSolarTimeByDate function for option 5
     Date: 1/1/2010
    High solar radiation for the day: 0.151000W/m2
     Time:
     09:20
     09:30
Main SIT
  1)
     Error while opening file: notfound.csv
  2)
     Input month to search(1-12)
     Error: invalid month. Expects integer.
  3)
     Input month to search(1-12)
     13
     Input year to search
     9123
    Error: invalid date.
  4)
     Input month to search(1-12)
     1
     Input year to search
     2010
     January 2010: 22.500000 km/h, 21.709999 degrees C
  5)
```

Input month to search(1-12)
2
Input year to search
2010
February 2010: No Data

Input year to search(YYYY)
rw
Error: invalid year. Expects integer.

January 2010: 22.500000 km/h, 21.709999 degrees C February 2010: No Data March 2010: 21.600000 km/h, 18.940001 degrees C April 2010: No Data

May 2010: No Data
June 2010: No Data
July 2010: No Data

August 2010: 7.200000 km/h, 11.366000 degrees C

September 2010: No Data October 2010: No Data November 2010: No Data December 2010: No Data

Input year to search
12345
Error: invalid year. Expects integer.

9)

```
January 2010: 0.014473 kWh/m<sup>2</sup>
  February 2010: No Data
  March 2010: 0.015783 kWh/m<sup>2</sup>
  April 2010: No Data
  May 2010: No Data
  June 2010: No Data
  July 2010: No Data
  August 2010: 0.009472 kWh/m<sup>2</sup>
  September 2010: No Data
  October 2010: No Data
  November 2010: No Data
  December 2010: No Data
10)
  Input year to search
   ytr
  Error: invalid year. Expects integer.
11)
  WindTempSolar.csv
        2010
   2
        January, 22.500000, 21.709999, 0.014473
   3
        March, 21.600000, 18.940001, 0.015783
        August,7.200000,11.366000,0.009472
12)
   Error: Invalid date
  Error Data: 31/31/31
  Accepted date format: dd/mm/yyyy
13)
  Date: 1/1/2010
  High solar radiation for the day: 0.151000W/m2
```

Time: 09:20 09:30

14)

Error: Unknown command. Only numbers 1-6 accepted.

Evaluation

Refer to txt document "Evaluation.txt"