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SIT123: Data Capture Technologies

Lab Report 3.1:

Using the Data Logger Shield in Arduino (30 marks)

In this task, we will learn about using an SD card to save sensor data.

Pre-requisites: You must do the following before this task

1. **Attend Class (Lecture) & Seminar**
2. **Lab report 2**
3. **Read <https://learn.adafruit.com/adafruit-data-logger-shield/using-the-real-time-clock>**
4. **Read this sheet from top to bottom**

Due Date Friday 5:00pm, 12th August 2022

Task Objective

In this task, you will write a program to detect motion and save the detected motion readings to an SD card, using a data logger shield.

Hardware Required

Arduino Board

USB cable

SD Card (SanDisk 16Gb Ultra SDHC Memory Card)

Data Logging Shield for Arduino

CR1220 Coin Cell Battery

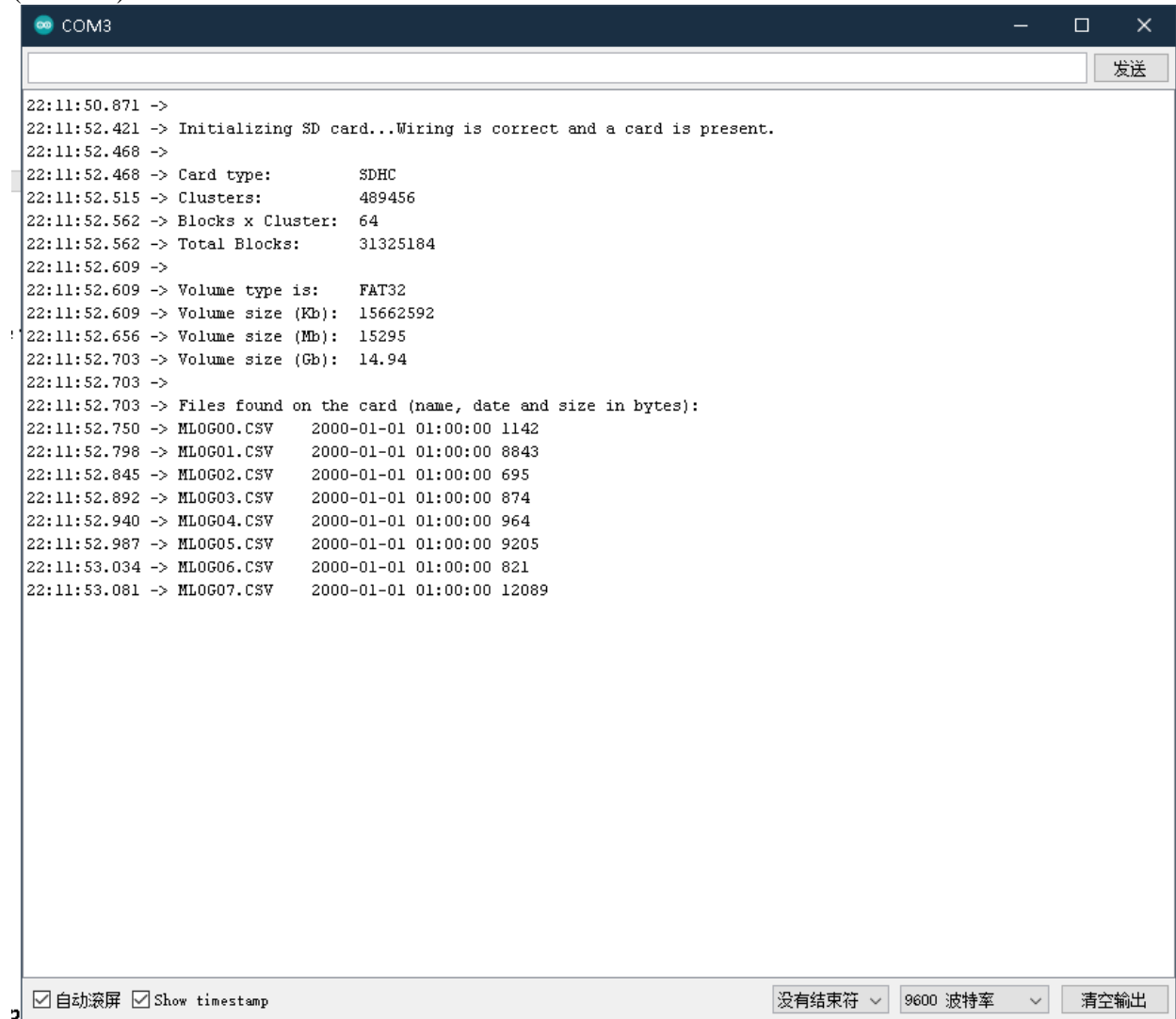
HCSR505 PIR Passive Infra Red Motion Detector

Task Submission Details

There are 3 questions in this task. Answer all of them in this word document itself and submit to unit site.

Q1. Follow the steps in “Setting Up The SD Card Activity Sheet”. At the end of activity, take a screenshot of the Serial Monitor and include here.

(5 marks)



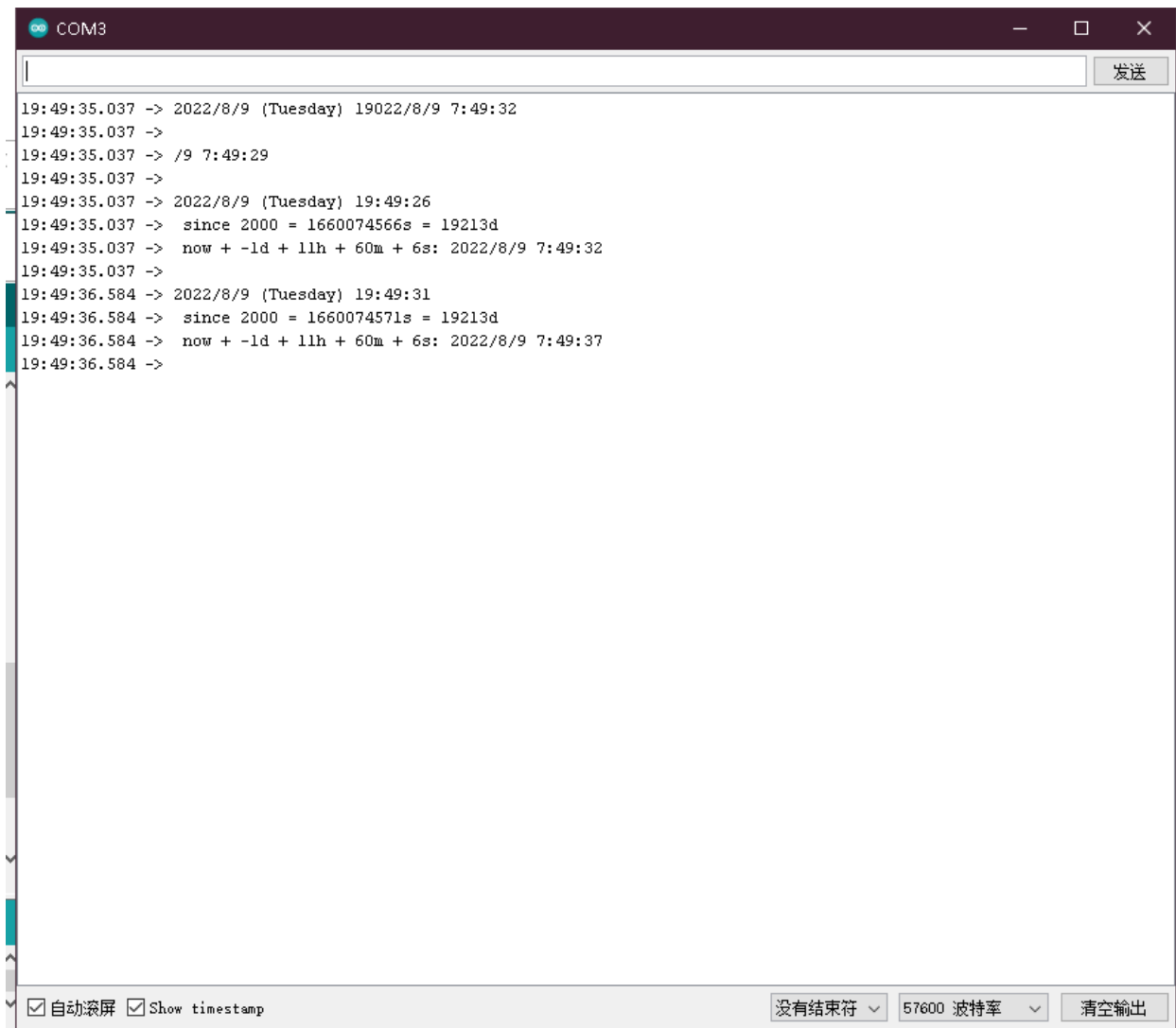
The screenshot shows a Serial Monitor window titled "COM3". The window has a text area displaying the following output:

```
22:11:50.871 ->
22:11:52.421 -> Initializing SD card...Wiring is correct and a card is present.
22:11:52.468 ->
22:11:52.468 -> Card type:          SDHC
22:11:52.515 -> Clusters:          489456
22:11:52.562 -> Blocks x Cluster:    64
22:11:52.562 -> Total Blocks:    31325184
22:11:52.609 ->
22:11:52.609 -> Volume type is:      FAT32
22:11:52.609 -> Volume size (Kb):    15662592
22:11:52.656 -> Volume size (Mb):    15295
22:11:52.703 -> Volume size (Gb):    14.94
22:11:52.703 ->
22:11:52.703 -> Files found on the card (name, date and size in bytes):
22:11:52.750 -> MLOG00.CSV      2000-01-01 01:00:00 1142
22:11:52.798 -> MLOG01.CSV      2000-01-01 01:00:00 8843
22:11:52.845 -> MLOG02.CSV      2000-01-01 01:00:00 695
22:11:52.892 -> MLOG03.CSV      2000-01-01 01:00:00 874
22:11:52.940 -> MLOG04.CSV      2000-01-01 01:00:00 964
22:11:52.987 -> MLOG05.CSV      2000-01-01 01:00:00 9205
22:11:53.034 -> MLOG06.CSV      2000-01-01 01:00:00 821
22:11:53.081 -> MLOG07.CSV      2000-01-01 01:00:00 12089
```

At the bottom of the window, there are several controls: a checkbox for "自动滚屏" (Auto Scroll) which is checked, a checkbox for "Show timestamp" which is checked, a dropdown menu for "没有结束符" (No terminator), a dropdown menu for "9600 波特率" (9600 baud rate), and a button labeled "清空输出" (Clear output).

Q2. Follow the steps in “Using the Real Time Clock Activity Sheet”.

- At the end of activity, take a screenshot of the Serial Monitor and include here. (6 marks)



```
19:49:35.037 -> 2022/8/9 (Tuesday) 19022/8/9 7:49:32
19:49:35.037 ->
19:49:35.037 -> /9 7:49:29
19:49:35.037 ->
19:49:35.037 -> 2022/8/9 (Tuesday) 19:49:26
19:49:35.037 -> since 2000 = 1660074566s = 19213d
19:49:35.037 -> now + -1d + 11h + 60m + 6s: 2022/8/9 7:49:32
19:49:35.037 ->
19:49:36.584 -> 2022/8/9 (Tuesday) 19:49:31
19:49:36.584 -> since 2000 = 1660074571s = 19213d
19:49:36.584 -> now + -1d + 11h + 60m + 6s: 2022/8/9 7:49:37
19:49:36.584 ->
```

☒ 自动滚屏 ☒ Show timestamp 没有结束符 57600 波特率 清空输出

b. Examine the code. What does the following line of code do?

```
DateTime now = rtc.now();
```

This function returns a DateTime object that describes the year, month, day, hour, minute, and second when now() was called on that object.

(Hint: refer to <https://learn.adafruit.com/adafruit-data-logger-shield/using-the-real-time-clock>)
(4 marks)

Q3. Now you are ready to start logging data to file! Follow the steps in “Saving Motion Data Activity Sheet”.

a. At the end of activity, take a screenshot of the Serial Monitor and include here.
(5 marks)

```
22:26:00.892 -> 62999, 1660083955, 2022/8/9 22:25:55, Inactive
22:26:01.930 -> 64000, 1660083956, 2022/8/9 22:25:56, Inactive
22:26:02.929 -> 64999, 1660083957, 2022/8/9 22:25:57, Inactive
22:26:03.922 -> 65999, 1660083958, 2022/8/9 22:25:58, Inactive
22:26:04.918 -> 66999, 1660083959, 2022/8/9 22:25:59, Inactive
22:26:05.912 -> 67999, 1660083960, 2022/8/9 22:26:0, Inactive
22:26:06.906 -> 68999, 1660083961, 2022/8/9 22:26:1, Inactive
22:26:07.900 -> 69999, 1660083962, 2022/8/9 22:26:2, Inactive
22:26:08.892 -> 71000, 1660083963, 2022/8/9 22:26:3, Inactive
22:26:09.889 -> 71999, 1660083964, 2022/8/9 22:26:4, Inactive
22:26:10.932 -> 72999, 1660083965, 2022/8/9 22:26:5, Inactive
22:26:11.928 -> 73999, 1660083966, 2022/8/9 22:26:6, Inactive
22:26:12.922 -> 74999, 1660083967, 2022/8/9 22:26:7, Inactive
22:26:13.920 -> 75999, 1660083968, 2022/8/9 22:26:8, Inactive
22:26:14.916 -> 76999, 1660083969, 2022/8/9 22:26:9, Inactive
22:26:15.910 -> 78000, 1660083970, 2022/8/9 22:26:10, Inactive
22:26:16.904 -> 78999, 1660083971, 2022/8/9 22:26:11, Inactive
22:26:17.903 -> 80000, 1660083972, 2022/8/9 22:26:12, Inactive
22:26:18.896 -> 80999, 1660083973, 2022/8/9 22:26:13, Inactive
22:26:19.891 -> 81999, 1660083974, 2022/8/9 22:26:14, Inactive
22:26:20.885 -> 82999, 1660083975, 2022/8/9 22:26:15, Inactive
22:26:21.882 -> 83998, 1660083976, 2022/8/9 22:26:16, Inactive
22:26:22.925 -> 84999, 1660083977, 2022/8/9 22:26:17, Inactive
22:26:23.920 -> 85999, 1660083978, 2022/8/9 22:26:18, Inactive
22:26:24.916 -> 86999, 1660083979, 2022/8/9 22:26:19, Inactive
22:26:25.912 -> 87998, 1660083980, 2022/8/9 22:26:20, Inactive
22:26:26.906 -> 88999, 1660083981, 2022/8/9 22:26:21, Inactive
22:26:27.902 -> 89998, 1660083982, 2022/8/9 22:26:22, Inactive
22:26:28.886 -> 90999, 1660083983, 2022/8/9 22:26:23, Inactive
22:26:29.926 -> 91999, 1660083984, 2022/8/9 22:26:24, Inactive
22:26:30.915 -> 92999, 1660083985, 2022/8/9 22:26:25, Inactive
22:26:31.914 -> 93999, 1660083986, 2022/8/9 22:26:26, Inactive
22:26:32.908 -> 94999, 1660083987, 2022/8/9 22:26:27, Inactive
22:26:33.900 -> 96000, 1660083988, 2022/8/9 22:26:28, Inactive
22:26:34.887 -> 96999, 1660083989, 2022/8/9 22:26:29, Inactive
22:26:35.880 -> 97999, 1660083990, 2022/8/9 22:26:30, Inactive
22:26:36.919 -> 98999, 1660083991, 2022/8/9 22:26:31, Inactive
```

- b. Run your program. Wave your hand in front of the motion sensor and observe the 'Active' state, then stop and wait until you see an 'Inactive' state on the Serial Monitor. Keep doing this for three minutes so that you get both 'Active' and 'Inactive' data. At the end of three minutes, unplug the USB. This will switch off the Arduino board. Next, retrieve the .csv file containing motion sensor data from the SD card. Upload the .csv file with this report to unit site.

(10 marks)

References

<https://learn.adafruit.com/adafruit-data-logger-shield/using-the-sd-card>

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SIT123: Data Capture Technologies

Lab Report 3.2:

Analyze motion sensor data (30 marks)

In this task we will see how to analyse a given set of motion sensor data and infer how John's bathroom usage compares to the rest of the population.

Due Date Friday 5:00pm, 12th August 2022

Hardware Required

None.

Software Required

Microsoft Excel

Pre-requisites: You must do the following before this task

- 1. Attend Class (Lecture) & Seminar**
- 2. Read this sheet from top to bottom**

Task Overview

Raw data is given in the Excel file. Explanation about the data in the Excel file is given in the data document file "Data document.pdf".

We will be using the following key steps to execute this task.

Step 1 - Read the provided Data document and inspect the provided raw data in the Excel file

Step 2 - Calculate the time durations for each bathroom visit

Step 3 - Calculate descriptive statistics for the data set using Excel's built-in functions, to find out some useful information about John's bathroom usage, such as the average time he spends in the bathroom per visit.

Step-by-step Instructions: Calculate the time durations for each bathroom visit

1. Open the provided Excel file. You are now going to use the given data to calculate time durations for each bathroom visit. To do this, first insert new sheet. Name it 'CalculatedDurations'
2. Copy the two columns TIMESTAMP & STATE from the first sheet to the newly created sheet

G30

	A	B	C	D
1	TIMESTAMP	STATE		
2	01/01/17 10:00:00	Active		
3	01/01/17 10:15:00	Inactive		
4	01/01/17 14:00:00	Active		
5	01/01/17 14:05:30	Inactive		
6	01/01/17 22:15:30	Active		
7	01/01/17 22:20:00	Inactive		
8	02/01/17 7:05:00	Active		
9	02/01/17 7:22:00	Inactive		
10	02/01/17 21:00:00	Active		
11	02/01/17 21:10:00	Inactive		
12	03/01/17 7:01:00	Active		
13	03/01/17 7:16:20	Inactive		
14	03/01/17 19:16:20	Active		
15	03/01/17 19:25:20	Inactive		
16	03/01/17 22:16:00	Active		
17	03/01/17 22:20:00	Inactive		
18	04/01/17 7:01:00	Active		

raw_data CalculatedDurations +

Select destination and press ENTER or choose Paste

3. Add a new column with header 'DURATION (MINUTES)' to the right.

	A	B	C
1	TIMESTAMP	STATE	DURATION (MINUTES)
2	01/01/17 10:00:00	Active	
3	01/01/17 10:15:00	Inactive	
4	01/01/17 14:00:00	Active	
5	01/01/17 14:05:30	Inactive	
6	01/01/17 22:15:30	Active	
7	01/01/17 22:20:00	Inactive	
8	02/01/17 7:05:00	Active	
9	02/01/17 7:22:00	Inactive	
10	02/01/17 21:00:00	Active	
11	02/01/17 21:10:00	Inactive	
12	03/01/17 7:01:00	Active	
13	03/01/17 7:16:20	Inactive	
14	03/01/17 19:16:20	Active	
15	03/01/17 19:25:20	Inactive	
16	03/01/17 22:16:00	Active	
17	03/01/17 22:20:00	Inactive	
18	04/01/17 7:01:00	Active	
19	04/01/17 7:16:20	Inactive	
20	04/01/17 19:30:40	Active	
21	04/01/17 19:41:20	Inactive	
22	04/01/17 22:26:00	Active	

raw_data CalculatedDurations +

Ready

4. Now, what we want to do is to calculate how much time John spent in the bathroom per each visit. To do this, we need to find out the time difference between each 'Active' state and the next 'Inactive' state.

The first visit in the given data starts at 10 am and ends at 10:15 am. Let's calculate the duration of this first visit.

The duration of the first visit is the time difference between 10:15 am and 10:00 am. To calculate this in Excel, we can write a simple formula.

Click on cell C3 and type the following:

$=(A3-A2)$

What is displayed is the time difference, but you'll notice that it is not in minutes! To get the answer in minutes, you need to multiply this by 24 * 60. This is because there are 24 hours in a day, and 60 minutes to each hour. Modify the formula in C3 to be:

$=(A3-A2) * 24 * 60$

Press Enter.

You should now see 15 as the answer. As you can see, the time difference between 10:15 am and 10:00 is indeed 15 minutes, so our formula is correct!

C3 \updownarrow \times \checkmark f_x $=(A3-A2) * 24 * 60$			
	A	B	C
1	TIMESTAMP	STATE	DURATION (MINUTES)
2	01/01/17 10:00:00	Active	
3	01/01/17 10:15:00	Inactive	15.00000001
4	01/01/17 14:00:00	Active	

5. Now we need to apply this formula to all of the remaining rows in Column C. Select C3 and hover your pointer to the edge of the C3 cell until you see a cross hair. Then click and drag the pointer to the last cell in the range (C35)

C3 \updownarrow \times \checkmark f_x $=(A3-A2) * 24 * 60$				
	A	B	C	D
1	TIMESTAMP	STATE	DURATION (MINUTES)	
2	01/01/17 10:00:00	Active		
3	01/01/17 10:15:00	Inactive	15.00000001	
4	01/01/17 14:00:00	Active		
5	01/01/17 14:05:30	Inactive		
6	01/01/17 22:15:30	Active		

	A	B	C
2	01/01/17 10:00:00	Active	
3	01/01/17 10:15:00	Inactive	15.00000001
4	01/01/17 14:00:00	Active	225
5	01/01/17 14:05:30	Inactive	5.499999997
6	01/01/17 22:15:30	Active	490
7	01/01/17 22:20:00	Inactive	4.499999994
8	02/01/17 7:05:00	Active	525
9	02/01/17 7:22:00	Inactive	16.99999999
10	02/01/17 21:00:00	Active	818
11	02/01/17 21:10:00	Inactive	10
12	03/01/17 7:01:00	Active	591
13	03/01/17 7:16:20	Inactive	15.33333333
14	03/01/17 19:16:20	Active	720
15	03/01/17 19:25:20	Inactive	8.999999998
16	03/01/17 22:16:00	Active	170.6666667
17	03/01/17 22:20:00	Inactive	4.000000003
18	04/01/17 7:01:00	Active	521
19	04/01/17 7:16:20	Inactive	15.33333333
20	04/01/17 19:30:40	Active	734.3333333
21	04/01/17 19:41:20	Inactive	10.66666667
22	04/01/17 22:26:00	Active	164.6666667
23	04/01/17 22:30:00	Inactive	4.000000003
24	05/01/17 7:01:00	Active	511
25	05/01/17 7:16:00	Inactive	15
26	05/01/17 19:26:10	Active	730.1666667
27	05/01/17 19:35:55	Inactive	9.749999995
28	05/01/17 22:19:00	Active	163.0833333
29	05/01/17 22:27:00	Inactive	8.000000005
30	06/01/17 7:01:00	Active	514
31	06/01/17 7:16:20	Inactive	15.33333333
32	06/01/17 19:15:00	Active	718.6666667
33	06/01/17 19:24:40	Inactive	9.666666663
34	06/01/17 22:15:00	Active	170.3333333
35	06/01/17 22:21:50	Inactive	6.833333328
36			
37			

raw_data
CalculatedDurations
+

Ready

- Now as you can see we have the active durations in Column C. But, the active durations should be, [Time motion stopped - Time motion started], or in other words [Time motion went inactive - Time motion went active]. But our formula in step 5 applied it to ALL rows. For example, look at the result in C4. That is [Time new motion started - Time previous motion stopped]. Now we need to filter these out, and only keep durations from [Time motion went inactive - Time motion went active].
- Add a new column header named 'ACTIVE DURATION (MINUTES)' to the right.

F20					
	A	B	C	D	E
1	TIMESTAMP	STATE	DURATION (MINUTES)	ACTIVE DURATION (MINUTES)	
2	01/01/17 10:00:00	Active			
3	01/01/17 10:15:00	Inactive	15.00000001		
4	01/01/17 14:00:00	Active	225		
5	01/01/17 14:05:30	Inactive	5.499999997		
6	01/01/17 22:15:30	Active	490		
7	01/01/17 22:20:00	Inactive	4.499999994		
8	02/01/17 7:05:00	Active	525		
9	02/01/17 7:22:00	Inactive	16.99999999		
10	02/01/17 21:00:00	Active	818		
11	02/01/17 21:10:00	Inactive	10		
	raw_data	CalculatedDurations	+		
	Ready				

8. Of course, we can manually select which cells contain the Active Durations (time diff between Inactive - Active). But imagine if we had hundreds of rows! So we're going to automate this by making use of Excel.

9. What we want Excel to do is to select the DURATION value from Column C if the corresponding row in Column B contains 'Inactive'.

To do this, we write this as a formula. Type the following into D2:

=IF(ISNUMBER(FIND("Inactive",B2)),C2,"NULL")

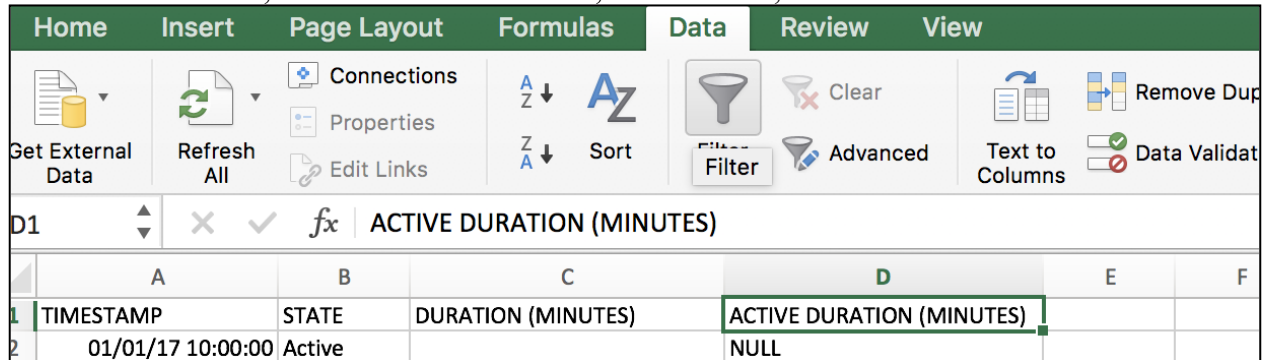
Here the formula is saying, IF B2 contains 'Inactive', then use the value in C2, else, insert NULL

10. Apply the above formula to cells D2:D35

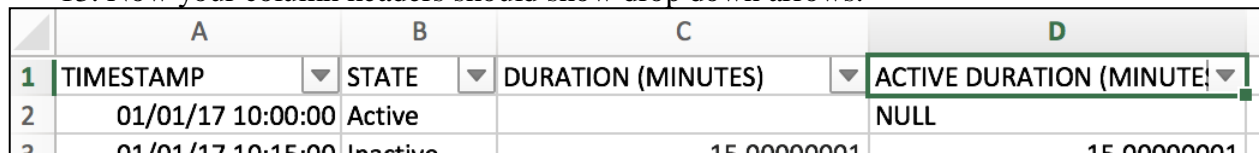
	A	B	C	D
1	TIMESTAMP	STATE	DURATION (MINUTES)	ACTIVE DURATION (MINUTES)
2	01/01/17 10:00:00	Active		NULL
3	01/01/17 10:15:00	Inactive	15.00000001	15.00000001
4	01/01/17 14:00:00	Active	225	NULL
5	01/01/17 14:05:30	Inactive	5.499999997	5.499999997
6	01/01/17 22:15:30	Active	490	NULL
7	01/01/17 22:20:00	Inactive	4.499999994	4.499999994
8	02/01/17 7:05:00	Active	525	NULL
9	02/01/17 7:22:00	Inactive	16.99999999	16.99999999
10	02/01/17 21:00:00	Active	818	NULL
11	02/01/17 21:10:00	Inactive	10	10
12	03/01/17 7:01:00	Active	591	NULL
13	03/01/17 7:16:20	Inactive	15.33333333	15.33333333
14	03/01/17 19:16:20	Active	720	NULL
15	03/01/17 19:25:20	Inactive	8.999999998	8.999999998
16	03/01/17 22:16:00	Active	170.6666667	NULL
17	03/01/17 22:20:00	Inactive	4.000000003	4.000000003
18	04/01/17 7:01:00	Active	521	NULL
19	04/01/17 7:16:20	Inactive	15.33333333	15.33333333
20	04/01/17 19:30:40	Active	734.3333333	NULL
21	04/01/17 19:41:20	Inactive	10.66666667	10.66666667
22	04/01/17 22:26:00	Active	164.6666667	NULL
23	04/01/17 22:30:00	Inactive	4.000000003	4.000000003
24	05/01/17 7:01:00	Active	511	NULL
25	05/01/17 7:16:00	Inactive	15	15
26	05/01/17 19:26:10	Active	730.1666667	NULL
27	05/01/17 19:35:55	Inactive	9.749999995	9.749999995
28	05/01/17 22:19:00	Active	163.0833333	NULL
29	05/01/17 22:27:00	Inactive	8.000000005	8.000000005
30	06/01/17 7:01:00	Active	514	NULL
31	06/01/17 7:16:20	Inactive	15.33333333	15.33333333
32	06/01/17 19:15:00	Active	718.6666667	NULL
33	06/01/17 19:24:40	Inactive	9.666666663	9.666666663
34	06/01/17 22:15:00	Active	170.3333333	NULL
35	06/01/17 22:21:50	Inactive	6.833333328	6.833333328
	raw_data	CalculatedDurations	Sheet3	+

11. OK - now we have column D with only the active values, but now we've got NULL values which we need to filter out. Remember that our goal is to have a list of active duration values. We are going to filter these in the next step.

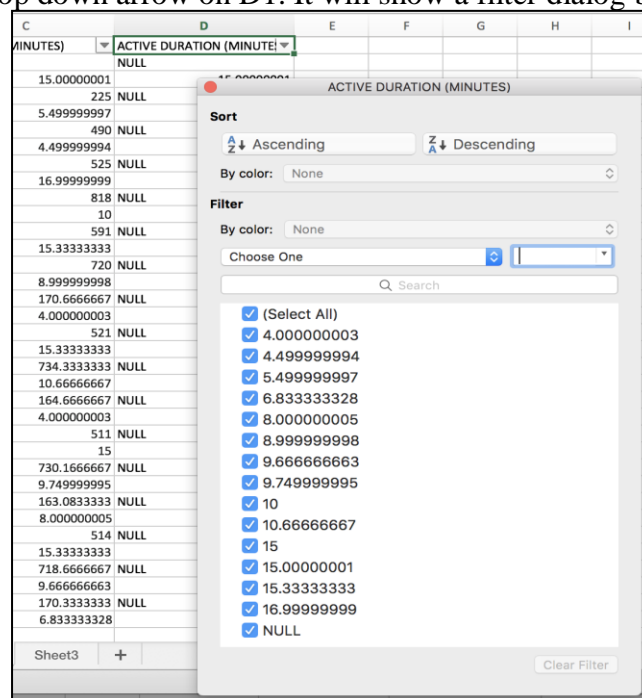
12. Click on D1, and on the Excel Ribbon, under 'Data', click on 'Filter'



13. Now your column headers should show drop down arrows:



14. Click on the drop down arrow on D1. It will show a filter dialog box



15. Untick the checkbox for 'NULL'. This will immediately filter out the NULL values in Column D.

	A	B	C	D	F	F	G	H
1	TIMESTAMP	STATE	DURATION (MINUTES)	ACTIVE DURATION (MINUTE)	ACTIVE DURATION (MINUTES)			
3	01/01/17 10:15:00	Inactive	15.00000001	15.00000001	<div> Sort <div> A Z Ascending Z A Descending </div> By color: None <div> Filter By color: None <div> Choose One <div> Q Search <div> 9.749999995 10 10.66666667 15 15.00000001 15.33333333 16.99999999 NULL </div> Clear Filter </div> </div> </div> </div>			
5	01/01/17 14:05:30	Inactive	5.499999997	5.499999997				
7	01/01/17 22:20:00	Inactive	4.499999994	4.499999994				
9	02/01/17 7:22:00	Inactive	16.99999999	16.99999999				
11	02/01/17 21:10:00	Inactive	10	10				
13	03/01/17 7:16:20	Inactive	15.33333333	15.33333333				
15	03/01/17 19:25:20	Inactive	8.999999998	8.999999998				
17	03/01/17 22:20:00	Inactive	4.000000003	4.000000003				
19	04/01/17 7:16:20	Inactive	15.33333333	15.33333333				
21	04/01/17 19:41:20	Inactive	10.66666667	10.66666667				
23	04/01/17 22:30:00	Inactive	4.000000003	4.000000003				
25	05/01/17 7:16:00	Inactive	15	15				
27	05/01/17 19:35:55	Inactive	9.749999995	9.749999995				
29	05/01/17 22:27:00	Inactive	8.000000005	8.000000005				
31	06/01/17 7:16:20	Inactive	15.33333333	15.33333333				
33	06/01/17 19:24:40	Inactive	9.666666663	9.666666663				
35	06/01/17 22:21:50	Inactive	6.833333328	6.833333328				
36								
37								
38								
39								
40								
41								
42								

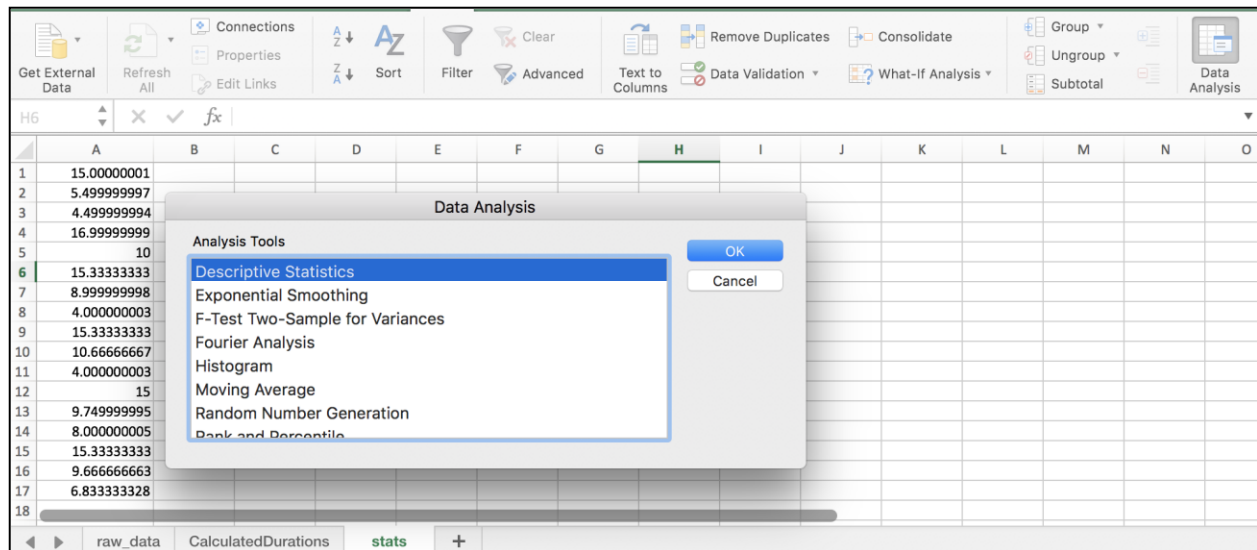
16. Have a look at column D. Now all the values that are displayed are the active durations for each bathroom visit!

Step-by-step Instructions: Calculate descriptive statistics for the data set

- First, create a new sheet named 'Stats', and copy-paste the filtered Active Duration values in column D, to the new sheet.

A1									15.0000000069849
	A	B	C	D	E	F	G		
1	15.00000001								
2	5.499999997								
3	4.499999994								
4	16.99999999								
5	10								
6	15.33333333								
7	8.999999998								
8	4.000000003								
9	15.33333333								
10	10.66666667								
11	4.000000003								
12	15								
13	9.749999995								
14	8.000000005								
15	15.33333333								
16	9.666666663								
17	6.833333328								
18									
<div> raw_data CalculatedDurations stats </div> <div> Ready Filter Mode Average: 10.28921569 </div>									

- Next you need to turn on Excel's Data Analysis Add-On. Follow the instructions here: <https://www.youtube.com/watch?v=mIoS7IRo36c>
- Now, click on 'Data Analysis'



4. Select Descriptive Statistics and click OK.
5. Now, you will be shown the dialog box for Descriptive Statistics. Here, you need to select the following:
 - a. Input range: this is the data range in column A
 - b. Output range: this is cell range to add the descriptive statistics values
 - c. Summary statistics

Type in the following values:

The 'Descriptive Statistics' dialog box is shown with the following settings:

- Input:**
 - Input Range:
 - Grouped By: ☒ Columns, ☐ Rows
 - ☐ Labels in first row
- Output options:**
 - ☒ Output Range:
 - ☐ New Worksheet Ply:
 - ☐ New Workbook
 - ☒ Summary statistics: %
 - ☒ Confidence Level for Mean:
 - ☐ Kth Largest:
 - ☐ Kth Smallest:

6. Click OK. Descriptive statistic values for the given sample should displayed as in the following screenshot:

E23					
	A	B	C	D	E
1	15.00000001				
2	5.499999997				
3	4.499999994		Column1		
4	16.99999999				
5	10	Mean		10.28921569	
6	15.33333333	Standard Error		1.086442504	
7	8.999999998	Median		9.749999995	
8	4.000000003	Mode		15.33333333	
9	15.33333333	Standard Deviation		4.4795172	
10	10.66666667	Sample Variance		20.06607435	
11	4.000000003	Kurtosis		-1.416442188	
12	15	Skewness		0.030831397	
13	9.749999995	Range		12.99999999	
14	8.000000005	Minimum		4.000000003	
15	15.33333333	Maximum		16.99999999	
16	9.666666663	Sum		174.9166667	
17	6.833333328	Count		17	
18		Confidence Level		2.303155222	
19					
20					
<div> <div>raw_data</div> <div>Calculated Durations</div> <div>stats</div> </div>					
Ready Filter Mode					

All done! Now we have some useful information about John's bathroom usage.

Task Submission Details

There are 2 questions in this task. Answer all of them in this word document itself and submit to unit site.

Q1: Upload your completed excel workbook to unit site.

(16 marks)

Q2: Look at the calculated descriptive statistics. Fill in the below table explaining what each term means in terms of John's bathroom usage. The first row has been done for you.

Mean	10.289 minutes	The average time John uses the bathroom per visit is 10.289 minutes.
Median	9.749999995 11055	John's median time per bathroom visit was 9.75 minutes.
Mode	15.33333333 44198	John's most frequent bathroom break was 15.33 minutes.
Standard deviation	4.479517200 37625	The standard deviation time for John to use the toilet was 4.48 minutes.

Minimum	4.000000002 56113	The minimum time for John to use the toilet is 4 minutes.
Maximum	16.99999999 25494	The maximum time John used the toilet was 17 minutes.
Count	17	A total of 17 times data of John's toilet use were recorded.
Sum	174.9166666 51843	John spent a total of 174.92 minutes using the toilet.

(14 marks)

References

<https://www.khanacademy.org/math/statistics-probability/displaying-describing-data#mean-median-basics>
<https://www.khanacademy.org/math/statistics-probability/displaying-describing-data/pop-variance-standard-deviation/v/range-variance-and-standard-deviation-as-measures-of-dispersion>
<https://www.lynda.com/Business-Skills-tutorials/Descriptive-statistics/550747/611825-4.html?org=deakin.edu.au>

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SIT123: Data Capture Technologies

Lab Work Week 4:

Collect GPS data using mobile apps (30 marks)

Mobile phones have significant sensing capabilities such as GPS, acceleration and lux. In this task you will use existing free mobile apps to record some GPS data.

Due Date Friday 5:00pm, 12th August 2022

Hardware Required

A smartphone with GPS.

Software Required

A web browser

One of the following apps installed:

- Android: Geo Tracker
<https://play.google.com/store/apps/details?id=com.ilyabogdanovich.geotrack&hl=en>
- iOS: myTracks <https://itunes.apple.com/au/app/mytracks-the-gps-logger/id358697908?mt=8>
- Microsoft: GPS Tracker free
<https://www.microsoft.com/en-au/store/p/gps-tracker-free/9nblgggz2w34>

You may install and try out any other app well as, as long as they can track GPS & export tracks to GPX format.

Pre-requisites: You must do the following before this task

1. **Attend Class (Lecture)**
2. **Read this sheet from top to bottom**

Task Submission Details

There are 3 questions in this task. Answer all of them in this word document itself and submit to unit site.

Q1: Track a journey using one of the installed mobile apps. It is best if your tracked journey spans at least 5 kilometers. Export your track to GPX format and save the file to your computer. Upload your .GPX file to unit site.

(You can email the .gpx file from your phone and download it to your computer)
(5 marks)

Q2: Open a browser on your computer and go to <http://utrack.crempa.net/> . Upload your .GPX file to the site and click ‘Generate Report’. Take a screenshot and include here.

(5 marks)

Q3: What information can you see from the generated report?

(20 marks)

Four components can be found, namely, Elevation, Speed, Time and Distance
Elevation.

Min. altitude. 7 m.s.l.

Highest altitude. 127 m.s.l.

Average altitude. 60.9 m.s.l.

Maximum difference. 120 m

Total climbing: 229 m

Total descent: 297 m

Start elevation: 80.2 m.s.l.

Finish elevation: 12 m.s.l.

Final balance: -68.2 m

Speed.

Minimum speed: 0.6 km/h

Maximum speed: 73.1 km/h

Average climbing speed : 22.4 km/h

Average descent speed : 25.6 km/h

Average flat speed : 41.3 km/h

Average speed : 33.1 km/h

Time.

Date of the track. 9.8.2022

Start time: 05:53:45

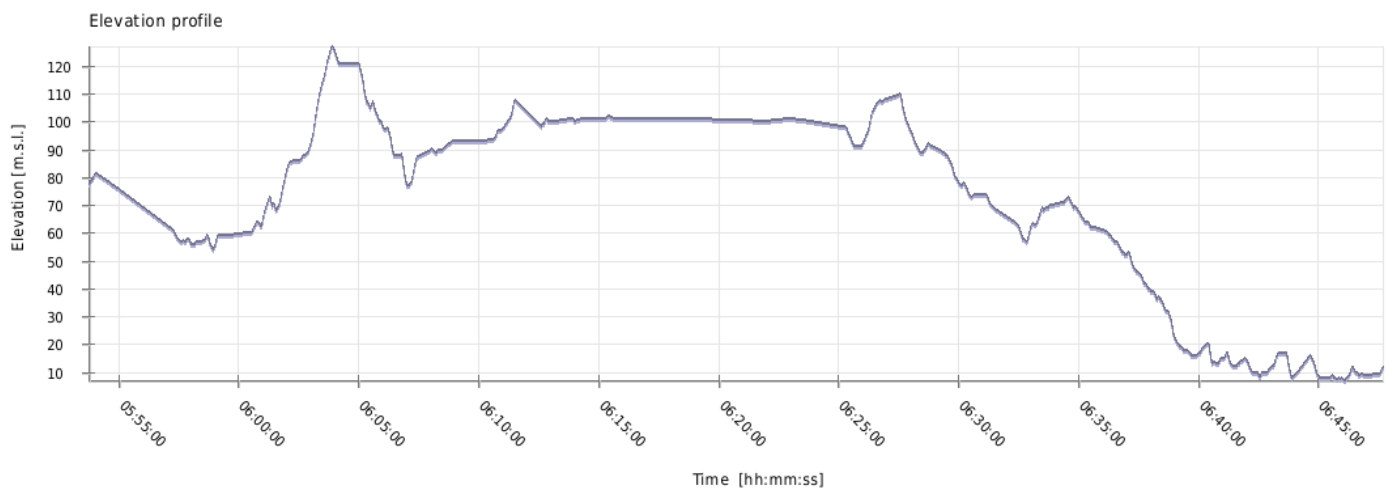
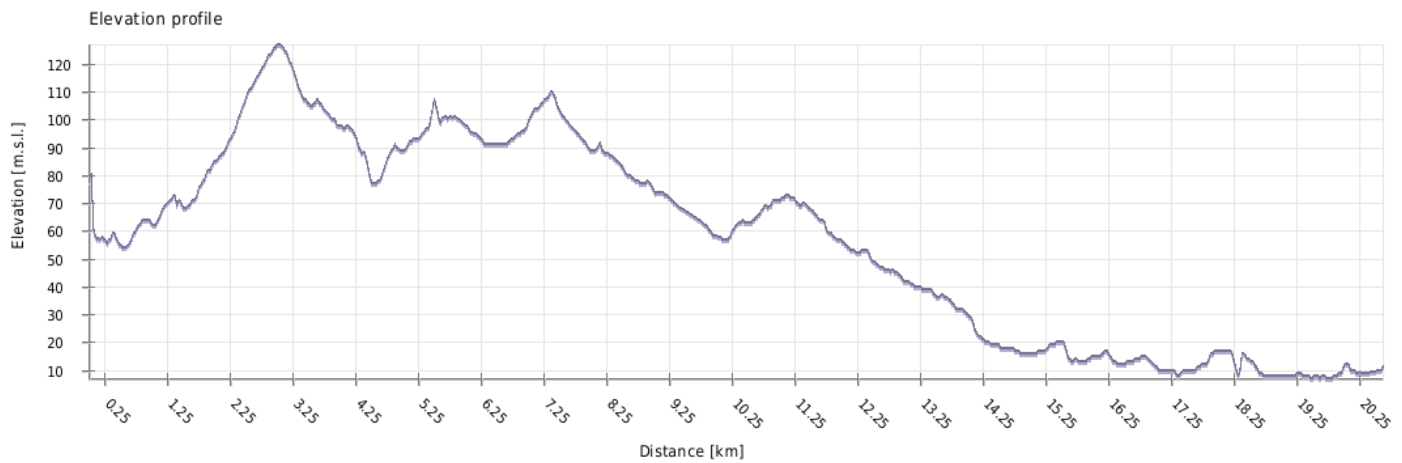
End time: 06:47:42

Total track time: 53m 57s

Climb time: 11m 21s
Downhill time: 17m 15s
Flat time: 25m 21s
Distance.
Total distance on the flat: 20.6km
Actual total distance: 20.6km
Climbing distance. 3.2km
Descent distance. 4km
Distance on flat ground: 13.4 km

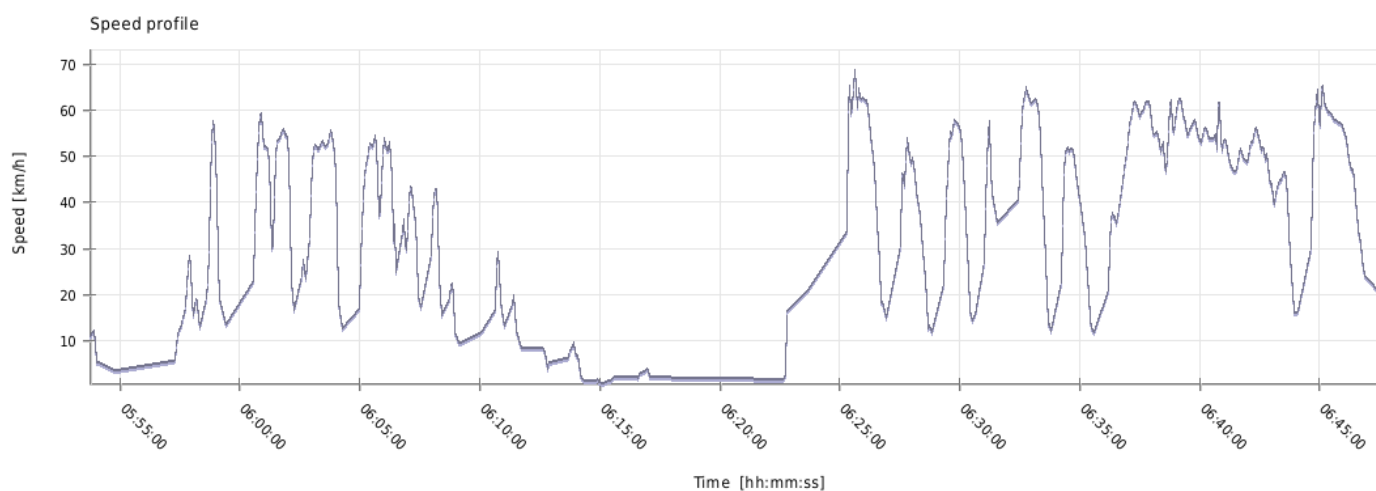
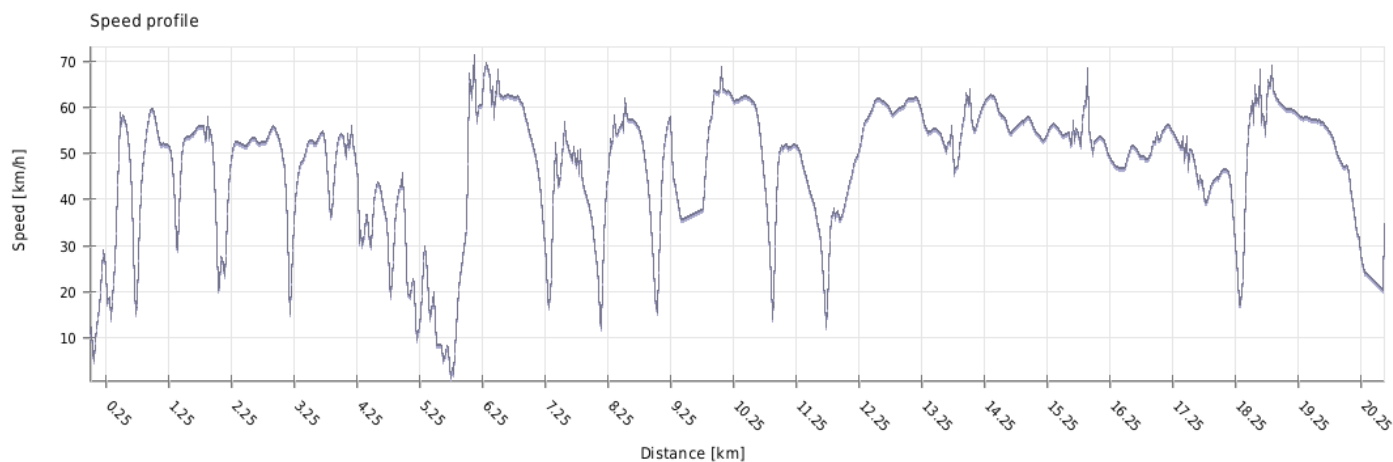
Note: depending on the app you used to record the GPS data, timestamps could be either in local time (that is AEST if you are in Melbourne) or sometimes it could be in UTC.

Elevation



Minimum elevation:	7 m.s.l.
Maximum elevation:	127 m.s.l.
Average elevation:	60.9 m.s.l.
Maximum difference:	120 m
Total climbing:	229 m
Total descent:	297 m
Start elevation:	80.2 m.s.l.
End elevation:	12 m.s.l.
Final balance:	-68.2 m

Speed

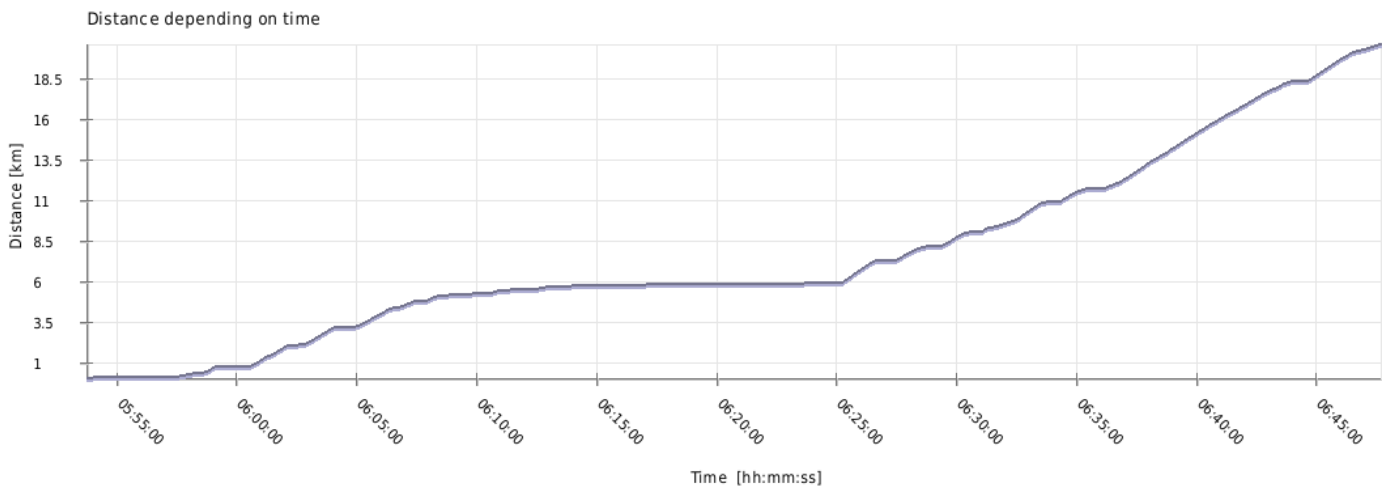


Minimum speed:	0.6 km/h
Maximum speed:	73.1 km/h
Average climbing speed :	22.4 km/h
Average descent speed :	25.6 km/h
Average flat speed:	41.3 km/h
Average speed:	33.1 km/h

Time

Date of track:	9.8.2022
Start time:	05:53:45
End time:	06:47:42
Total track time:	53m 57s
Climbing time:	11m 21s
Descent time:	17m 15s
Flat time:	25m 21s

Distance



Total flat distance:	20.6 km
Total real distance:	20.6 km
Climbing distance:	3.2 km
Descent distance:	4 km
Flat distance:	13.4 km