GPS DATA ANALYSIS PROCEDURE

Outline of GPS data

The GPS receiver output data or record tracks, the time, accuracy, etc. in NMEA format. NMEA is acronym for the National Marine Electronics Association. There are different types of NMEA messages. Some of those that are applicable to GPS receivers are listed below.

- GPGGA: essential fix data which provides 3D location and accuracy data.
- GPRMC: has its own version of essential GPS pvt (position, velocity, time) data.
- GPDPT: Depth
- GPVTG: Speed over ground and tracking offset.

The GPGGA message has enough information for this Manual's system. To understand the NMEA message structure, examine the \$GPGGA message as shown below, this particular message was an output from GPS receiver:

\$GPGGA,031959,1235.0071,N,10122.5079,E,1,16,0.7,3.6,M,,,,*0C

031959 is the time stamp: UTC time in hours, minutes and seconds.

1235.0071 is the latitude in the DDMM.MMMM format.

N denotes north latitude.

10122.5079 is the longitude in the DDDMM.MMMM format.

E denotes east longitude.

1 denotes the fixed quality: 1 =independent

2 = Differentially correct coordinate (e.g., WAAS, DGPS)

3 = PPS fix

4 = RTK fix coordinate (centimeter precision)

5 = RTK Float (decimeter precision.

16 denotes number of satellites used in the coordinate.

0.7 denotes the HDOP (horizontal dilution of precision).

3.6 denotes altitude, meters, above mean sea level.

M denotes units of altitude (eg. meters or feet)

(empty field): Height of geoid (mean sea level) above WGS84 ellipsoid

(empty field) time in seconds since last DGPS update

(empty field) DGPS station ID number

*0c is the checksum data, always begins with *

The NMEA of GPS is saved in text format. Here, the resource distribution is mapped with Microsoft Excel.

a. Loading NMEA data with Excel

Open text file data by using Excel program File -> Open --> All Files At Text Import Wizard – Step 1 of 3, select "Fix width", "Next"

Text Import Wizard - Step 1 of 3	x
The Text Wizard has determined that your data is Delimited. If this is correct, choose Next, or choose the data type that best describes your data.	
Choose the file type that best describes your data: Delimited - Characters such as commas or tabs separate each field.	
Start import at row: 1 Image: Start import at row: 874 : Thai (Windows)	•
Preview of file D: \My Documents \CFMD General \Activities 2106 \RIHN 2016 \GP\20140421_001.TXT.	
1 \$IIZDA,025130,21,04,2014,-07,00*70 2 \$IIVTG,278.5,T,,2.3,N,4.3,K,A*59 3 \$IIGGA,025131,1234.8355,N,10122.7301,E,1,09,1.1,0.7,M,,,,*06 4 \$IIRMC,025131,A,1234.8355,N,10122.7301,E,2.3,278.5,210414,,,A*62 5 \$IIDPT,8.3,0.0,*67	
Cancel < Back Next > Finish	

b. At Text Import Wizard – Step 2 of 3, separate cells by hour, minute, second, degree, min., lat., degree, minute, and long., and select "Next"

Text Import Wizard - Step 2 of 3	? <mark>×</mark>
This screen lets you set field widths (column breaks). Lines with arrows signify a column break.	
To CREATE a break line, click at the desired position. To DELETE a break line, double click on the line. To MOVE a break line, click and drag it.	
Data <u>preview</u> 10 20 <u>30 40 50 60</u>	
<pre>\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$</pre>	52
Cancel < <u>B</u> ack <u>N</u> ext >	> <u>F</u> inish

c. At Text Import Wizard - Step 3 of 3, select "General", "Finish"

Text Import Wizard - Step 3 of 3		? ×
This screen lets you select each col Column data format © <u>G</u> eneral © <u>T</u> ext © <u>D</u> ate: DMY	umn and set the Data Format. 'General' converts numeric values to numbers, date values to da remaining values to text. <u>A</u> dvanced	tes, and all
Data greview		
Ceneral GeGeGeCceCeneral \$IIZDA,025130,21,04,201 \$IIVTG,278.5,T,,,2.3,N, \$IIGGA,025131,1234.8355 \$IIRMC,025131,A,1234.835 \$IIRMC,025131,A,1234.83 \$IIDPT,8.3,0.0,*67 <	CeCeneCeneralCeCeneral 4,-07,00*70 4.3,K,A*59 ,N,10122.7301,E,1,09,1.1,0.7,M,,,,*06 355,N,10122.7301,E,2.3,278.5,210414,,,A*62	*
	Cancel < Back Next >	Einish

d. The Excel data sheet will be displayed as follows:

	Α	В	С	D	E	F	G	Н	I	J	K	L M N
1	"\$IIGGA	" /	2	51	3	31 ","	12	34.8355	","N","	101	22.7301	",E,1,09,1.1,0.7,M,,,,*06"
2	"\$IIRMC	"	2	51	3	31 ","	"A	,"1234.	8355","	"N,	1"122.7	3"01,E,2.3,278.5,210414,,,,A*62"
3	"\$IIDPT	"	8	"3,		00"	*	"67				
4	"\$IIZDA	,"	2	51	3	31 ","	21	",04,20	1"4","-	"07	,"00*71	
5	"\$IIVTG	" /	27	2	"1	,"T	"	,"",1.9	,N,"3.5	",К	,"A*5F	
6	"\$IIGGA	" /	2	51	1	32 ","	12	34.8354	","N","	101	22.7295	",E,1,09,1.1,0.3,M,,,,*0C"
7	"\$IIRMC	" /	2	51	3	32 ","	"A	,"1234.	8354","	"N,	1"122.7	2"95,E,1.9,272.1,210414,,,,A*6B"
8	"\$IIDPT	" /	8	"1,		00"	*	"65				
9	"\$IIZDA	," /	2	51	1	33 ","	21	",04,20	1"4","-	"07	,"00*73	
10	"\$IIVTG	" /	25	6	"3	,"T	"	,"",2.5	,N,"4.7	",К	,"A*51	
11	"\$IIGGA	" /	2	51	1	33 ","	12	34.8351	","N","	101	22.7289	",E,1,09,1.1,0.7,M,,,,*01"
12	"\$IIRMC	"	2	51	3	33 ","	"A	,"1234.	8351","	"N,	1"122.7	2"89,E,2.5,256.3,210414,,,,A*69"
13	"\$IIDPT	" /	8	"0,		00"	*	"64				
14	"\$IIZDA	,"	2	51	3	33 ","	21	",04,20	1"4","-	"07	,"00*73	
15	"\$IIVTG	" /	25	9	"0	,"T	"	,"",1.8	,N,"3.3	",K	,"A*50	
16	"\$IIGGA	" /	2	51	1	34 ","	12	34.835	","N","1	01	22.7284	",E,1,09,1.1,0.8,M,,,,*05"
17	"\$IIRMC	" /	2	51	1	34 ","	"A	,"1234.	8350","	"N,	1"122.7	2"84,E,1.8,259.0,210414,,,,A*60"
18	"\$IIDPT	" /	8	"3,		00"	*	"67				
19	"\$IIZDA	" /	2	51	3	35 ","	21	",04,20	1"4","-	"07	,"00*75	
20	"\$IIVTG	" /	24	6	"8	,"T	"	,"",1.9	,N,"3.6	",K	,"A*52	
21	"\$IIGGA	" /	2	51	1	35 ","	12	34.8347	","N","	101	22.7279	",E,1,09,1.1,0.6,M,,,,*0E"
22	"\$IIRMC	" /	2	51	1	35 ","	"A	,"1234.	8347","	"N,	1"122.7	2"79,E,1.9,246.8,210414,,,,A*62"
23	"\$IIDPT	,"	8	"2,	"	00"	,*	"66				
24	"\$IIZDA	,	2	51		36 ","	21	",04,20	1"4","-	"07	,"00*76	
25	"\$IIVTG	,"	23	2	"7	,"T	",	,"",1.8	,N,"3.4	",K	,"A*5D	
26	"\$IIGGA	,"	2	51		36 ","	12	34.8343	","N","	101	22.7276	",E,1,09,1.1,1.1,M,,,,*00"
27	"\$IIRMC	,"	2	51	3	36 ","	"A	,"1234.	8343","	"N,	1"122.7	2"76,E,1.8,232.7,210414,,,,A*67"

e. Move cursor into cell which indicates "\$IIGGA" where information on time, and position (Latitude and Longitude) are contained, use right bottom mouse click for drop down menu. Select "Filter", "Filter by Selected Cell's Value".

	A1 Tah	oma - 11 -	A 🛪 📆	- % , 🚿						^						_
	AB	I≣	🆄 • <u>A</u> •	4.0 .00 +a+ .00 →.0 +a+		E	F	G	Н		I	J	K	L	М	
1	"\$IIGĢ∆ '	12	51	21			12	34.8355	","N","		101	22.7301	",E,1,09,1	.1,0.7,M,,,	,*06"	
2	"\$IIRN 💑	Cu <u>t</u>			","		"A	,"1234.	8355","	"N,		1"122.7	3"01,E,2.3	3,278.5,210		"
3	"\$IIDF 🗈	<u>С</u> ору			00"		*	"67								
4	"\$IIZC 🙈	Paste			","		21	",04,20	1"4","-	"07		,"00*71				
5	"\$IIV1	Paste Special	l		, ["] Т		",	,"",1.9	,N,"3.5	",K		,"A*5F				
6	"\$IIG	Treest			","		12	34.8354	","N","		101	22.7295	",E,1,09,1	.1,0.3,M,,,	,*0C"	
7	"\$IIRN	Insert			"/"		"A	,"1234.	8354","	"N,		1"122.7	2"95,E,1.9	,272.1,210	414,,,A*6B	"
8	"\$IIDF	Delete			00"		,*	"65								
9	"\$IIZC	Clear Co <u>n</u> ter	nts		"/"		21	",04,20	1"4","-	"07		,"00*73				
10	"\$IIV1	Filter		•	K	Reapp	lv		"4.7	",K		,"A*51				
11	"\$IIG(Sort		•		Filter	v Selected Cel	l's Value	N","		101	22.7289	",E,1,09,1	.1,0.7,M,,,	,*01"	
12	"\$IIR					Till of the		l's Calas	51","	"N,		1"122.7	2"89,E,2.5	5,256.3,210)414,,,A*69	"
13	"\$IIDF 📟	Insert Comm	ent			Filter b	ly Selected Cel	is <u>C</u> olor								
14	"\$IIZC 🖀	Format Cells				Filter b	y Selected Cel	I's <u>F</u> ont Color	ŧ","-	"07		,"00*73				
15	"\$IIV1	Pick From Dr	op-down List.			Filter b	y Selected Cel	l's <u>I</u> con	"3.3	",K		,"A*50				
16	"\$IIG	Name a <u>R</u> ang	ge		"/"		12	34.835	","N","1	01		22.7284	",E,1,09,1	.1,0.8,M,,,	,*05"	
17	"\$IIRN 🔬	Hyperlink			',"		"A	,"1234.	8350","	"N,		1"122.7	2"84,E,1.8	3,259.0,210)414,,,A*60	"
18	"\$IIDP T,	0	э	1	00"		,*	"67								
19	"\$IIZDA,"	2	51	35	","		21	",04,20	1"4","-	"07		,"00*75				
20	"\$IIVTG,'	24	6	"8	,"Т		",	,"",1.9	,N,"3.6	",К		,"A*52				
21	"\$IIGGA,'	2	51	35	","		12	34.8347	","N","		101	22.7279	",E,1,09,1	.1,0.6,M,,,	,*0E"	
22	"\$IIRMC,'	2	51	35	"/"		"A	,"1234.	8347","	"N,		1"122.7	2"79,E,1.9	,246.8,210)414,,,A*62	"
23	"\$IIDPT,"	8	"2	,"	00"		,*	"66								
24	"\$IIZDA,"	2	51	36	"		21	",04,20	1"4","-	"07		,"00*76				
25	"\$IIVTG,'	23	2	"7	,"Т		",	,"",1.8	,N,"3.4	",К		,"A*5D				
26	"\$IIGGA,'	2	51	36	","		12	34.8343	","N","		101	22.7276	",E,1,09,1	.1,1.1,M,,,	,*00"	
27	"\$IIRMC,	2	51	36	","		"A	,"1234.	8343","	"N,		1"122.7	2"76,E,1.8	3,232.7,210)414,,,A*67	

f. Excel data sheet will display only the row of data starting with "\$IIGGA". Column defines C as hour, D as minute, E as second, G as degree of latitude, H as minute of latitude, J as degree of longitude, K as minute of longitude.

	•		D (E E	0		т	1	V	1	м
	A		в	. <u> </u>		G	H			N C		IM
1	\$IIZDA,	₽	_	•	•		,04,201 💌	4,-	07, 💌	00*/0	· · · · · · · · · · · · · · · · · · ·	
3	\$IIGGA,		2	51	31 ","	12	34.8355	","N","	101	22.7301	,E,1,09,1.1,0	.7,M,,,,*06
8	\$IIGGA,	""	2	51	32 ","	12	34.8354	","N","	101	22.7295	,E,1,09,1.1,0	.3,M,,,,*0C
13	\$IIGGA,	""	2	51	33 ","	12	34.8351	","N","	101	22.7289	,E,1,09,1.1,0	.7,M,,,,*01
18	\$IIGGA,	""	2	51	34 ","	12	34.835	","N","	101	22.7284	,E,1,09,1.1,0	.8,M,,,,*05
23	\$IIGGA,		2	51	35 ","	12	34.8347	","N","	101	22.7279	,E,1,09,1.1,0	.6,M,,,,*0E
28	\$IIGGA,		2	51	36 ","	12	34.8343	","N","	101	22.7276	,E,1,09,1.1,1	.1,M,,,,*00
33	\$IIGGA,	""	2	51	37 ","	12	34.834	","N","	101	22.7273	,E,1,09,1.1,1	.4,M,,,,*02
38	\$IIGGA,	""	2	51	38 ","	12	34.8335	","N","	101	22.7271	,E,1,09,1.1,1	.4,M,,,,*0D
43	\$IIGGA,	""	2	51	39 ","	12	34.833	","N","	101	22.7269	,E,1,09,1.1,1	.6,M,,,,*02
48	\$IIGGA,	""	2	51	40 ","	12	34.8325	","N","	101	22.7268	,E,1,09,1.1,1	.6,M,,,,*09
53	\$IIGGA,	" "	2	51	40 ","	12	34.8325	","N","	101	22.7268	,E,1,09,1.1,1	.6,M,,,,*09
58	\$IIGGA,	" "	2	51	42 ","	12	34.8315	","N","	101	22.7268	,E,1,09,1.1,1	.4,M,,,,*0A
63	\$IIGGA,	" "	2	51	43 ","	12	34.8309	","N","	101	22.7268	,E,1,09,1.1,1	.7,M,,,,*05
68	\$IIGGA,	" "	2	51	44 ","	12	34.8304	","N","	101	22.727	,E,1,09,1.1,1	.3,M,,,,*02
73	\$IIGGA,	" "	2	51	44 ","	12	34.8304	","N","	101	22.727	,E,1,09,1.1,1	.3,M,,,,*02
78	\$IIGGA,	" "	2	51	46 ","	12	34.8294	","N","	101	22.7275	,E,1,09,1.1,1	.5,M,,,,*0B
83	\$IIGGA,	" "	2	51	47 ","	12	34.8289	","N","	101	22.7279	,E,1,09,1.1,1	.6,M,,,,*09
88	\$IIGGA,	· · ·	2	51	47 ","	12	34.8289	","N","	101	22.7279	,E,1,09,1.1,1	.6,M,,,,*09
93	\$IIGGA,	· · ·	2	51	48 ","	12	34.8285	","N","	101	22.7283	,E,1,09,1.1,1	.4,M,,,,*0D
98	\$IIGGA,	· · ·	2	51	49 ","	12	34.8281	","N","	101	22.7287	,E,1,09,1.1,1	.7,M,,,,*0F
103	\$IIGGA,	· · ·	2	51	50 ","	12	34.8278	","N","	101	22.7292	,E,1,09,1.1,1	.3,M,,,,*01
108	\$IIGGA,		2	51	51 ","	12	34.8274	","N","	101	22.7298	,E,1,09,1.1,1	.5,M,,,,*00
113	\$IIGGA,		2	51	51 ","	12	34.8274	","N","	101	22.7298	,E,1,09,1.1,1	.5,M,,,,*00
118	\$IIGGA,	· · ·	2	51	51 ","	12	34.8274	","N","	101	22.7298	,E,1,09,1.1,1	.5,M,,,,*00
100	477001	11 11	-		U U		D 4 00 7 4	10 U.S. (0. 10		22 7222	E 1 00 1 1 1	F WAA

Copy all the data to a new work sheet.

g. Delete data in column A, B, F, I and L-N.

A	В	C D	E F	G	Н	Ι	J	K	L	M N
1 "\$IIGGA 🖓	," 🔽 2	💌 51 💽		•	34.8355 💌	","N"," 💌	1-	22.7301	",E,1,09 -	1,0.7,M,,,,*06"
6 "\$IIGGA	," 2	51	32 ","	12	34.8354	","N","	101	22.7295	",E,1,09,1	.1,0.3,M,,,,*0C"
11 "\$IIGGA	," 2	51	33 ","	12	34.8351	","N","	101	22.7289	",E,1,09,1	.1,0.7,M,,,,*01"
16 "\$IIGGA	," 2	51	34 ","	12	34.835	","N","	101	22.7284	",E,1,09,1	.1,0.8,M,,,,*05"
21 "\$IIGGA	," 2	51	35 ","	12	34.8347	","N","	101	22.7279	",E,1,09,1	.1,0.6,M,,,,*0E"
26 "\$IIGGA	," 2	51	36 ","	12	34.8343	","N","	101	22.7276	",E,1,09,1	.1,1.1,M,,,,*00"
31 "\$IIGGA	," 2	51	37 ","	12	34.834	","N","	101	22.7273	",E,1,09,1	.1,1.4,M,,,,*02"
36 "\$IIGGA	," 2	51	38 ","	12	34.8335	","N","	101	22.7271	",E,1,09,1	.1,1.4,M,,,,*0D"
41 "\$IIGGA	," 2	51	39 ","	12	34.833	","N","	101	22.7269	",E,1,09,1	.1,1.6,M,,,,*02"
46 "\$IIGGA	," 2	51	40 ","	12	34.8325	","N","	101	22.7268	",E,1,09,1	.1,1.6,M,,,,*09"
51 "\$IIGGA	," 2	51	40 ","	12	34.8325	","N","	101	22.7268	",E,1,09,1	.1,1.6,M,,,,*09"
56 "\$IIGGA	," 2	51	42 ","	12	34.8315	","N","	101	22.7268	",E,1,09,1	.1,1.4,M,,,,*0A"
61 "\$IIGGA	," 2	51	43 ","	12	34.8309	","N","	101	22.7268	",E,1,09,1	.1,1.7,M,,,,*05"
66 "\$IIGGA	," 2	51	44 ","	12	34.8304	","N","	101	22.727	",E,1,09,1	.1,1.3,M,,,,*02"
71 "\$IIGGA	," 2	51	44 ","	12	34.8304	","N","	101	22.727	",E,1,09,1	.1,1.3,M,,,,*02"
76 "\$IIGGA	," 2	51	46 ","	12	34.8294	","N","	101	22.7275	",E,1,09,1	.1,1.5,M,,,,*0B"
81 "\$IIGGA	," 2	51	47 ","	12	34.8289	","N","	101	22.7279	",E,1,09,1	.1,1.6,M,,,,*09"
86 "\$IIGGA	," 2	51	47 ","	12	34.8289	","N","	101	22.7279	",E,1,09,1	.1,1.6,M,,,,*09"
91 "\$IIGGA	," 2	51	48 ","	12	34.8285	","N","	101	22.7283	",E,1,09,1	.1,1.4,M,,,,*0D"
96 "\$IIGGA	," 2	51	49 ","	12	34.8281	","N","	101	22.7287	",E,1,09,1	.1,1.7,M,,,,*0F"
101 "\$IIGGA	," 2	51	50 ","	12	34.8278	","N","	101	22.7292	",E,1,09,1	.1,1.3,M,,,,*01"
106 "\$IIGGA	," 2	51	51 ","	12	34.8274	","N","	101	22.7298	",E,1,09,1	.1,1.5,M,,,,*00"
111 "\$IIGGA	," 2	51	51 ","	12	34.8274	","N","	101	22.7298	",E,1,09,1	.1,1.5,M,,,,*00"

h. After deleting, calcurate UTC (Coordinated Universal Time) and degree of latitude and longitude, column H as 1:00, I as 0:01, J as 00:00:01, K as =+H1*A1+B1*I1+C1*J1, L as =+D1+E1/60 and M as =+F1+G1/60.

	K1	- ()	f _x	=+H1*A1+B1	*I1+C1*J1								
	Α	В	С	D	E	F	G	Н	Ι	J	К	L	М
1	2	51	31	12	34.8355	101	22.7301	1:00	0:01	0:00:01	2:51	12.58059167	101.378835
2	2	51	32	12	34.8354	101	22.7295	1:00	0:01	0:00:01	2:51	12.58059	101.378825
3	2	51	33	12	34.8351	101	22.7289	1:00	0:01	0:00:01	2:51	12.580585	101.378815
4	2	51	34	12	34.835	101	22.7284	1:00	0:01	0:00:01	2:51	12.58058333	101.3788067
5	2	51	35	12	34.8347	101	22.7279	1:00	0:01	0:00:01	2:51	12.58057833	101.3787983
6	2	51	36	12	34.8343	101	22.7276	1:00	0:01	0:00:01	2:51	12.58057167	101.3787933
7	2	51	37	12	34.834	101	22.7273	1:00	0:01	0:00:01	2:51	12.58056667	101.3787883
8	2	51	38	12	34.8335	101	22.7271	1:00	0:01	0:00:01	2:51	12.58055833	101.378785
9	2	51	39	12	34.833	101	22.7269	1:00	0:01	0:00:01	2:51	12.58055	101.3787817
10	2	51	40	12	34.8325	101	22.7268	1:00	0:01	0:00:01	2:51	12.58054167	101.37878
11	2	51	40	12	34.8325	101	22.7268	1:00	0:01	0:00:01	2:51	12.58054167	101.37878
12	2	51	42	12	34.8315	101	22.7268	1:00	0:01	0:00:01	2:51	12.580525	101.37878
13	2	51	43	12	34.8309	101	22.7268	1:00	0:01	0:00:01	2:51	12.580515	101.37878
14	2	51	44	12	34.8304	101	22.727	1:00	0:01	0:00:01	2:51	12.58050667	101.3787833
15	2	51	44	12	34.8304	101	22.727	1:00	0:01	0:00:01	2:51	12.58050667	101.3787833
16	2	51	46	12	34.8294	101	22.7275	1:00	0:01	0:00:01	2:51	12.58049	101.3787917
17	2	51	47	12	34.8289	101	22.7279	1:00	0:01	0:00:01	2:51	12.58048167	101.3787983
18	2	51	47	12	34.8289	101	22.7279	1:00	0:01	0:00:01	2:51	12.58048167	101.3787983

i. Adjust the value of UTC in columm K by selecting, "Format Cells". "Time", and "13:30:55".

	К1	- (°) J	fx =+H1*A1+I1	*B1+J1*C1							
	A	B C	D	E	F	G	Н	I J	K L	М	N O
1	2	51	31 12	34.8355	101	22.7301	1:00		2 54 42 500	F0467 404 37000	9 7
2	2	51	32 12	34.8354	101	22.7295	1:00	Format Cells	2.54 14	Same and Lines.	8
3	2	51	33 12	34.8351	101	22.7289	1:00	Number Alignment	Fant Barder	Cill Destastion	
4	2	51	34 12	34.835	101	22.7284	1:00	Aignment	Forti Border	Fill Protection	
5	2	51	35 12	34.8347	101	22.7279	1:00	Category:			
6	2	51	36 12	34.8343	101	22.7276	1:00	General A	Sample		
7	2	51	37 12	34.834	101	22.7273	1:00	Currency	2:51:31		
8	2	51	38 12	34.8335	101	22.7271	1:00	Accounting	<u>T</u> ype:		
9	2	51	39 12	34.833	101	22.7269	1:00	Time	*13:30:55		<u>^</u>
10	2	51	40 12	34.8325	101	22.7268	1:00	Percentage	en:no:cc		-
11	2	51	40 12	34.8325	101	22.7268	1:00	Scientific	en:no 1.		-
12	2	51	42 12	34.8315	101	22.7268	1:00	Text	a:no PM 1:30:55 PM		
13	2	51	43 12	34.8309	101	22.7268	1:00	Custom	13:30:55		▼
14	2	51	44 12	34.8304	101	22.727	1:00		Locale (location):		
15	2	51	44 12	34.8304	101	22.727	1:00		Thai (Thailand)		•
16	2	51	46 12	34.8294	101	22.7275	1:00				
17	2	51	47 12	34.8289	101	22.7279	1:00				
18	2	51	47 12	34.8289	101	22.7279	1:00	Ψ			
19	2	51	48 12	34.8285	101	22.7283	1:00	Tura farmata disalari data	and the second standard	an data wakaza Tara ƙasar	to the the site with an
20	2	51	49 12	34.8281	101	22.7287	1:00	asterisk (*) respond to ch	and time serial numbers anges in regional date a	nd time settings that are sp	ecified for the operating
21	2	51	50 12	34.8278	101	22.7292	1:00	system. Formats without	an asterisk are not affec	ted by operating system se	ttings.
22	2	51	51 12	34.8274	101	22.7298	1:00				
23	2	51	51 12	34.8274	101	22.7298	1:00				
24	2	51	51 12	34.8274	101	22.7298	1:00				OK Cancel
25	2	51	51 12	34.8274	101	22.7298	1:00				
26	2	51	51 12	34.8274	101	22.7298	1:00	0:01 0:00:01	2:51 12.580	45667 101.3788	83

Excel sheet UTC time will show columm K

	Α	В	С	D	E	F	G	Н	Ι	J	K	L	М
1	2	51	31	12	34.8355	101	22.7301	1:00	0:01	0:00:01	2:51:31	12.58059167	101.378835
2	2	51	32	12	34.8354	101	22.7295	1:00	0:01	0:00:01	2:51:32	12.58059	101.378825
3	2	51	33	12	34.8351	101	22.7289	1:00	0:01	0:00:01	2:51:33	12.580585	101.378815
4	2	51	34	12	34.835	101	22.7284	1:00	0:01	0:00:01	2:51:34	12.58058333	101.3788067
5	2	51	35	12	34.8347	101	22.7279	1:00	0:01	0:00:01	2:51:35	12.58057833	101.3787983
6	2	51	36	12	34.8343	101	22.7276	1:00	0:01	0:00:01	2:51:36	12.58057167	101.3787933
7	2	51	37	12	34.834	101	22.7273	1:00	0:01	0:00:01	2:51:37	12.58056667	101.3787883
8	2	51	38	12	34.8335	101	22.7271	1:00	0:01	0:00:01	2:51:38	12.58055833	101.378785
9	2	51	39	12	34.833	101	22.7269	1:00	0:01	0:00:01	2:51:39	12.58055	101.3787817
10	2	51	40	12	34.8325	101	22.7268	1:00	0:01	0:00:01	2:51:40	12.58054167	101.37878
11	2	51	40	12	34.8325	101	22.7268	1:00	0:01	0:00:01	2:51:40	12.58054167	101.37878
12	2	51	42	12	34.8315	101	22.7268	1:00	0:01	0:00:01	2:51:42	12.580525	101.37878
13	2	51	43	12	34.8309	101	22.7268	1:00	0:01	0:00:01	2:51:43	12.580515	101.37878
14	2	51	44	12	34.8304	101	22.727	1:00	0:01	0:00:01	2:51:44	12.58050667	101.3787833
15	2	51	44	12	34.8304	101	22.727	1:00	0:01	0:00:01	2:51:44	12.58050667	101.3787833
16	2	51	46	12	34.8294	101	22.7275	1:00	0:01	0:00:01	2:51:46	12.58049	101.3787917
17	2	51	47	12	34.8289	101	22.7279	1:00	0:01	0:00:01	2:51:47	12.58048167	101.3787983
18	2	51	47	12	34.8289	101	22.7279	1:00	0:01	0:00:01	2:51:47	12.58048167	101.3787983
19	2	51	48	12	34.8285	101	22.7283	1:00	0:01	0:00:01	2:51:48	12.580475	101.378805
20	2	51	49	12	34.8281	101	22.7287	1:00	0:01	0:00:01	2:51:49	12.58046833	101.3788117
21	2	51	50	12	34.8278	101	22.7292	1:00	0:01	0:00:01	2:51:50	12.58046333	101.37882
22	2	51	51	12	34.8274	101	22.7298	1:00	0:01	0:00:01	2:51:51	12.58045667	101.37883
23	2	51	51	12	34.8274	101	22.7298	1:00	0:01	0:00:01	2:51:51	12.58045667	101.37883
24	2	51	51	12	34.8274	101	22.7298	1:00	0:01	0:00:01	2:51:51	12.58045667	101.37883
25	2	51	51	12	34.8274	101	22.7298	1:00	0:01	0:00:01	2:51:51	12.58045667	101.37883
26	2	51	51	12	34.8274	101	22.7298	1:00	0:01	0:00:01	2:51:51	12.58045667	101.37883

j. Copy values from column K to M to a new sheet. "Paste", "Paste Values". Convert the data of column A to time by "Format Cells", "Time", "13:30:55".

	A1 Taho	a 🛛 11 📑 🗛 🕺	* % ' 🎺 <mark>96296</mark>
	В	🗏 🗄 • <mark></mark> • <u>A</u> •	•.0 .00 =a+ .00 >.0 =a+
1	0.1191087	6 12 58059167	101 378835
2	0.11 💑	lut	8825
3	0.119 🗈	ору	8815
4	0.119 💦	aste	8067
5	0.119	aste Special	7983
6	0.119		7933
7	0.119	nsert	7883
8	0.119	<u>elete</u>	8785
9	0.119	lear Co <u>n</u> tents	7817
10	0.119	ilt <u>e</u> r	▶ 7878
11	0.119	ort	, 7878
12	0.119	- ·	7878
13	0.119 📟	nsert Comment	7878
14	0.119	ormat Cells	7833
15	0.119	ic <u>k</u> From Drop-down List	7833
16	0.119	lame a <u>R</u> ange	7917
17	0.119 🧕	lyperlink	7983
18	0.119233	12.300-010107	101.3707983
19	0.1193055	12.580475	101.378805
20	0.119317	.3 12.58046833	101.3788117
21	0.1193287	4 12.58046333	101.37882
22	0.1193402	8 12.58045667	101.37883
23	0.1193402	8 12.58045667	101.37883
24	0.1193402	8 12.58045667	101.37883
25	0.1193402	8 12.58045667	101.37883
26	0.1193402	8 12.58045667	101.37883

-			В		С	D	E	
mat Cel	s		-		-		? 🗾	x
Number	Alignment	Font	Border	Fill	Protection			
Catagory								-
General	•	Sample						
Number	<u> </u>	2:51:3	31					
Currency	/	Tunci						
Date		13-30	-55					
Time Percenta	00	e:no:0	za PM					
Fraction	/yc	ດຕ:ຕວ	: "				E	=
Scientific		acno P	M				_	
Special		1:30:5	5 PM					-
Custom		Locale (ocation):					
		Thai (T	hailand)					-
			incline incly					
	-							
	-							
Time form	ats display dat	e and time	serial numbe	ers as dat	e values. Time	formats that be	egin with an	
Fime form asterisk (system. F	ats display dat *) respond to d	e and time hanges in r t an asteris	serial numbe egional date k are not aff	ers as dat and time fected by	e values. Time settings that a operating syst	formats that be are specified for em settings.	egin with an the operating	,
Time form asterisk (system. F	ats display dat *) respond to d formats without	e and time hanges in r t an asteris	serial numbe egional date k are not aff	ers as dat and time fected by	e values. Time settings that a operating syst	e formats that be are specified for sem settings.	egin with an the operating	,
Time form asterisk (system, F	ats display dat *) respond to d formats without	e and time hanges in r t an asteris	serial numbe egional date k are not aff	ers as dat and time fected by	e values. Time settings that a operating syst	e formats that be are specified for tem settings.	egin with an the operating	,
Time form asterisk (system. F	nats display dat *) respond to d formats without	e and time hanges in r t an asteris	serial numbe egional date k are not aff	ers as dat and time fected by	e values. Time settings that a operating syst	e formats that be are specified for em settings. OK	egin with an the operating Cancel)
Time form asterisk (system. F	nats display dat *) respond to co formats without	e and time hanges in r t an asteris	serial numbe egional date k are not aff 58045667	ers as dat and time fected by	e values. Time settings that a operating syst	e formats that be are specified for rem settings. OK	egin with an the operating Cancel	,
Time form asterisk (system. F	nats display dat ") respond to c cormats without 119340278 119340278	e and time hanges in r t an asteris	serial numbe egional date k are not aff 8045667	ers as dat e and time fected by	te values. Time : settings that a operating syst 101.37883 101.37883	e formats that be are specified for em settings.	egin with an the operating Cancel	
Time form asterisk (system. F 6 0. 7 0. 8 0.	nats display dat ") respond to c cormats without 119340278 119340278 119409722	e and time hanges in rt an asteris 12.5 12.5	serial numbe egional date k are not aff 8045667 8045667 58041167	ers as dat e and time fected by	te values. Time e settings that a operating syst 101.37883 101.37885	CK	egin with an the operating Cancel	
Time form asterisk (system. F 6 0. 7 0. 8 0. 9 0.	119340278 119340278 119340278 119409722 119409722	e and time hanges in r t an asteris 12.5 12.5 12.5	serial numbe egional date k are not aff 8045667 8045667 8041167 8041167	ers as dat and time fected by	101.3788 101.3788 101.3788 101.3788	CK	egin with an the operating Cancel	
Time form asterisk (system. F 5 0. 7 0. 8 0. 9 0. 0 (119340278 119340278 119340278 119409722 119409722 0.11943287	e and time hanges in r t an asteris 12.5 12.5 12.5 12.5	serial numbe egional date k are not aff 8045667 8045667 58041167 58041167 58041167	ers as dat and time fected by	101.3788 101.3788 101.3788 101.3788 101.3788 101.37889 01.378890	CK CK CK	egin with an the operating Cancel	

k. The column A is UTC. Normally, local mean time is used in the resarch. So the local time is shown in column E (UTC add Time difference). The columns of latitude and longitude should be reversed, because the latitude is on the y axis and longitude on the x axis.

	Α	В	С	D	E	F	G	
1	UTC	Latitude	Longitude	Time Diff.	Local Time	Longitude	Latitude	
2	2:51:31	12.58059167	101.378835	7:00	=+D2+A2	101.378835	12.58059167	
3	2:51:32	12.58059	101.378825	7:00	9:51:32	101.378825	12.58059	
4	2:51:33	12.580585	101.378815	7:00	9:51:33	101.378815	12.580585	
5	2:51:34	12.58058333	101.3788067	7:00	9:51:34	101.3788067	12.58058333	
6	2:51:35	12.58057833	101.3787983	7:00	9:51:35	101.3787983	12.58057833	
7	2:51:36	12.58057167	101.3787933	7:00	9:51:36	101.3787933	12.58057167	
8	2:51:37	12.58056667	101.3787883	7:00	9:51:37	101.3787883	12.58056667	
9	2:51:38	12.58055833	101.378785	7:00	9:51:38	101.378785	12.58055833	
10	2:51:39	12.58055	101.3787817	7:00	9:51:39	101.3787817	12.58055	
11	2:51:40	12.58054167	101.37878	7:00	9:51:40	101.37878	12.58054167	
12	2:51:40	12.58054167	101.37878	7:00	9:51:40	101.37878	12.58054167	
13	2:51:42	12.580525	101.37878	7:00	9:51:42	101.37878	12.580525	
14	2:51:43	12.580515	101.37878	7:00	9:51:43	101.37878	12.580515	
15	2:51:44	12.58050667	101.3787833	7:00	9:51:44	101.3787833	12.58050667	
16	2:51:44	12.58050667	101.3787833	7:00	9:51:44	101.3787833	12.58050667	
17	2:51:46	12.58049	101.3787917	7:00	9:51:46	101.3787917	12.58049	
18	2:51:47	12.58048167	101.3787983	7:00	9:51:47	101.3787983	12.58048167	

1. Select Columns F and G, select insert chart, select a scatter plot chart. This procedure can produce a drawing of the track line.



m. Add shore line data and detect with the tracking data. This procedure will produces a rough survey map. After a chart is added, some of the default elements should be modified to create an exquisite eye-catching map.

I	1 01 .3558	12.5697			
1	1 01 .3558	12.5697			12.64
	101.3557	12.56972			
					12.62
	101.485		12.631253 sh	hore line data	
	101.47656		12.631253 sh	hore line data	125
	101.47598		12.630373 sh	hore line data	12.6
	101.46982		12.630373 sh	hore line data	دم ح
	101.46923		12.629493 sh	hore line data	12.58
	101.45574		12.629493 sh	hore line data	
	101.45486		12.628613 sh	hore line data	12 56
	101.45339		12.628613 sh	hore line data	
	101.45251		12.628026 sh	hore line data	
	101.45163		12.628026 sł	hore line data	12.54
	101.45075		12.627146 sh	hore line data	
	101.44987		12.627146 sh	hore line data	12.52
	101.44928		12.626266 sh	hore line data	D
	101.44488		12.626266 sh	hore line data	
	101.444		12.625386 sh	hore line data	12.5
	101.44166		12.625386 sh	hore line data	
	101.43667		12.620399 sh	hore line data	12.48
	101.43579		12.620399 sh	hore line data	101.25 101.3 101.35 101.4 101.45 101.5
	101.43197		12.616586 sh	hore line data	
1	101 /2107		10 616706 -1	K	

Plotting of survey data cruise tract could be displayed to fit with the design survey transect in the study area. This experiment was conducted in the set-net fishing ground of Banphe, Rayong Province, Thailand. The coverage survey area is 2.5×6.5 square kilometers with parallel cruise tract of 500 meters apart.



Survey transect coverage in the set-net fishing ground of Banphe, Rayong Province, Thailand.