

List of Figures

1.1	Google maps navigation using GPS	1
1.2	Timeline Feature on Google Maps	1
1.3	Blocked Signal GPS[10]	2
1.4	Trajectory pattern in F multi-floor building at Telkom University	3
2.1	Coordinate system (relative to a device) that’s used by the Sensor API [25].	10
2.2	Graph of accelerometer reading. Figure (a) shows when the device is pushed on its left side toward the right. Figure (b) is pushed on its up side toward the down. Figure (c) is pushed on its front side toward the back.	10
2.3	The barometer sensor reading in 2nd floor at F building Telkom University	11
2.4	The ambient geomagnetic field to the Y axis.	12
2.5	Algorithm to save the recording sensors [18]	13
2.6	Algorithm to reconstruct trajectory [18]	14
2.7	Illustration of human movement from A point to C point	15
2.8	Trigonometric formula in quadrant 1 [23]	15
3.1	System Architecture Review	19
3.2	Flow of the System Architecture	19
3.3	Illustration of human movement from A point to C point	22
3.4	Trigonometric formula in quadrant 1 [23]	23
4.1	Illustration of 4 different paths on single floor. The difference of each path is in the walking direction. Figure (a) shows the walking direction to the east and Figure (e) shows the number of footstep. Figure (b) shows the walking direction to the north and Figure (f) shows the number of footstep. Figure (c) shows the walking direction to the diagonal and Figure (g) shows the number of footstep. Figure (d) shows the walking direction combination of three previous paths and Figure (h) shows the number of footstep.	25

4.2	Illustration of path on multi floor. Figure (a) shows the walking direction from the first floor to the second floor and Figure (b) shows the number of footstep detected.	25
4.3	Example of holding the device with the angle position is 90° . . .	26
4.4	Graph of Accelerometer Reading. Figure (a) shows that when human move to other position then the value of accelerometer reading is change, while the human is stop or stay the value of accelerometer reading is constant. Figure (b) shows the value of accelerometer reading when walking activity is on single floor and up-stair	26
4.5	Reference to the holding device using protractor	27
4.6	Testing scenario for range walking. Figure (a), (b), and (c) shows the scenario with actual step is 10 step and spent 20 second for finish the scenario. The difference is each figure used the different times scenario. The scenario are figure (a) is 2 second for walk and 2 second for stop, figure (b) is 5 second for walk and 5 second for stop, while figure (c) is 10 second for walk and 10 second for stop.	27
4.7	The level average of accuracy based on path a scenario testing. .	30
4.8	The level average of accuracy based on path b scenario testing. .	30
4.9	The level average of accuracy based on path c scenario testing. .	31
4.10	The level average of accuracy based on path d scenario testing. .	31
4.11	Direct comparison trajectory reconstruction result with the value of the threshold is 0.1 and device position is 0° . Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	31
4.12	The average level of accuracy based on the optimum value of the threshold is 0.3 in single floor	33
4.13	The average level of accuracy based on the constant optimum accuracy value of the threshold is 0.1 in single floor	33
4.14	The average level of accuracy based on the optimum value of the threshold is 0.3 in multi-floor	33
4.15	Direct comparison trajectory reconstruction result for path a testing scenario. Figure (a) shows the result of device position 0° . Figure (b) with device position 30° . Figure (c) with device position 45° . Figure (d) device position is 90°	34
4.16	Direct comparison trajectory reconstruction result for path b testing scenario. Figure (a) shows the result of device position 0° . Figure (b) with device position 30° . Figure (c) with device position 45° . Figure (d) device position is 90°	34

4.17	Direct comparison trajectory reconstruction result for path c testing scenario. Figure (a) shows the result of device position 0°. Figure (b) with device position 30°. Figure (c) with device position 45°. Figure (d) device position is 90°.	34
4.18	Direct comparison trajectory reconstruction result for path d testing scenario. Figure (a) shows the result of device position 0°. Figure (b) with device position 30°. Figure (c) with device position 45°. Figure (d) device position is 90°.	35
4.19	Direct comparison trajectory reconstruction result for path a testing scenario. Figure (a) shows the result of device position 0°. Figure (b) with device position 30°. Figure (c) with device position 45°. Figure (d) device position is 90°.	35
4.20	Direct comparison trajectory reconstruction result for path b testing scenario. Figure (a) shows the result of device position 0°. Figure (b) with device position 30°. Figure (c) with device position 45°. Figure (d) device position is 90°.	35
4.21	Direct comparison trajectory reconstruction result for path c testing scenario. Figure (a) shows the result of device position 0°. Figure (b) with device position 30°. Figure (c) with device position 45°. Figure (d) device position is 90°.	36
4.22	Direct comparison trajectory reconstruction result for path d testing scenario. Figure (a) shows the result of device position 0°. Figure (b) with device position 30°. Figure (c) with device position 45°. Figure (d) device position is 90°.	36
4.23	Direct comparison trajectory reconstruction result for multi floor testing scenario. Figure (a) shows the result of device position 0°. Figure (b) with device position 30°. Figure (c) with device position 45°. Figure (d) device position is 90°.	36
4.24	Graph Visualization Level of Accuracy Range Walking Test Scenario based on the best threshold and device position is 0° . . .	37
4.25	The level accuracy based on the optimum value of the range walking in multi floor	38
4.26	The level accuracy based on the optimum value of the range walking in multi floor	38
4.27	Direct comparison trajectory reconstruction result for range walking path a testing scenario in 2 second. Figure (a) the result of 0.1 threshold is more sensitive then figure (b) with 0.3 threshold, when detecting human activity (walking or stop).	39
4.28	Direct comparison trajectory reconstruction result for range walking path a testing scenario in 5 second. Figure (a) the result of 0.1 threshold, figure (b) is the result of 0.3 threshold when detecting human activity (walking or stop).	39

4.29	Direct comparison trajectory reconstruction result for range walking path a testing scenario in 10 second. Figure (a) the result of 0.1 threshold, figure (b) is the result of 0.3 threshold when detecting human activity (walking or stop).	39
4.30	The result of trajectory reconstruction based on range walking testing scenario with the value of the threshold is 0.1. Figure (a) shows the scenario of 2s. Figure (b) shows the scenario of 5s. Figure (c) shows the scenario of 10s.	40
4.31	The result of trajectory reconstruction based on range walking testing scenario with the value of the threshold is 0.3. Figure (a) shows the scenario of 2s. Figure (b) shows the scenario of 5s. Figure (c) shows the scenario of 10s.	40
5.1	Direct comparison trajectory reconstruction result with the value of the threshold is 0.2 and device position is 0° . Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	46
5.2	Direct comparison trajectory reconstruction result with the value of the threshold is 0.3 and device position is 0° . Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	46
5.3	Direct comparison trajectory reconstruction result with the value of the threshold is 0.4 and device position is 0° . Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	46
5.4	Direct comparison trajectory reconstruction result with the value of the threshold is 0.5 and device position is 0° . Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	47
5.5	Direct comparison trajectory reconstruction result with the value of the threshold is 0.1 and device position is 30° . Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	47

5.6	Direct comparison trajectory reconstruction result with the value of the threshold is 0.2 and device position is 30°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	47
5.7	Direct comparison trajectory reconstruction result with the value of the threshold is 0.3 and device position is 30°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	48
5.8	Direct comparison trajectory reconstruction result with the value of the threshold is 0.4 and device position is 30°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	48
5.9	Direct comparison trajectory reconstruction result with the value of the threshold is 0.5 and device position is 30°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	48
5.10	Direct comparison trajectory reconstruction result with the value of the threshold is 0.1 and device position is 45°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	48
5.11	Direct comparison trajectory reconstruction result with the value of the threshold is 0.2 and device position is 45°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	49
5.12	Direct comparison trajectory reconstruction result with the value of the threshold is 0.3 and device position is 45°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	49
5.13	Direct comparison trajectory reconstruction result with the value of the threshold is 0.4 and device position is 30°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	49

5.14	Direct comparison trajectory reconstruction result with the value of the threshold is 0.5 and device position is 45°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	49
5.15	Direct comparison trajectory reconstruction result with the value of the threshold is 0.1 and device position is 90°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	50
5.16	Direct comparison trajectory reconstruction result with the value of the threshold is 0.2 and device position is 90°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	50
5.17	Direct comparison trajectory reconstruction result with the value of the threshold is 0.3 and device position is 90°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	50
5.18	Direct comparison trajectory reconstruction result with the value of the threshold is 0.4 and device position is 90°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	50
5.19	Direct comparison trajectory reconstruction result with the value of the threshold is 0.5 and device position is 90°. Figure (a) shows the result for path a. Figure (b) shows the result for path b. Figure (c) shows the result for path c. Figure (d) shows the result for path d.	51