# MATLAB & Mobile Phone Sensors

Using "MATLAB Mobile" to access organic cell phone sensors and to export data file to "MATLAB Drive."

Experiment A: Turn on the acceleration sensor. Place the cell phone flat on the table. Collect data for 1-2 minutes. Download the data file from MATLAB Drive.

Load acceleration data file to workspace

```
load("C:\Users\m260477\Desktop\EW202\ICE\ICE2\Z_Acceleration.mat")
Acceleration
```

```
Acceleration = 613×3 timetable
```

| | Timestamp | X | Y | Z |
|---|---|---|---|---|
| 1 | 22-Jan-2024 10:01:28.978 | -0.0322 | 0.1365 | 9.8432 |
| 2 | 22-Jan-2024 10:01:29.078 | 0.0581 | 0.1418 | 9.8480 |
| 3 | 22-Jan-2024 10:01:29.178 | 0.0362 | 0.1206 | 9.8601 |
| 4 | 22-Jan-2024 10:01:29.279 | -0.0479 | 0.0979 | 9.8551 |
| 5 | 22-Jan-2024 10:01:29.379 | 0.1013 | 0.1642 | 9.8560 |
| 6 | 22-Jan-2024 10:01:29.479 | -0.0377 | 0.1266 | 9.8613 |
| 7 | 22-Jan-2024 10:01:29.579 | 0.0858 | 0.1397 | 9.8314 |
| 8 | 22-Jan-2024 10:01:29.680 | -0.0275 | 0.1006 | 9.8607 |
| 9 | 22-Jan-2024 10:01:29.780 | 0.0498 | 0.1666 | 9.8341 |
| 10 | 22-Jan-2024 10:01:29.880 | -0.0144 | 0.1190 | 9.8718 |
| 11 | 22-Jan-2024 10:01:29.980 | -0.0174 | 0.1597 | 9.8676 |
| 12 | 22-Jan-2024 10:01:30.081 | 0.0630 | 0.1482 | 9.8703 |
| 13 | 22-Jan-2024 10:01:30.181 | -0.0368 | 0.1130 | 9.8681 |
| 14 | 22-Jan-2024 10:01:30.281 | 0.0852 | 0.1612 | 9.8434 |
| 15 | 22-Jan-2024 10:01:30.381 | -0.0415 | 0.1221 | 9.8649 |
| 16 | 22-Jan-2024 10:01:30.482 | 0.0654 | 0.1736 | 9.8648 |
| 17 | 22-Jan-2024 10:01:30.582 | 0.0037 | 0.1433 | 9.8477 |
| 18 | 22-Jan-2024 10:01:30.682 | -0.0561 | 0.1548 | 9.8678 |
| 19 | 22-Jan-2024 10:01:30.782 | 0.0564 | 0.1666 | 9.8563 |
| 20 | 22-Jan-2024 10:01:30.883 | -0.0129 | 0.1307 | 9.8548 |
| 21 | 22-Jan-2024 10:01:30.983 | 0.0889 | 0.1412 | 9.8396 |
| 22 | 22-Jan-2024 10:01:31.083 | -0.0427 | 0.0963 | 9.8609 |
| 23 | 22-Jan-2024 10:01:31.183 | 0.0760 | 0.1540 | 9.8578 |
| 24 | 22-Jan-2024 10:01:31.284 | 0.0006 | 0.1278 | 9.8581 |

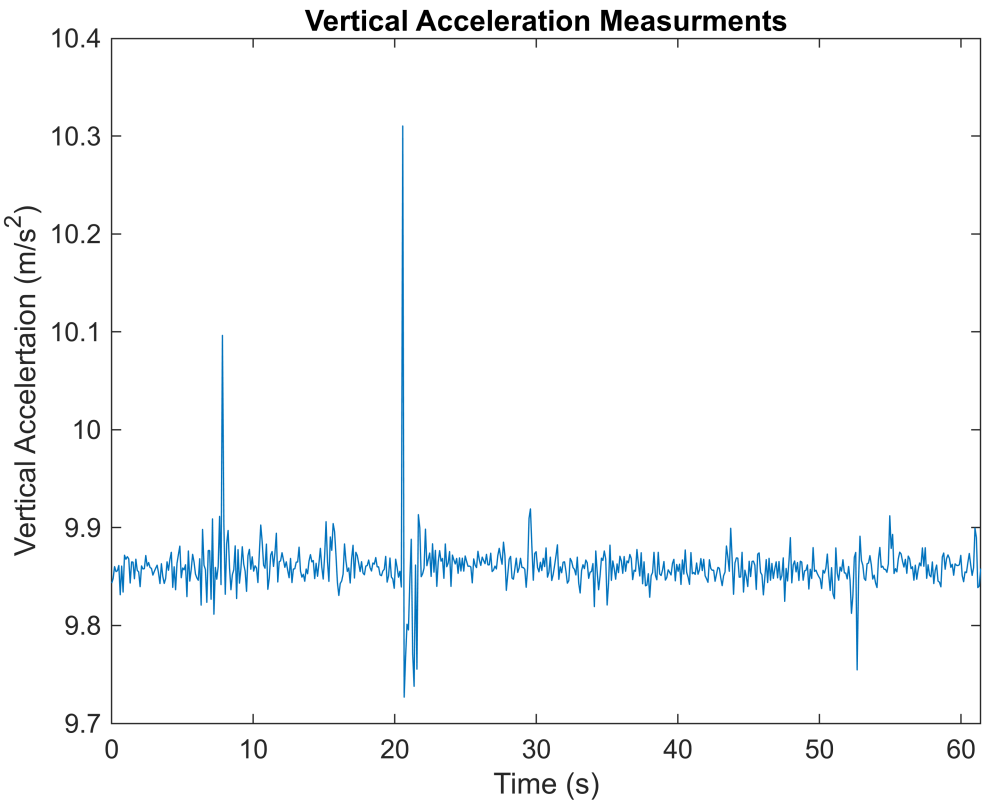
| | Timestamp | X | Y | Z |
|---|---|---|---|---|
| 25 | 22-Jan-2024 10:01:31.384 | -0.0302 | 0.1482 | 9.8715 |
| 26 | 22-Jan-2024 10:01:31.484 | 0.0497 | 0.1621 | 9.8607 |
| 27 | 22-Jan-2024 10:01:31.584 | -0.0254 | 0.1304 | 9.8643 |
| 28 | 22-Jan-2024 10:01:31.685 | 0.0922 | 0.1513 | 9.8592 |
| 29 | 22-Jan-2024 10:01:31.785 | -0.0539 | 0.1132 | 9.8583 |
| 30 | 22-Jan-2024 10:01:31.885 | 0.0714 | 0.1674 | 9.8515 |
| 31 | 22-Jan-2024 10:01:31.985 | 0.0021 | 0.1052 | 9.8552 |
| 32 | 22-Jan-2024 10:01:32.086 | 0.0349 | 0.1718 | 9.8586 |
| 33 | 22-Jan-2024 10:01:32.186 | 0.0012 | 0.1379 | 9.8616 |
| 34 | 22-Jan-2024 10:01:32.286 | 0.0073 | 0.1320 | 9.8536 |
| 35 | 22-Jan-2024 10:01:32.386 | 0.0847 | 0.1242 | 9.8428 |
| 36 | 22-Jan-2024 10:01:32.487 | -0.0551 | 0.0979 | 9.8631 |
| 37 | 22-Jan-2024 10:01:32.587 | 0.0724 | 0.1512 | 9.8501 |
| 38 | 22-Jan-2024 10:01:32.687 | -0.0334 | 0.1334 | 9.8429 |
| 39 | 22-Jan-2024 10:01:32.787 | 0.0605 | 0.1563 | 9.8480 |
| 40 | 22-Jan-2024 10:01:32.887 | -0.0123 | 0.1027 | 9.8651 |
| 41 | 22-Jan-2024 10:01:32.988 | 0.0512 | 0.1861 | 9.8564 |
| 42 | 22-Jan-2024 10:01:33.088 | 0.0228 | 0.1340 | 9.8675 |
| 43 | 22-Jan-2024 10:01:33.188 | -0.0278 | 0.1283 | 9.8748 |
| 44 | 22-Jan-2024 10:01:33.288 | 0.0531 | 0.1709 | 9.8389 |
| 45 | 22-Jan-2024 10:01:33.389 | -0.0283 | 0.1340 | 9.8600 |
| 46 | 22-Jan-2024 10:01:33.489 | 0.0382 | 0.1685 | 9.8365 |
| 47 | 22-Jan-2024 10:01:33.589 | -0.0183 | 0.1064 | 9.8634 |
| 48 | 22-Jan-2024 10:01:33.689 | 0.0186 | 0.1632 | 9.8726 |
| 49 | 22-Jan-2024 10:01:33.790 | 0.0331 | 0.1461 | 9.8811 |
| 50 | 22-Jan-2024 10:01:33.890 | -0.0614 | 0.1061 | 9.8488 |
| 51 | 22-Jan-2024 10:01:33.990 | 0.1034 | 0.2045 | 9.8588 |
| 52 | 22-Jan-2024 10:01:34.091 | -0.0416 | 0.0945 | 9.8569 |
| 53 | 22-Jan-2024 10:01:34.191 | 0.0476 | 0.1650 | 9.8621 |
| 54 | 22-Jan-2024 10:01:34.291 | -0.0105 | 0.1054 | 9.8295 |
| 55 | 22-Jan-2024 10:01:34.392 | 0.0452 | 0.1780 | 9.8762 |
| 56 | 22-Jan-2024 10:01:34.492 | 0.0388 | 0.1447 | 9.8453 |
| 57 | 22-Jan-2024 10:01:34.592 | -0.0144 | 0.1203 | 9.8569 |

| | Timestamp | X | Y | Z |
|---|---|---|---|---|
| 58 | 22-Jan-2024 10:01:34.693 | 0.0864 | 0.2081 | 9.8727 |
| 59 | 22-Jan-2024 10:01:34.792 | -0.0329 | 0.1067 | 9.8649 |
| 60 | 22-Jan-2024 10:01:34.894 | 0.0124 | 0.1685 | 9.8525 |
| 61 | 22-Jan-2024 10:01:34.994 | 0.0004 | 0.1100 | 9.8486 |
| 62 | 22-Jan-2024 10:01:35.094 | 0.0290 | 0.1509 | 9.8462 |
| 63 | 22-Jan-2024 10:01:35.195 | 0.0061 | 0.1515 | 9.8682 |
| 64 | 22-Jan-2024 10:01:35.295 | 0.0157 | 0.1512 | 9.8208 |
| 65 | 22-Jan-2024 10:01:35.395 | 0.0394 | 0.1784 | 9.8982 |
| 66 | 22-Jan-2024 10:01:35.496 | 0.0272 | 0.1424 | 9.8616 |
| 67 | 22-Jan-2024 10:01:35.596 | -0.0259 | 0.1576 | 9.8572 |
| 68 | 22-Jan-2024 10:01:35.696 | -0.0144 | 0.1380 | 9.8236 |
| 69 | 22-Jan-2024 10:01:35.796 | 0.0689 | 0.1563 | 9.8766 |
| 70 | 22-Jan-2024 10:01:35.897 | -0.0476 | 0.1353 | 9.8766 |
| 71 | 22-Jan-2024 10:01:35.997 | 0.0403 | 0.1326 | 9.8268 |
| 72 | 22-Jan-2024 10:01:36.097 | 0.0427 | 0.1471 | 9.9089 |
| 73 | 22-Jan-2024 10:01:36.197 | 0.0019 | 0.1394 | 9.8115 |
| 74 | 22-Jan-2024 10:01:36.298 | 0.0464 | 0.1229 | 9.8594 |
| 75 | 22-Jan-2024 10:01:36.398 | 0.0027 | 0.1560 | 9.8473 |
| 76 | 22-Jan-2024 10:01:36.498 | 0.0680 | 0.0925 | 9.8601 |
| 77 | 22-Jan-2024 10:01:36.598 | 0.0120 | 0.1355 | 9.9115 |
| 78 | 22-Jan-2024 10:01:36.699 | -0.0144 | 0.1117 | 9.8417 |
| 79 | 22-Jan-2024 10:01:36.799 | 0.0609 | 0.2314 | 10.0964 |
| 80 | 22-Jan-2024 10:01:36.899 | -0.0629 | 0.1573 | 9.9048 |
| 81 | 22-Jan-2024 10:01:36.999 | 0.0629 | 0.1691 | 9.8319 |
| 82 | 22-Jan-2024 10:01:37.100 | -0.0245 | 0.1413 | 9.8836 |
| 83 | 22-Jan-2024 10:01:37.200 | -0.0058 | 0.1780 | 9.8971 |
| 84 | 22-Jan-2024 10:01:37.300 | 0.0442 | 0.1483 | 9.8588 |
| 85 | 22-Jan-2024 10:01:37.400 | 0.0094 | 0.1189 | 9.8365 |
| 86 | 22-Jan-2024 10:01:37.501 | 0.0518 | 0.1594 | 9.8519 |
| 87 | 22-Jan-2024 10:01:37.601 | -0.0391 | 0.1274 | 9.8570 |
| 88 | 22-Jan-2024 10:01:37.701 | 0.0177 | 0.1742 | 9.8814 |
| 89 | 22-Jan-2024 10:01:37.801 | 0.0356 | 0.1382 | 9.8275 |
| 90 | 22-Jan-2024 10:01:37.902 | -0.0632 | 0.1293 | 9.8775 |

| | Timestamp | X | Y | Z |
|---|---|---|---|---|
| 91 | 22-Jan-2024 10:01:38.002 | 0.0537 | 0.1653 | 9.8432 |
| 92 | 22-Jan-2024 10:01:38.102 | -0.0494 | 0.1193 | 9.8576 |
| 93 | 22-Jan-2024 10:01:38.202 | 0.0448 | 0.1717 | 9.8805 |
| 94 | 22-Jan-2024 10:01:38.303 | -0.0094 | 0.1509 | 9.8627 |
| 95 | 22-Jan-2024 10:01:38.403 | -0.0003 | 0.1407 | 9.8555 |
| 96 | 22-Jan-2024 10:01:38.503 | 0.0470 | 0.1476 | 9.8348 |
| 97 | 22-Jan-2024 10:01:38.603 | -0.0362 | 0.1370 | 9.8714 |
| 98 | 22-Jan-2024 10:01:38.704 | 0.0454 | 0.1471 | 9.8778 |
| 99 | 22-Jan-2024 10:01:38.804 | 0.0022 | 0.1377 | 9.8575 |
| 100 | 22-Jan-2024 10:01:38.904 | -0.0232 | 0.1459 | 9.8702 |
| | ⋮ | | | |

Plot vertical acceleration data (Z axis data when the cell phone is placed face-up on table)

```
time = Acceleration.Timestamp;
% Calculate the difference between timestamps and cumulative sum them
x = seconds(cumsum(diff(time)));
x = [0; x]; % Time starts at 0 seconds
z = Acceleration.Z;
plot(x,z)
title("Vertical Acceleration Measurments")
xlabel("Time (s)")
ylabel("Vertical Accelertaion (m/s^2)")
xlim("tight")
```




Find the latest value of the vertical acceleration

```
z(end)
```

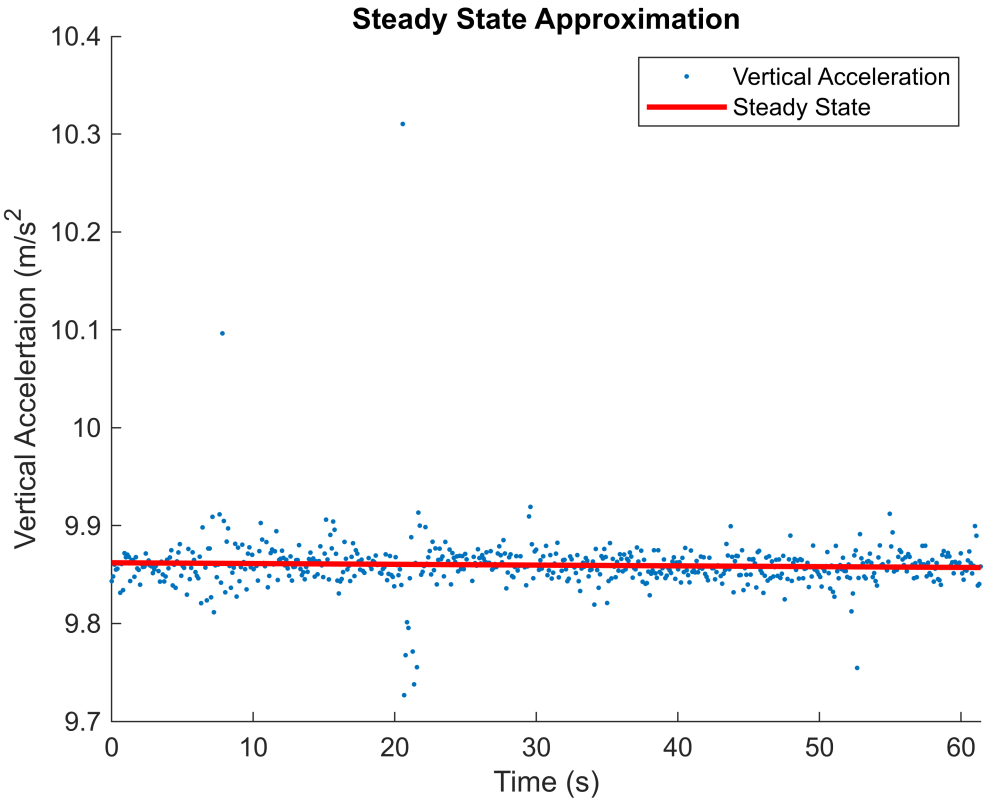
```
ans = 9.8582
```

Is this value a good estimate of the steady state?

Not really... Its just the last value. Doesn't represent the whole sample data collected.

Find a better estimate of the steady-state value

```
scatter(x,z,".")
pfit = polyfit(x,z,1);
pval = polyval(pfit,x);
hold on
plot(x,pval,"r","LineWidth",2)
title("Steady State Approximation")
legend(["Vertical Acceleration" "Steady State"])
xlabel("Time (s)")
ylabel("Vertical Accelertaion (m/s^2")
xlim("tight"),
hold off
```




```
trimmed_mean_estimate = trimmean(z,10)
```

```
trimmed_mean_estimate = 9.8591
```

What is the value of the acceleration of gravity?

9.81

Write a logical IF statement to declare (or not) error in the measurement of g=9.81 m/s^2:

```
if trimmed_mean_estimate ~= 9.81
    disp('There is measurement error')
else
    disp('There is no measurement error')
end
```

```
There is measurement error
```

How is acceleration measured in general? What type of accelerometer is inside the cell phone?

Accleration is the change in velocity with resepect to time.

MEMS-based accelerometer.

[STRETCH] Experiment B: Generate orientation data (e.g., change the pitch anlge, that is, the angle from the table to the plane of the phone). Load orientation data file to workspace

```
load("C:\Users\m260477\Desktop\EW202\ICE\ICE2\Y_Acceleration.mat")
```

## Acceleration

Acceleration = 230×3 timetable

| | Timestamp | X | Y | Z |
|---|---|---|---|---|
| 1 | 22-Jan-2024 14:21:04.701 | 0.0123 | 0.0479 | 9.8720 |
| 2 | 22-Jan-2024 14:21:04.801 | 0.0001 | 0.0169 | 9.8510 |
| 3 | 22-Jan-2024 14:21:04.901 | -0.0310 | 0.0061 | 9.8467 |
| 4 | 22-Jan-2024 14:21:05.002 | -0.0449 | 0.0343 | 9.8581 |
| 5 | 22-Jan-2024 14:21:05.102 | -0.0247 | 0.0623 | 9.8769 |
| 6 | 22-Jan-2024 14:21:05.202 | -0.0057 | 0.0557 | 9.8552 |
| 7 | 22-Jan-2024 14:21:05.302 | 0.0545 | 0.0519 | 9.9874 |
| 8 | 22-Jan-2024 14:21:05.403 | -0.0094 | 0.2853 | 10.7349 |
| 9 | 22-Jan-2024 14:21:05.503 | 0.1093 | 0.8532 | 9.6647 |
| 10 | 22-Jan-2024 14:21:05.603 | -0.0004 | 1.5369 | 9.1487 |
| 11 | 22-Jan-2024 14:21:05.703 | -0.1775 | 1.9777 | 9.3704 |
| 12 | 22-Jan-2024 14:21:05.804 | -0.0088 | 2.3429 | 9.7241 |
| 13 | 22-Jan-2024 14:21:05.904 | -0.0539 | 2.7002 | 9.3758 |
| 14 | 22-Jan-2024 14:21:06.004 | 0.0018 | 3.1243 | 9.7039 |
| 15 | 22-Jan-2024 14:21:06.104 | -0.0518 | 3.5584 | 9.7185 |
| 16 | 22-Jan-2024 14:21:06.205 | -0.0554 | 4.0843 | 8.9297 |
| 17 | 22-Jan-2024 14:21:06.305 | -0.0269 | 4.5519 | 8.9149 |
| 18 | 22-Jan-2024 14:21:06.405 | -0.0325 | 4.9442 | 8.6754 |
| 19 | 22-Jan-2024 14:21:06.505 | -0.0666 | 5.2812 | 8.6664 |
| 20 | 22-Jan-2024 14:21:06.606 | -0.0784 | 5.6097 | 8.4094 |
| 21 | 22-Jan-2024 14:21:06.706 | -0.0762 | 5.9215 | 7.9718 |
| 22 | 22-Jan-2024 14:21:06.806 | -0.0704 | 6.2407 | 7.3728 |
| 23 | 22-Jan-2024 14:21:06.906 | -0.0172 | 6.5701 | 7.2571 |
| 24 | 22-Jan-2024 14:21:07.007 | 0.1192 | 6.8673 | 6.9087 |
| 25 | 22-Jan-2024 14:21:07.107 | -0.0855 | 7.0909 | 7.1086 |
| 26 | 22-Jan-2024 14:21:07.207 | -0.0948 | 7.2755 | 6.4933 |
| 27 | 22-Jan-2024 14:21:07.307 | -0.0501 | 7.3856 | 7.1140 |
| 28 | 22-Jan-2024 14:21:07.408 | -0.0488 | 7.4437 | 6.5375 |
| 29 | 22-Jan-2024 14:21:07.508 | -0.0093 | 7.4514 | 6.3240 |
| 30 | 22-Jan-2024 14:21:07.608 | -0.0398 | 7.4478 | 6.2992 |
| 31 | 22-Jan-2024 14:21:07.708 | -0.0491 | 7.3521 | 6.4676 |
| 32 | 22-Jan-2024 14:21:07.809 | 0.0043 | 7.2500 | 6.6113 |

| | Timestamp | X | Y | Z |
|---|---|---|---|---|
| 33 | 22-Jan-2024 14:21:07.909 | 0.0181 | 7.1557 | 6.8911 |
| 34 | 22-Jan-2024 14:21:08.009 | 0.0093 | 7.0375 | 7.0152 |
| 35 | 22-Jan-2024 14:21:08.109 | 0.0064 | 6.8532 | 7.0707 |
| 36 | 22-Jan-2024 14:21:08.210 | -0.0316 | 6.6091 | 7.4081 |
| 37 | 22-Jan-2024 14:21:08.310 | 0.0127 | 6.4146 | 7.4292 |
| 38 | 22-Jan-2024 14:21:08.410 | 0.0891 | 6.1435 | 7.5747 |
| 39 | 22-Jan-2024 14:21:08.510 | -0.0034 | 5.8054 | 7.8784 |
| 40 | 22-Jan-2024 14:21:08.611 | 0.1085 | 5.4297 | 8.3972 |
| 41 | 22-Jan-2024 14:21:08.711 | -0.0250 | 5.0825 | 8.4598 |
| 42 | 22-Jan-2024 14:21:08.810 | 0.0677 | 4.7857 | 8.5683 |
| 43 | 22-Jan-2024 14:21:08.911 | -0.0829 | 4.4582 | 8.8494 |
| 44 | 22-Jan-2024 14:21:09.012 | 0.0022 | 4.1525 | 8.9078 |
| 45 | 22-Jan-2024 14:21:09.112 | -0.0745 | 3.7686 | 9.0038 |
| 46 | 22-Jan-2024 14:21:09.212 | 0.0091 | 3.3408 | 9.4494 |
| 47 | 22-Jan-2024 14:21:09.312 | -0.0186 | 2.9540 | 9.3958 |
| 48 | 22-Jan-2024 14:21:09.413 | -0.0248 | 2.6628 | 9.5557 |
| 49 | 22-Jan-2024 14:21:09.513 | 0.0118 | 2.4115 | 9.6988 |
| 50 | 22-Jan-2024 14:21:09.613 | 0.0117 | 2.2155 | 9.6663 |
| 51 | 22-Jan-2024 14:21:09.713 | 0.0223 | 2.0355 | 9.6096 |
| 52 | 22-Jan-2024 14:21:09.814 | -0.0058 | 1.8293 | 9.7634 |
| 53 | 22-Jan-2024 14:21:09.914 | -0.0106 | 1.6574 | 9.7232 |
| 54 | 22-Jan-2024 14:21:10.014 | -0.1882 | 1.5002 | 9.6142 |
| 55 | 22-Jan-2024 14:21:10.114 | -0.0515 | 1.3212 | 9.8070 |
| 56 | 22-Jan-2024 14:21:10.215 | -0.0257 | 1.0794 | 9.9639 |
| 57 | 22-Jan-2024 14:21:10.315 | -0.1021 | 0.8971 | 9.6724 |
| 58 | 22-Jan-2024 14:21:10.415 | -0.0528 | 0.7240 | 9.8051 |
| 59 | 22-Jan-2024 14:21:10.515 | 0.0284 | 0.6130 | 9.8792 |
| 60 | 22-Jan-2024 14:21:10.616 | -0.0747 | 0.4905 | 9.9163 |
| 61 | 22-Jan-2024 14:21:10.716 | -0.0337 | 0.3727 | 9.8793 |
| 62 | 22-Jan-2024 14:21:10.816 | 0.0572 | 0.3060 | 9.8777 |
| 63 | 22-Jan-2024 14:21:10.916 | 0.0043 | 0.1916 | 9.8862 |
| 64 | 22-Jan-2024 14:21:11.017 | -0.0208 | 0.1241 | 9.9627 |
| 65 | 22-Jan-2024 14:21:11.117 | -0.0704 | 0.0733 | 9.8078 |

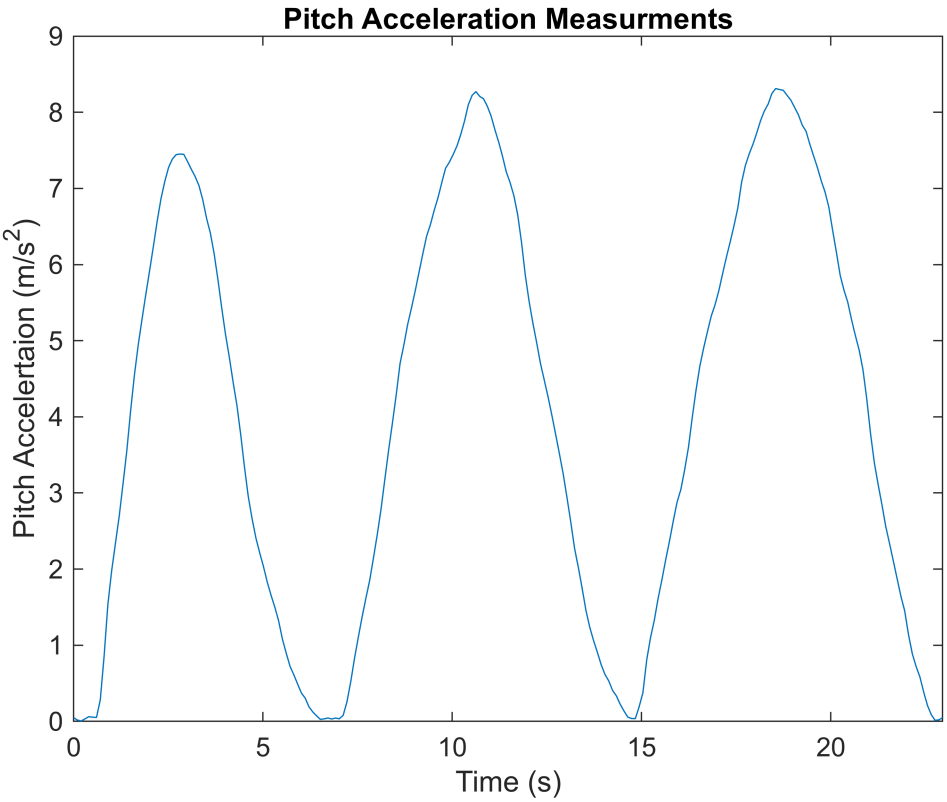
| | Timestamp | X | Y | Z |
|---|---|---|---|---|
| 66 | 22-Jan-2024 14:21:11.217 | -0.0126 | 0.0265 | 9.8601 |
| 67 | 22-Jan-2024 14:21:11.317 | -0.0570 | 0.0337 | 9.8712 |
| 68 | 22-Jan-2024 14:21:11.418 | -0.0199 | 0.0445 | 9.8715 |
| 69 | 22-Jan-2024 14:21:11.518 | -0.0430 | 0.0314 | 9.8679 |
| 70 | 22-Jan-2024 14:21:11.618 | -0.0265 | 0.0446 | 9.8816 |
| 71 | 22-Jan-2024 14:21:11.718 | -0.0160 | 0.0343 | 9.8702 |
| 72 | 22-Jan-2024 14:21:11.819 | -0.0331 | 0.0789 | 10.1531 |
| 73 | 22-Jan-2024 14:21:11.919 | -0.0835 | 0.2560 | 9.8519 |
| 74 | 22-Jan-2024 14:21:12.019 | -0.0314 | 0.5197 | 9.8131 |
| 75 | 22-Jan-2024 14:21:12.119 | 0.1045 | 0.8266 | 9.9604 |
| 76 | 22-Jan-2024 14:21:12.220 | -0.0138 | 1.1074 | 9.9037 |
| 77 | 22-Jan-2024 14:21:12.320 | -0.1428 | 1.3722 | 9.5944 |
| 78 | 22-Jan-2024 14:21:12.420 | -0.0060 | 1.6189 | 9.6991 |
| 79 | 22-Jan-2024 14:21:12.520 | -0.0145 | 1.8525 | 9.8667 |
| 80 | 22-Jan-2024 14:21:12.621 | 0.0305 | 2.1509 | 9.5962 |
| 81 | 22-Jan-2024 14:21:12.721 | -0.0196 | 2.4565 | 9.5325 |
| 82 | 22-Jan-2024 14:21:12.821 | -0.0672 | 2.7915 | 9.6256 |
| 83 | 22-Jan-2024 14:21:12.921 | 0.0319 | 3.1818 | 9.4476 |
| 84 | 22-Jan-2024 14:21:13.022 | 0.0371 | 3.5686 | 9.5012 |
| 85 | 22-Jan-2024 14:21:13.122 | -0.0437 | 3.9227 | 9.2485 |
| 86 | 22-Jan-2024 14:21:13.221 | -0.0687 | 4.2935 | 8.8954 |
| 87 | 22-Jan-2024 14:21:13.322 | 0.0546 | 4.6996 | 8.4665 |
| 88 | 22-Jan-2024 14:21:13.423 | -0.1133 | 4.9433 | 8.3844 |
| 89 | 22-Jan-2024 14:21:13.523 | 0.0391 | 5.2129 | 8.4131 |
| 90 | 22-Jan-2024 14:21:13.623 | -0.0765 | 5.4270 | 8.1588 |
| 91 | 22-Jan-2024 14:21:13.723 | -0.0627 | 5.6554 | 8.1157 |
| 92 | 22-Jan-2024 14:21:13.824 | -0.0434 | 5.8994 | 8.0051 |
| 93 | 22-Jan-2024 14:21:13.924 | -0.0181 | 6.1422 | 7.7103 |
| 94 | 22-Jan-2024 14:21:14.024 | 0.0281 | 6.3731 | 7.3967 |
| 95 | 22-Jan-2024 14:21:14.124 | 0.0245 | 6.5240 | 7.4106 |
| 96 | 22-Jan-2024 14:21:14.225 | 0.0052 | 6.7122 | 7.2574 |
| 97 | 22-Jan-2024 14:21:14.325 | 0.0259 | 6.8786 | 7.1267 |
| 98 | 22-Jan-2024 14:21:14.425 | 0.0275 | 7.0762 | 6.6471 |

| | Timestamp | X | Y | Z |
|---|---|---|---|---|
| 99 | 22-Jan-2024 14:21:14.525 | -0.0636 | 7.2653 | 6.3655 |
| 100 | 22-Jan-2024 14:21:14.626 | -0.0494 | 7.3449 | 6.5942 |

⋮

Plot orientation data

```
time = Acceleration.Timestamp;
% Calculate the difference between timestamps and cumulative sum them
x = seconds(cumsum(diff(time)));
x = [0; x]; % Time starts at 0 seconds
y = Acceleration.Y;
plot(x,y)
title("Pitch Acceleration Measurments")
xlabel("Time (s)")
ylabel("Pitch Accelertaion (m/s^2)")
xlim("tight")
```




Does the graph capture the pitch angle correctly?

Yes!

*Prof Kiriakos Kiriakidis (Jan 18, 2024).*