Clemson University

ECE 4310: Computer Vision

Lab 7: Motion Tracking

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Due: November 10, 2020

**Purpose:**

The purpose of this lab was to calculate the distance a phone traveled based on data from the acceleration in the x, y, and z directions and data from gyroscopes measuring pitch, roll, and yaw sampled every 0.05 seconds. The was to use this information given (in the .txt file) to create a C program which automatically segment the data into periods of motion and periods of rests and calculate the motion along and about each axis during the periods of motion.

**Output and Results:**

Chart, line chart

Description automatically generated

**Figure 1**: Raw Data

Chart, line chart

Description automatically generated

**Figure 2:** Smoothed Data (Window size = 25)

**Table 1:** Results in movement and rotation (Window Size = 10)

Thresholds: Accelerator = 0.0009 and Gyroscope = 0.03

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Start Index** | **Stop Index** | **Start Time** | **End Time** | **X [m]** | **Y [m]** | **Z [m]** | **Pitch [radians]** | **Roll [radians]** | **Yaw [radians]** |
| 15 | 49 | 0.7 | 2.4 | 0.242882 | -0.313148 | -14.010061 | -0.017793 | 0.0014 | -0.046751 |
| 110 | 142 | 5.45 | 7.05 | 0.057237 | 0.53329 | -12.414348 | 0.001226 | -0.015332 | 0.041271 |
| 206 | 238 | 10.25 | 11.85 | -0.217162 | 0.081988 | -12.399938 | -0.001187 | -0.00968 | -0.021367 |
| 287 | 313 | 14.3 | 15.6 | 0.306143 | -0.000505 | -8.185588 | -0.00397 | 0.018928 | 0.038564 |
| 314 | 329 | 15.65 | 16.4 | -0.06246 | -0.003031 | -2.725714 | -0.00156 | -0.01674 | 0.002479 |
| 379 | 408 | 18.9 | 20.35 | 0.359972 | -0.054766 | -10.64872 | 0.160133 | 0.101771 | -0.066214 |
| 449 | 488 | 22.4 | 24.35 | 3.056256 | -1.637123 | -17.66159 | -0.17722 | -0.113945 | 0.050609 |
| 623 | 663 | 31.1 | 33.1 | -0.104642 | -0.106179 | -19.392608 | 0.046047 | -0.000761 | 1.506481 |
| 742 | 775 | 37.05 | 38.7 | -0.13283 | 0.117453 | -13.269423 | -0.001093 | -0.00997 | -1.505605 |
| 855 | 889 | 42.7 | 44.4 | -0.659122 | -4.135501 | -11.766035 | 1.575511 | -0.096717 | -0.080646 |
| 957 | 991 | 47.8 | 49.5 | -0.551448 | -12.606755 | -2.955155 | -1.517109 | 0.008954 | 0.050742 |
| 1060 | 1088 | 52.95 | 54.35 | 2.599399 | -0.017509 | -8.314717 | -0.005016 | 1.702578 | -0.073202 |
| 1159 | 1195 | 57.9 | 59.7 | 14.105117 | -0.017829 | -2.897318 | -0.038691 | -1.605712 | 0.045554 |
| **Total Distance:** | |  |  | 18.999341 | -18.159615 | -136.64122 |  |  |  |
| **Total Angular Rotation:** | |  |  |  |  |  | 0.019278 | -0.035226 | -0.058083 |

**Table 2:** Results in movement and rotation (Window Size = 20)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Start Index** | **Stop**  **Index** | **Start Time** | **End Time** | **X [m]** | **Y [m]** | **Z [m]** | **Pitch [radians]** | **Roll [radians]** | **Yaw [radians]** |
| 6 | 48 | 0.25 | 2.35 | 0.352533 | -0.309568 | -21.381299 | -0.017175 | 0.000298 | -0.044526 |
| 100 | 142 | 4.95 | 7.05 | 0.191492 | 0.578579 | -21.376094 | 0.001452 | -0.01667 | 0.040136 |
| 197 | 237 | 9.8 | 11.8 | -0.150589 | 0.105197 | -19.386427 | -0.000551 | -0.012135 | -0.013817 |
| 277 | 329 | 13.8 | 16.4 | 0.68473 | 0.018411 | -32.78159 | -0.005372 | 0.001318 | 0.041893 |
| 369 | 407 | 18.4 | 20.3 | 0.434299 | -0.003757 | -17.976666 | 0.16069 | 0.105549 | -0.059015 |
| 440 | 485 | 21.95 | 24.2 | 3.981427 | -2.823389 | -23.638944 | -0.192021 | -0.093844 | 0.049514 |
| 613 | 661 | 30.6 | 33 | -0.00152 | -0.075387 | -27.943726 | 0.047987 | -0.0047 | 1.4599 |
| 733 | 774 | 36.6 | 38.65 | -0.139125 | 0.087022 | -20.451682 | -0.001611 | -0.010253 | -1.4764 |
| 845 | 889 | 42.2 | 44.4 | -0.641987 | -4.129016 | -21.225546 | 1.575496 | -0.097429 | -0.080252 |
| 947 | 991 | 47.3 | 49.5 | -0.909985 | -22.070812 | -2.855779 | -1.513114 | 0.00934 | 0.051571 |
| 1050 | 1088 | 52.45 | 54.35 | 2.612688 | -0.019962 | -16.336424 | -0.005032 | 1.702818 | -0.073442 |
| 1150 | 1195 | 57.45 | 59.7 | 23.021133 | -0.03924 | -1.887527 | -0.040427 | -1.616448 | 0.043937 |
| **Total Distance:** | |  |  | 29.435096 | -28.681921 | -227.2417 |  |  |  |
| **Total Angular Rotation:** | |  |  |  |  |  | 0.010323 | -0.032157 | -0.060501 |

Thresholds: Accelerator = 0.0009 and Gyroscope = 0.03

**Conclusion:**

The purpose of this lab was to calculate the distance a phone traveled based on data from the acceleration in the x, y, and z directions and data from gyroscopes measuring pitch, roll, and yaw sampled every 0.05 seconds. As seen in Table 1 and 2 above, as the window size gets bigger more data is lost when trying to calculate how far the phone has traveled. I choose 10 and 20 window sizes because I felt like they were far enough apart to get a sense of how the data changes with window size but not too big that data is lost. Some of the axis are easier to calculate due to less variance in them and vice versa.