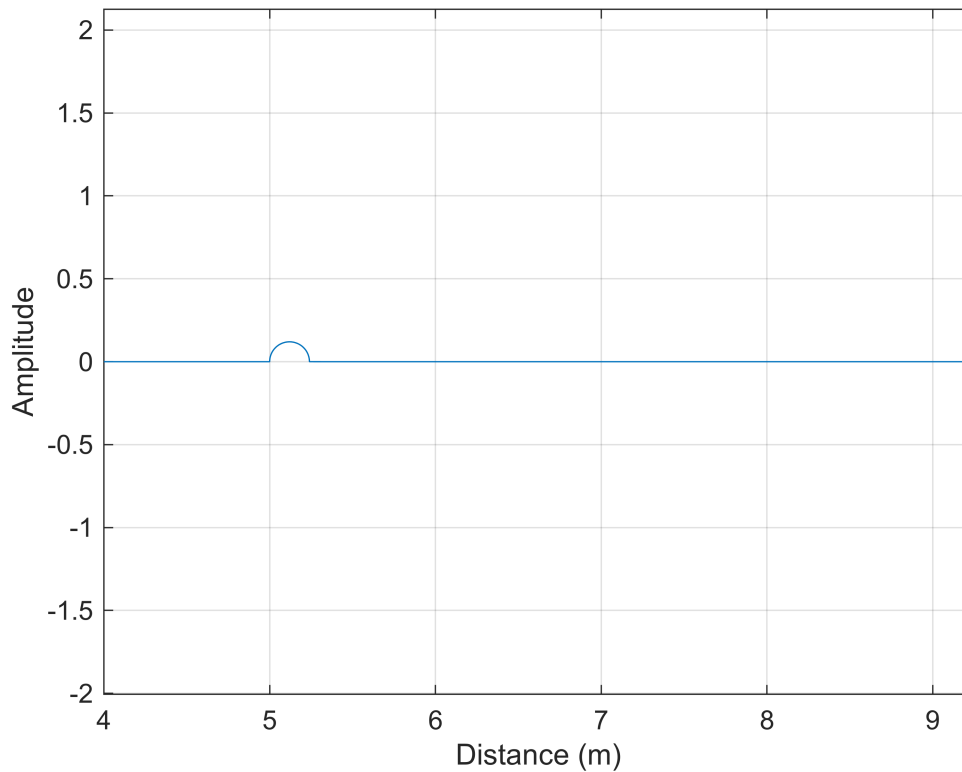


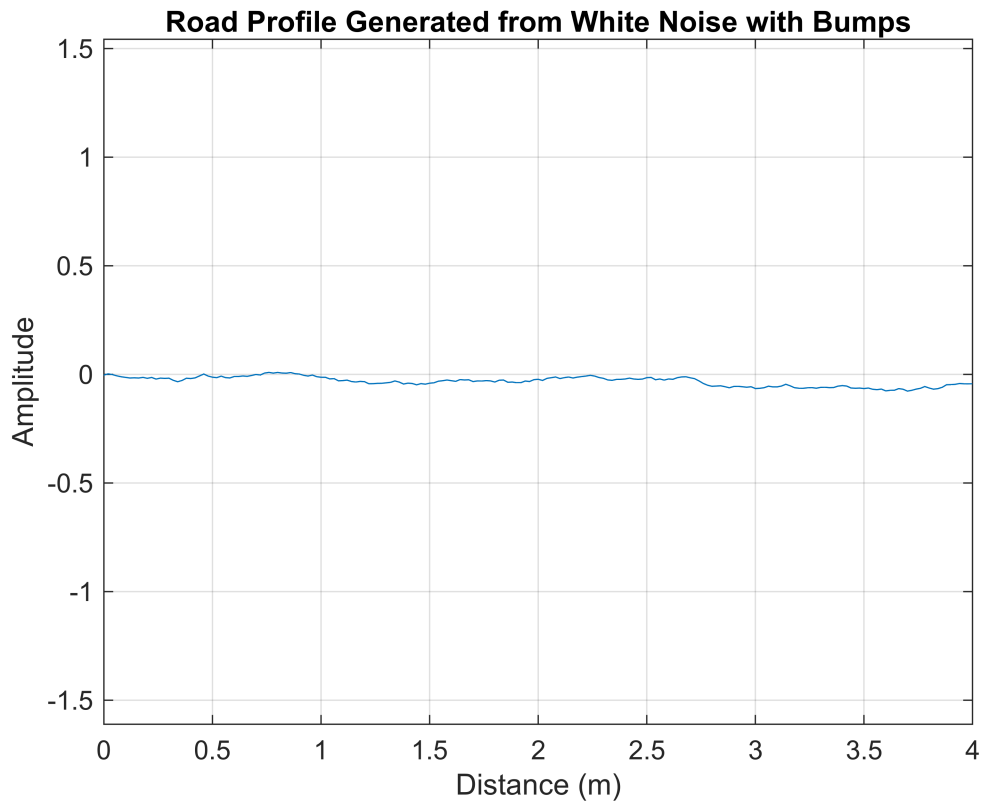
Road Profile - Generation

```
[X_r, Z_r] = bump_road_input(5,0.12,15);
```



```
profile_length = 200;           % Length of the road profile (meters)
sampling_rate = 50;             % Numberof points per meter
amplitude_factor = 0.005;       % Roughness
num_bumps = 5;                  % Number of bumps
bump_amplitude = 0.001;         % Amplitude of bumps
bump_frequency = 0.5;           % Frequency of bumps
```

```
[X_r, Z_r] = generateRoadProfileWithBumps(profile_length, sampling_rate, amplitude_factor, num_bumps, bump_amplitude, bump_frequency);
```



```
road.X_r = X_r;
road.Z_r = Z_r;
```

Car Model

```
%Vehicle
scooter.mass = 150;
scooter.front_unsprung_mass = 15;
scooter.rear_unsprung_mass = 15;
scooter.Lateral_MOI = 20;
scooter.CG_2_Front = 0.5;
scooter.CG_2_Rear = 0.5;

stiffness.front_strut = 15000;
stiffness.rear_strut = 15000;
stiffness.tire_front = 100000;
stiffness.tire_rear = 100000;

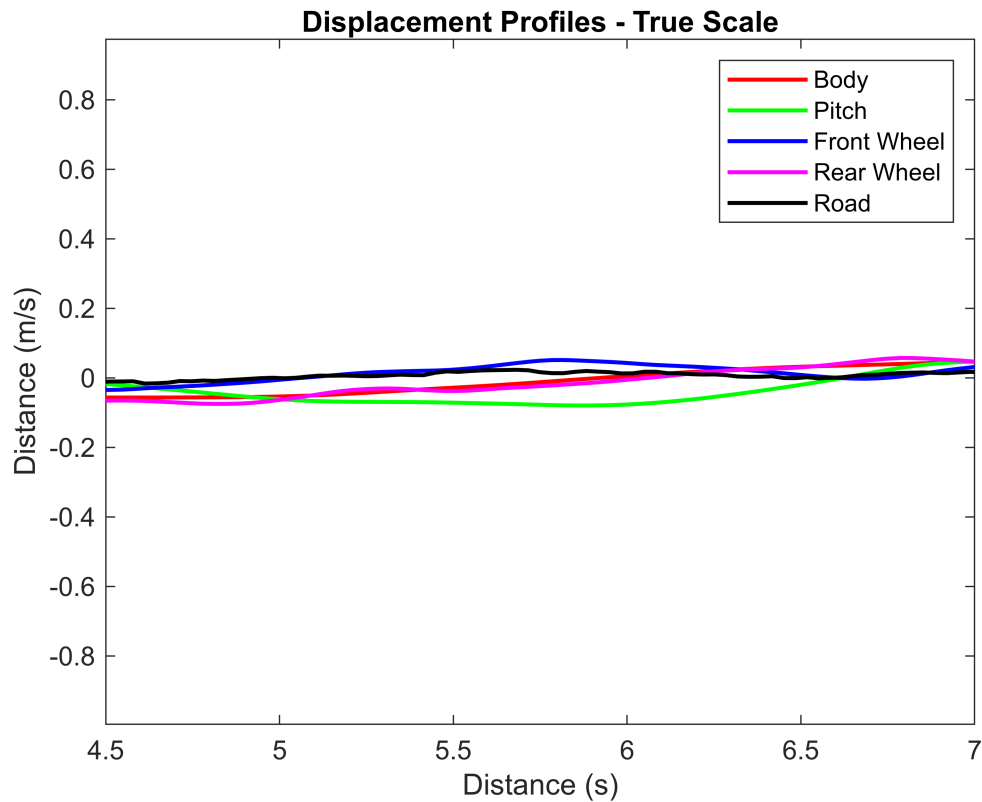
damping.strut_front = 1000;
damping.strut_rear = 1000;

%Velocity
initial_vel = 10; %velocity in m/s
acc = 0;
```

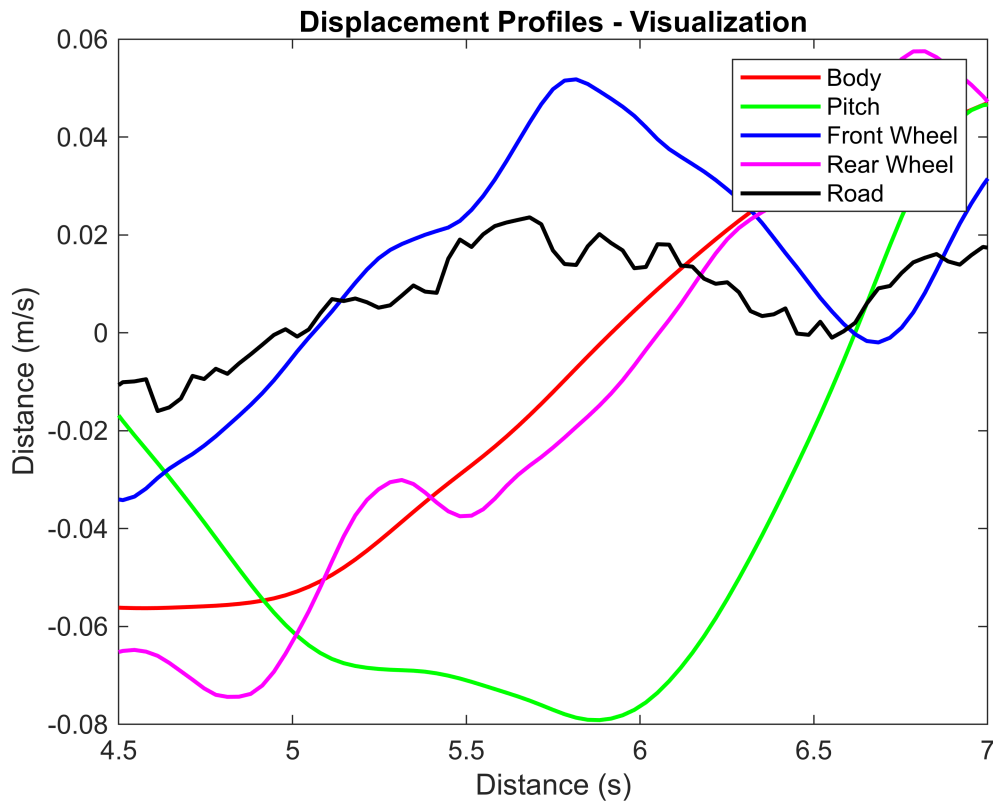
SOLVING

```
[displacement, velocity, acceleration] = Ride_Comfort_Analysis(scooter, stiffness, damping, road)
```

```
displacement = struct with fields:
    z_body: [300x1 double]
    z_unsprung_front: [300x1 double]
    z_unsprung_rear: [300x1 double]
    theta: [300x1 double]
    time: [300x1 double]
    tire_front: [-0.0066 -0.0091 -0.0114 -0.0142 -0.0154 -0.0170 -0.0169 -0.0214 -0.0206 -0.0193 -0.0166 -0.0142 -0.0114 -0.0091 -0.0066 -0.0041 -0.0016 5.6040e-05 -0.0041 -0.0069 -0.0080 -0.0078 -0.0089 -0.0096 -0.0088 -0.0090 -0.0092 -0.0094 -0.0096 -0.0098 -0.0100 -0.0102 -0.0104 -0.0106 -0.0108 -0.0110 -0.0112 -0.0114 -0.0116 -0.0118 -0.0120 -0.0122 -0.0124 -0.0126 -0.0128 -0.0130 -0.0132 -0.0134 -0.0136 -0.0138 -0.0140 -0.0142 -0.0144 -0.0146 -0.0148 -0.0150 -0.0152 -0.0154 -0.0156 -0.0158 -0.0160 -0.0162 -0.0164 -0.0166 -0.0168 -0.0170 -0.0172 -0.0174 -0.0176 -0.0178 -0.0180 -0.0182 -0.0184 -0.0186 -0.0188 -0.0190 -0.0192 -0.0194 -0.0196 -0.0198 -0.0200 -0.0202 -0.0204 -0.0206 -0.0208 -0.0210 -0.0212 -0.0214 -0.0216 -0.0218 -0.0220 -0.0222 -0.0224 -0.0226 -0.0228 -0.0230 -0.0232 -0.0234 -0.0236 -0.0238 -0.0240 -0.0242 -0.0244 -0.0246 -0.0248 -0.0250 -0.0252 -0.0254 -0.0256 -0.0258 -0.0260 -0.0262 -0.0264 -0.0266 -0.0268 -0.0270 -0.0272 -0.0274 -0.0276 -0.0278 -0.0280 -0.0282 -0.0284 -0.0286 -0.0288 -0.0290 -0.0292 -0.0294 -0.0296 -0.0298 -0.0300]
    tire_rear: [-0.0016 5.6040e-05 -0.0041 -0.0069 -0.0080 -0.0078 -0.0089 -0.0096 -0.0088 -0.0090 -0.0092 -0.0094 -0.0096 -0.0098 -0.0099 -0.0101 -0.0103 -0.0105 -0.0107 -0.0109 -0.0111 -0.0113 -0.0115 -0.0117 -0.0119 -0.0121 -0.0123 -0.0125 -0.0127 -0.0129 -0.0131 -0.0133 -0.0135 -0.0137 -0.0139 -0.0141 -0.0143 -0.0145 -0.0147 -0.0149 -0.0151 -0.0153 -0.0155 -0.0157 -0.0159 -0.0161 -0.0163 -0.0165 -0.0167 -0.0169 -0.0171 -0.0173 -0.0175 -0.0177 -0.0179 -0.0181 -0.0183 -0.0185 -0.0187 -0.0189 -0.0191 -0.0193 -0.0195 -0.0197 -0.0199 -0.0201 -0.0203 -0.0205 -0.0207 -0.0209 -0.0211 -0.0213 -0.0215 -0.0217 -0.0219 -0.0221 -0.0223 -0.0225 -0.0227 -0.0229 -0.0231 -0.0233 -0.0235 -0.0237 -0.0239 -0.0241 -0.0243 -0.0245 -0.0247 -0.0249 -0.0251 -0.0253 -0.0255 -0.0257 -0.0259 -0.0261 -0.0263 -0.0265 -0.0267 -0.0269 -0.0271 -0.0273 -0.0275 -0.0277 -0.0279 -0.0281 -0.0283 -0.0285 -0.0287 -0.0289 -0.0291 -0.0293 -0.0295 -0.0297 -0.0299 -0.0301]
    longitudinal_pos_front: [1 1.0334 1.0669 1.1003 1.1338 1.1672 1.2007 1.2341 1.2676 1.3010 1.3344 1.3679 1.4013 1.4348 1.4682 1.5016 1.5350 1.5684 1.6018 1.6352 1.6686 1.7020 1.7354 1.7688 1.8022 1.8356 1.8690 1.9024 1.9358 1.9692 2.0026 2.0360 2.0694 2.1028 2.1362 2.1696 2.2030 2.2364 2.2698 2.3032 2.3366 2.3700 2.4034 2.4368 2.4702 2.5036 2.5370 2.5704 2.6038 2.6372 2.6706 2.7040 2.7374 2.7708 2.8042 2.8376 2.8710 2.9044 2.9378 2.9712 3.0046 3.0380 3.0714 3.1048 3.1382 3.1716 3.2050 3.2384 3.2718 3.3052 3.3386 3.3720 3.4054 3.4388 3.4722 3.5056 3.5390 3.5724 3.6058 3.6392 3.6726 3.7060 3.7394 3.7728 3.8062 3.8396 3.8730 3.9064 3.9398 3.9732 4.0066 4.0400 4.0734 4.1068 4.1402 4.1736 4.2070 4.2404 4.2738 4.3072 4.3406 4.3740 4.4074 4.4408 4.4742 4.5076 4.5410 4.5744 4.6078 4.6412 4.6746 4.7080 4.7414 4.7748 4.8082 4.8416 4.8750 4.9084 4.9418 4.9752 5.0086 5.0420 5.0754 5.1088 5.1422 5.1756 5.2090 5.2424 5.2758 5.3092 5.3426 5.3760 5.4094 5.4428 5.4762 5.5096 5.5430 5.5764 5.6098 5.6432 5.6766 5.7100 5.7434 5.7768 5.8102 5.8436 5.8770 5.9104 5.9438 5.9772 6.0106 6.0440 6.0774 6.1108 6.1442 6.1776 6.2110 6.2444 6.2778 6.3112 6.3446 6.3780 6.4114 6.4448 6.4782 6.5116 6.5450 6.5784 6.6118 6.6452 6.6786 6.7120 6.7454 6.7788 6.8122 6.8456 6.8790 6.9124 6.9458 6.9792 7.0126 7.0460 7.0794 7.1128 7.1462 7.1796 7.2130 7.2464 7.2798 7.3132 7.3466 7.3800 7.4134 7.4468 7.4802 7.5136 7.5470 7.5804 7.6138 7.6472 7.6806 7.7140 7.7474 7.7808 7.8142 7.8476 7.8810 7.9144 7.9478 7.9812 8.0146 8.0480 8.0814 8.1148 8.1482 8.1816 8.2150 8.2484 8.2818 8.3152 8.3486 8.3820 8.4154 8.4488 8.4822 8.5156 8.5490 8.5824 8.6158 8.6492 8.6826 8.7160 8.7494 8.7828 8.8162 8.8496 8.8830 8.9164 8.9498 8.9832 9.0166 9.0500 9.0834 9.1168 9.1502 9.1836 9.2170 9.2504 9.2838 9.3172 9.3506 9.3840 9.4174 9.4508 9.4842 9.5176 9.5510 9.5844 9.6178 9.6512 9.6846 9.7180 9.7514 9.7848 9.8182 9.8516 9.8850 9.9184 9.9518 9.9852 10.0186 10.0520 10.0854 10.1188 10.1522 10.1856 10.2190 10.2524 10.2858 10.3192 10.3526 10.3860 10.4194 10.4528 10.4862 10.5196 10.5530 10.5864 10.6198 10.6532 10.6866 10.7200 10.7534 10.7868 10.8202 10.8536 10.8870 10.9204 10.9538 10.9872 11.0206 11.0540 11.0874 11.1208 11.1542 11.1876 11.2210 11.2544 11.2878 11.3212 11.3546 11.3880 11.4214 11.4548 11.4882 11.5216 11.5550 11.5884 11.6218 11.6552 11.6886 11.7220 11.7554 11.7888 11.8222 11.8556 11.8890 11.9224 11.9558 11.9892 12.0226 12.0560 12.0894 12.1228 12.1562 12.1896 12.2230 12.2564 12.2898 12.3232 12.3566 12.3900 12.4234 12.4568 12.4902 12.5236 12.5570 12.5904 12.6238 12.6572 12.6906 12.7240 12.7574 12.7908 12.8242 12.8576 12.8910 12.9244 12.9578 12.9912 13.0246 13.0580 13.0914 13.1248 13.1582 13.1916 13.2250 13.2584 13.2918 13.3252 13.3586 13.3920 13.4254 13.4588 13.4922 13.5256 13.5590 13.5924 13.6258 13.6592 13.6926 13.7260 13.7594 13.7928 13.8262 13.8596 13.8930 13.9264 13.9598 13.9932 14.0266 14.0600 14.0934 14.1268 14.1602 14.1936 14.2270 14.2604 14.2938 14.3272 14.3606 14.3940 14.4274 14.4608 14.4942 14.5276 14.5610 14.5944 14.6278 14.6612 14.6946 14.7280 14.7614 14.7948 14.8282 14.8616 14.8950 14.9284 14.9618 14.9952 15.0286 15.0620 15.0954 15.1288 15.1622 15.1956 15.2290 15.2624 15.2958 15.3292 15.3626 15.3960 15.4294 15.4628 15.4962 15.5296 15.5630 15.5964 15.6298 15.6632 15.6966 15.7300 15.7634 15.7968 15.8302 15.8636 15.8970 15.9304 15.9638 15.9972 16.0306 16.0640 16.0974 16.1308 16.1642 16.1976 16.2310 16.2644 16.2978 16.3312 16.3646 16.3980 16.4314 16.4648 16.4982 16.5316 16.5650 16.5984 16.6318 16.6652 16.6986 16.7320 16.7654 16.7988 16.8322 16.8656 16.8990 16.9324 16.9658 16.9992 17.0326 17.0660 17.0994 17.1328 17.1662 17.1996 17.2330 17.2664 17.2998 17.3332 17.3666 17.3999 17.4333 17.4667 17.5001 17.5335 17.5669 17.6003 17.6337 17.6671 17.7005 17.7339 17.7673 17.8007 17.8341 17.8675 17.9009 17.9343 17.9677 18.0011 18.0345 18.0679 18.1013 18.1347 18.1681 18.2015 18.2349 18.2683 18.3017 18.3351 18.3685 18.4019 18.4353 18.4687 18.5021 18.5355 18.5689 18.6023 18.6357 18.6691 18.7025 18.7359 18.7693 18.8027 18.8361 18.8695 18.9029 18.9363 18.9697 19.0031 19.0365 19.0699 19.1033 19.1367 19.1701 19.2035 19.2369 19.2703 19.3037 19.3371 19.3705 19.4039 19.4373 19.4707 19.5041 19.5375 19.5709 19.6043 19.6377 19.6711 19.7045 19.7379 19.7713 19.8047 19.8381 19.8715 19.9049 19.9383 19.9717 20.0051 20.0385 20.0719 20.1053 20.1387 20.1721 20.2055 20.2389 20.2723 20.3057 20.3391 20.3725 20.4059 20.4393 20.4727 20.5061 20.5395 20.5729 20.6063 20.6397 20.6731 20.7065 20.7399 20.7733 20.8067 20.8401 20.8735 20.9069 20.9403 20.9737 21.0071 21.0405 21.0739 21.1073 21.1407 21.1741 21.2075 21.2409 21.2743 21.3077 21.3411 21.3745 21.4079 21.4413 21.4747 21.5081 21.5415 21.5749 21.6083 21.6417 21.6751 21.7085 21.7419 21.7753 21.8087 21.8421 21.8755 21.9089 21.9423 21.9757 22.0091 22.0425 22.0759 22.1093 22.1427 22.1761 22.2095 22.2429 22.2763 22.3097 22.3431 22.3765 22.4099 22.4433 22.4767 22.5101 22.5435 22.5769 22.6103 22.6437 22.6771 22.7105 22.7439 22.7773 22.8107 22.8441 22.8775 22.9109 22.9443 22.9777 23.0111 23.0445 23.0779 23.1113 23.1447 23.1781 23.2115 23.2449 23.2783 23.3117 23.3451 23.3785 23.4119 23.4453 23.4787 23.5121 23.5455 23.5789 23.6123 23.6457 23.6791 23.7125 23.7459 23.7793 23.8127 23.8461 23.8795 23.9129 23.9463 23.9797 24.0131 24.0465 24.0799 24.1133 24.1467 24.1801 24.2135 24.2469 24.2803 24.3137 24.3471 24.3805 24.4139 24.4473 24.4807 24.5141 24.5475 24.5809 24.6143 24.6477 24.6811 24.7145 24.7479 24.7813 24.8147 24.8481 24.8815 24.9149 24.9483 24.9817 25.0151 25.0485 25.0819 25.1153 25.1487 25.1821 25.2155 25.2489 25.2823 25.3157 25.3491 25.3825 25.4159 25.4493 25.4827 25.5161 25.5495 25.5829 25.6163 25.6497 25.6831 25.7165 25.7499 25.7833 25.8167 25.8501 25.8835 25.9169 25.9503 25.9837 26.0171 26.0505 26.0839 26.1173 26.1507 26.1841 26.2175 26.2509 26.2843 26.3177 26.3511 26.3845 26.4179 26.4513 26.4847 26.5181 26.5515 26.5849 26.6183 26.6517 26.6851 26.7185 26.7519 26.7853 26.8187 26.8521 26.8855 26.9189 26.9523 26.9857 27.0191 27.0525 27.0859 27.1193 27.1527 27.1861 27.2195 27.2529 27.2863 27.3197 27.3531 27.3865 27.4199 27.4533 27.4867 27.5201 27.5535 27.5869 27.6203 27.6537 27.6871 27.7205 27.7539 27.7873 27.8207 27.8541 27.8875 27.9209 27.9543 27.9877 28.0211 28.0545 28.0879 28.1213 28.1547 28.1881 28.2215 28.2549 28.2883 28.3217 28.3551 28.3885 28.4219 28.4553 28.4887 28.5221 28.5555 28.5889 28.6223 28.6557 28.6891 28.7225 28.7559 28.7893 28.8227 28.8561 28.8895 28.9229 28.9563 28.9897 29.0231 29.0565 29.0899 29.1233 29.1567 29.1901 29.2235 29.2569 29.2903 29.3237 29.3571 29.3905 29.4239 29.4573 29.4907 29.5241 29.5575 29.5909 29.6243 29.6577 29.6911 29.7245 29.7579 29.7913 29.8247 29.8581 29.8915 29.9249 29.9583 29.9917 30.0251 30.0585 30.0919 30.1253 30.1587 30.1921 30.2255 30.2589 30.2923 30.3257 30.3591 30.3925 30.4259 30.4593 30.4927 30.5261 30.5595 30.5929 30.6263 30.6597 30.6931 30.7265 30.7599 30.7933 30.8267 30.8601 30.8935 30.9269 30.9603 30.9937 31.0271 31.0605 31.0939 31.1273 31.1607 31.1941 31.2275 31.2609 31.2943 31.3277 31.3611 31.3945 31.4279 31.4613 31.4947 31.5281 31.5615 31.5949 31.6283 31.6617 31.6951 31.7285 31.7619 31.7953 31.8287 31.8621 31.8955 31.9289 31.9623 31.9957 32.0291 32.0625 32.0959 32.1293 32.1627 32.1961 32.2295 32.2629 32.2963 32.3297 32.3631 32.3965 32.4299 32.4633 32.4967 32.5301 32.5635 32.5969 32.6303 32.6637 32.6971 32.7305 32.7639 32.7973 32.8307 32.8641 32.8975 32.9309 32.9643 32.9977 33.0311 33.0645 33.0979 33.1313 33.1647 33.1981 33.2315 33.2649 33.2983 33.3317 33.3651 33.3985 33.4319 33.4653 33.4987 33.5321 33.5655 33.5989 33.6323 33.6657 33.6991 33.7325 33.7659 33.7993 33.8327 33.8661 33.8995 33.9329 33.9663 33.9997 34.0331 34.0665 34.0999 34.1333 34.1667 34.1999 34.2333 34.2667 34.2999 34.3333 34.3667 34.3999 34.4333 34.4667 34.4999 34.5333 34.5667 34.5999 34.6333 34.6667 34.6999 34.7333 34.7667 34.7999 34.8333 34.8667 34.8999 34.9333 34.9667 34.9999 35.0333 35.0667 35.0999 35.1333 35.1667 35.1999 35.2333 35.2667 35.2999 35.3333 35.3667 35.3999 35.4333 35.4667 35.4999 35.5333 35.5667 35.5999 35.6333 35.6667 35.6999 35.7333 35.7667 35.7999 35.8333 35.8667 35.8999 35.9333 35.9667 35.9999 36.0333 36.0667 36.0999 36.1333 36.1667 36.1999 36.2333 36.2667 36.2999 36.3333 36.3667 36.3999 36.4333 36.4667 36.4999 36.5333 36.5667 36.5999 36.6333 36.6667 36.6999 36.7333 36.7667 36.7999 36.8333 36.8667 36.8999 36.9333 36.9667 36.9999 37.0333 37.0667 37.0999 37.1333 37.1667 37.1999 37.2333 37.2667 37.2999 37.3333 37.3667 37.3999 37.4333 37.4667 37.4999 37.5333 37.5667 37.5999 37.6333 37.6667 37.6999 37.7333 37.7667 37.7999 37.8333 37.8667 37.8999 37.9333 37.9667 37.9999 38.0333 38.0667 38.0999 38.1333 38.1667 38.1999 38.2333 38.2667 38.2999 38.3333 38.3667 38.3999 38.4333 38.4667 38.4999 38.5333 38.5667 38.5999 38.6333 38.6667 38.6999 38.7333 38.7667 38.7999 38.8333 38.8667 38.8999 38.9333 38.9667 38.9999 39.0333 39.0667 39.0999 39.1333 39.1667 39.1999 39.2333 39.2667 39.2999 39.3333 39.3667 39.3999 39.4333 39.4667 39.4999 39.5333 39.5667 39.5999 39.6333 39.6667 39.6999 39.7333 39.7667 39.7999 39.8333 39.8667 39.8999 39.9333 39.9667 39.9999 40.0333 40.0667 40.0999 40.1333 40.1667 40.1999 40.2333 40.2667 40.2999 40.3333 40.3667 40.3999 40.4333 40.4667 40.4999 40.5333 40.5667 40.5999 40.6333 40.6667 40.6999 40.7333 40.7667 40.7999 40.8333 40.8667 40.8999 40.9333 40.9667 40.9999 41.0333 41.0667 41.0999 41.1333 41.1667 41.1999 41.2333 41.2667 41.2999 41.3333 41.3667 41.3999 41.4333 41.4667 41.4999 41.5333 41.5667 41.5999 41.6333 41.6667 41.6999 41.7333 41.7667 41.7999 41.8333 41.8667 41.8999 41.9333 41.9667 41.9999 42.0333 42.0667 42.0999 42.1333 42.1667 42.1999 42.2333 42.2667 42.2999 42.3333 42.3667 42.3999 42.4333 42.4667 42.4999 42.5333 42.5667 42.5999 42.6333 42.6667 42.6999 42.7333 42.7667 42.7999 42.8333 42.8667 42.8999 42.9333 42.9667 42.9999 43.0333 43.0667 43.0999 43.1333 43.1667 43.1999 43.2333 43.2667 43.2999 43.3333 43.3667 43.3999 43.4333 43.4667 43.4999 43.5333 43.5667 43.5999 43.6333 43.6667 43.6999 43.7333 43.7667 43.7999 43.8333 43.8667 43.8999 43.9333 43.9667 43.9999 44.0333 44.0667 44.0999 44.1333 44.1667 44.1999 44.2333 44.2667 44.2999 44.3333 44.3667 44.3999 44.4333 44.4667 44.4999 44.5333 44.5667 44.5999 44.6333 44.6667 44.6999 44.7333 44.7667 44.7999 44.8333 44.8667 44.8999 44.9333 44.9667 44.9999 45.0333 45.0667 45.0999 45.1333 45.1667 45.1999 45.2333 45.2667 45.2999 45.3333 45.3667 45.3999 45.4333 45.4667 45.4999 45.5333 45.5667 45.5999 45.6333 45
```

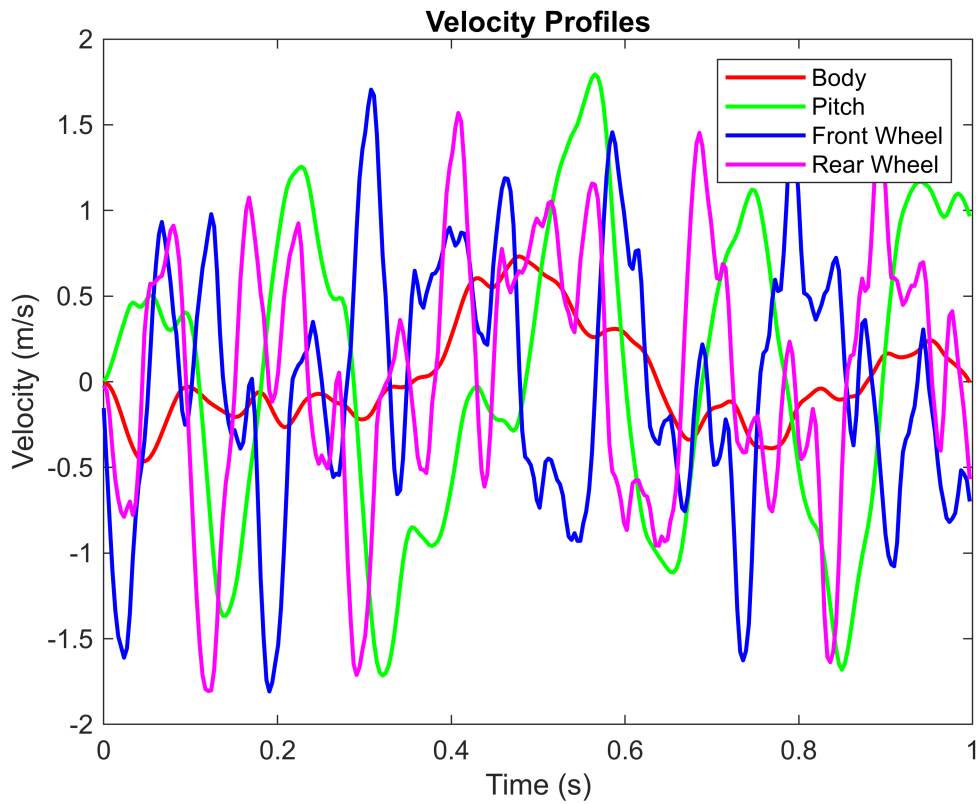


```
figure
u = displacement.longitudinal_pos_front;
plot(u , displacement.z_body, 'r', 'LineWidth', 1.5);
hold on;
plot(u, displacement.theta, 'g', 'LineWidth', 1.5);
plot(u, displacement.z_unsprung_front, 'b', 'LineWidth', 1.5);
plot(u, displacement.z_unsprung_rear, 'm', 'LineWidth', 1.5);
plot(u, displacement.tire_front, 'k', 'LineWidth', 1.5);
xlabel('Distance (s)');
ylabel('Distance (m/s)');
legend('Body', 'Pitch', 'Front Wheel', 'Rear Wheel','Road');
title('Displacement Profiles - Visualization');
xlim([4.5 7])
hold off
```

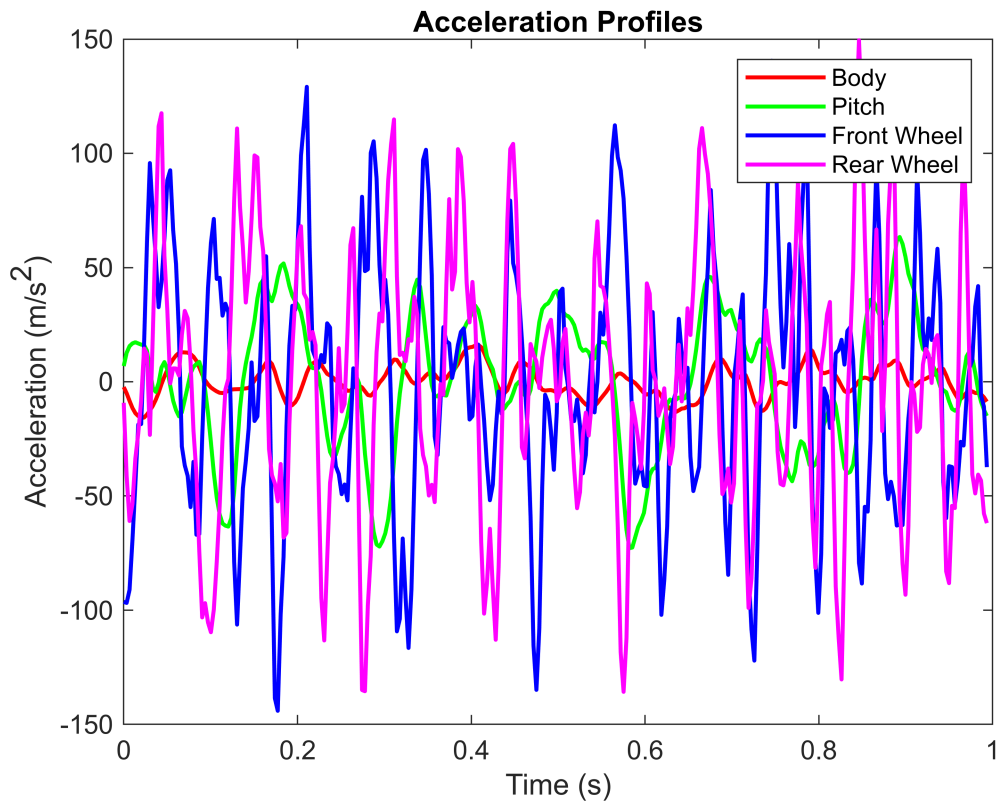


Time Based Analysis

```
figure;
plot(velocity.time, velocity.v_body, 'r', 'LineWidth', 1.5);
hold on;
plot(velocity.time, velocity.v_theta, 'g', 'LineWidth', 1.5);
plot(velocity.time, velocity.v_unsprung_front, 'b', 'LineWidth', 1.5);
plot(velocity.time, velocity.v_unsprung_rear, 'm', 'LineWidth', 1.5);
xlabel('Time (s)');
ylabel('Velocity (m/s)');
legend('Body', 'Pitch', 'Front Wheel', 'Rear Wheel');
title('Velocity Profiles');
hold off
```



```
figure;
plot(acceleration.time, acceleration.a_body, 'r', 'LineWidth', 1.5);
hold on;
plot(acceleration.time, acceleration.a_theta, 'g', 'LineWidth', 1.5);
plot(acceleration.time, acceleration.a_unsprung_front, 'b', 'LineWidth', 1.5);
plot(acceleration.time, acceleration.a_unsprung_rear, 'm', 'LineWidth', 1.5);
xlabel('Time (s)');
ylabel('Acceleration (m/s^2)');
legend('Body', 'Pitch', 'Front Wheel', 'Rear Wheel');
title('Acceleration Profiles');
hold off
```



RIDE COMFORT QUANTIZATION

Root Mean Square Acceleration

```
%Body
RMS_Acc_Body = rms(acceleration.a_body)
```

```
RMS_Acc_Body = 6.8532
```

```
%Pitch
RMS_Acc_Pitch = rms(acceleration.a_theta)
```

```
RMS_Acc_Pitch = 29.7704
```

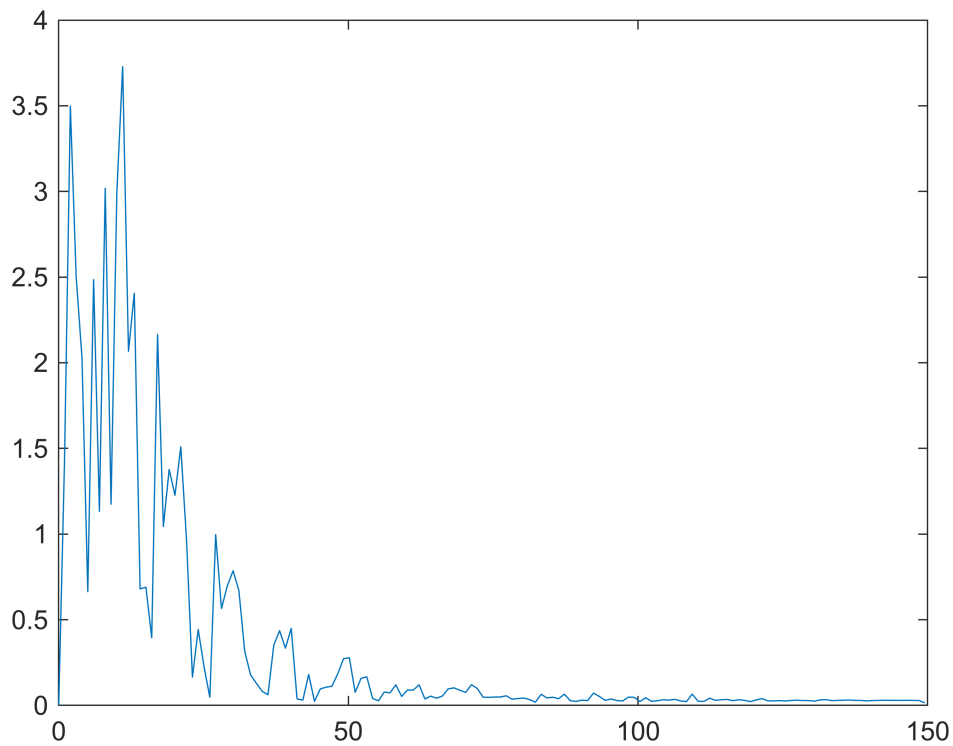
Transmissibility (acceleration based)

```
max(acceleration.a_body)/max(acceleration.a_unsprung_front)
```

```
ans = 0.1147
```

Power Spectral Density - Frequency based

```
[Weighted_PSD, frequency_arr, PSD] = Frequency_analysis(acceleration.a_body,acceleration.time);
plot(frequency_arr, PSD)
```



Total Power (PSD integral)

```
Total_Power = trapz(frequency_arr, PSD)
```

```
Total_Power = 52.1049
```

Finding Natural Frequencies

```
% Find and display the first 5 peaks in the amplitude spectrum (simple peak detection)
peaks = [];
locs = [];

for i = 2:length(frequency_arr)-1
    if PSD(i) > PSD(i-1) && PSD(i) > PSD(i+1)
        peaks = [peaks, PSD(i)];
        locs = [locs, frequency_arr(i)];
    end
end

n_modes = 5;
```

Natural Frequencies (First 5)

```
peaks = peaks(1:n_modes);
freqs = locs(1:n_modes)
```

```
freqs = 1x5
```


2.0067 6.0201 8.0268 11.0369 13.0436

```
plot(frequency_arr, PSD)
hold on;
plot(freqs, peaks, 'ro');
hold off;
```

