**Data Analysis**

As stated earlier, the main objective of this study was two-fold: To examine the accuracy of the mobile phone application and to test its repeatability (precision) as well. For the sake of testing the accuracy, data collected by the City of Champaign Public works were obtained for the comparison. These data were collected using state of the art technology (mention what it is) and were, only for the sake of this study, considered as “true data” while the data collected in this study were considered as an estimate. As for precision evaluation, different measurements were done for the same street to check whether the application was able to produce the same results time and time again.

**Precision Analysis**

If the application is able to get roughly the same results for the same settings, then it would be considered precise. For this, multiple drives were done on the same road links were done. Figure shows a typical example of a repeated drive which is data obtained for Windsor Road in Urbana between (X and Y) using (settings). This includes keeping the speed as close as possible to a target speed so that the comparison holds. Figures x shows the two IRI profiles obtained from the two trials. It can be seen that neither the trend nor the values are repeatable between the two trials. The value of the root mean square error (RSME) and the absolute difference between the two means are 2.26 in\mile and 2.13 in\mile, respectively. This means that there is not a only are the individual corresponding values on the two curves are different, but also the mean measured values are almost as far off. Table x shows RMSE and the absolute difference between the two averages for n repeated drives.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Avg IRI (m/km)** | **RMSE** | **Absolute Difference in Averages** | **% Diff** | **Street** |
| **PCC\_GS\_1st\_L2** |  | **2.76** | **2.58** |  | **Windsor** |
| **PCC\_GS\_2nd\_L2** |  |  |
| **PCC\_BS\_1st\_L1** | **2.54** | **0.13** | **0.02** |  |
| **PCC\_BS\_2nd\_L1** | **2.56** |  |
| **PCC\_BS\_1st\_15mph** | **2.17** | **0.06** | **0.04** |  | **Interstate** |
| **PCC\_BS\_2nd\_15mph** | **2.13** |  |
| **PCC\_BS\_1st\_30mph** | **2.29** | **0.2** | **0.13** |  |
| **PCC\_BS\_2nd\_30mph** | **2.16** |  |
| **AC\_BS\_1st\_15mph** | **3.09** | **0.14** | **0.1** |  | **State** |
| **AC\_BS\_2nd\_15mph** | **2.99** |  |
| **AC\_BS\_1st\_30mph** | **2.98** | **0.14** | **0.02** |  |
| **AC\_BS\_2nd\_30mph** | **2.96** |  |

Table : Repetability table

**Accuracy Analysis**

Comparisons were made between the collected data and the “true data”. A challenge faced was the difference in resolution between the two data sources. For the data obtained from the City of Champaign, the measurements were taken at a 100-ft interval. For the collected data, it was much larger. A preliminary test showed that the difference can be in an order of magnitude of three (the data from Champaign City is 3 times denser). To solve this issue, the average of three consecutive points for the true data was taken so that the comparison holds. The same analysis was done as in the previous section. Both RMSE and absolute difference of averages were calculated.

For the case shown in Figure (X), RMSE and absolute different of averages between Chamapign City and the first trail are 1.35 m/km and 1.14 m/km, respectively. For the second trial, the respective values are 1.43 m/km and 1.04 m/km. Table (X) summarizes these values for all the trial done in different combinations.

**Interpretation**