RDE Analysis and Open Source Tool Development

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- EU-RDE Regulation 2017/1151, Appendix 7, and Validation with EU-JRC EMROAD Tool
- Negative CO₂, NO_x, CO, PN emissions at zero vehicle speeds
- OBD CAN vehicle speeds and GPS vehicle speeds
- GPS Road Grade smoothing /w Savitzky–Golay filter
- WLTC CO2 Correlations /w EPA FTP, Highway, US06 cycles
- Data Processing Automation
- RDE Analysis CO2, v.a, RPA, NOx, CO, HC
- EPA's open source Python Tool Demo
 - File Selection and Output Directory GUI
 - Report Generation
 - Figure Plotting Saving in a PDF file



 Moving Average Window (MAW) CO2 are identical, but the MAW vehicle speeds are little offset due to data smoothing.







- The EPA road grades were estimated by using Savitzky–Golay filter.
- Two 1.2% Road Grade PASS/FAIL criteria in Urban and Total RDE Cycles
- The filtered altitude difference at vehspd = 0 is zero.
- OBD and GPS Vehicle speeds were synchronized with the elapsed time offset points.



WLTC CO2 Estimated at 19 kph: UDDS + HwFET extrapolation at 41 kph: UDDS/FTP bag 1 at 57kph: UDDS/FTP bag 1 + HwFET at 92 kph: FTP bag 3 + US06 bag 2

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- Fast PEMS data quality checking including all sub-directories
- Automatically construct a RDE drive profile with small route test data
- Automatically synchronize vehicle speeds in the PEMS test and OBD files
- Check RDE urban/rural/motorway drive distance share for pass/fail
- HTML report, PDF plotting and Excel processed data outputs

MAW CO2 and RDE Drive Shares



Quickly checking RDE route qualified driving profiles



 95 percentile of vehicle speed x acceleration can be adjusted by properly mixing Urban, Rural and Motorway vehicle speed shares.



Fail: Distance Drive Share Urban 20%, Rural 11%, Motorway 69%



NOx Emission

Correlations between an accumulation time and engine loads



- Automated PEMS and GPS Data Processing for RDE Analysis.
 About 10 minute analysis for 45 data files from 5 days PEMS tests
- Generated PDF, HTML and Excel output files for PEMS and OBD test data processing and analysis
- Develop a user-friendly GUI and executable Python code
- Investigate NOx correlations between engine loads and accumulation time