Car tracking and Vibration Test rig using Neo-Freerunner

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(a)

(b)

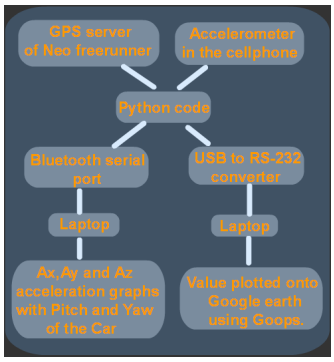
(c)

Fig 1(a) Shows the laptop running the car vibration visualization software 1(b) shows GPS location in Google earth 1(c) shows the test car with

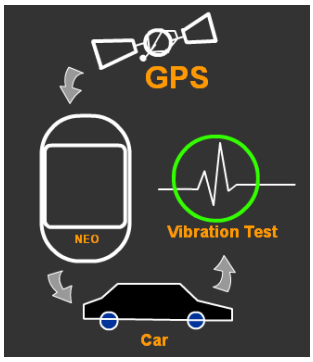
1. Abstract

Here we present our idea of using a cell-phone (the Neo Freerunner) for tracking a Car's location using GPS and measuring the road's quality using the accelerometer in the cell-phone. Neo-Freerunner is an open source Linux phone by Open Moko Inc. The phone can run many flavors of linux like Android, Qt, SHR etc. Here the implementation was done in SHR.

2. System Description



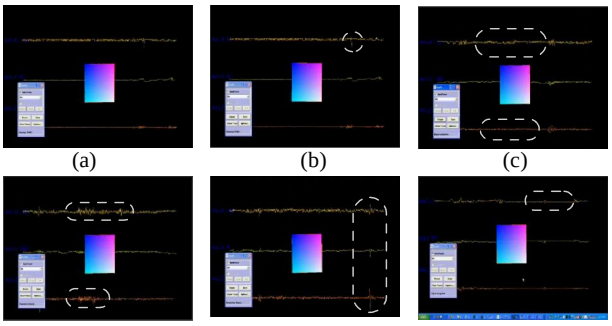
(a)



(b)

Fig 2(a) Shows the software architecture. 2(b)shows system schematic

The phone's GPS server is invoked and the NMEA sentences are read from a particular socket number. For reading the GPS data and forwarding it to the serial COM port we developed a python code. These values were sent over the hardware serial port using a USB to RS232 converter connected to the phones mini USB port. At the laptop's end another RS232-USB converter is used. The values are read using Goops software and plotted onto Google earth. There was even an option to provide the GPS values to google earth on a particular port number but that did not work all the time and hence wasn't reliable. The accelerometer values were read from the phone and forwarded over the Bluetooth serial bridge between the phone and the laptop. At the computer's end the Ax, Ay and Az acceleration values were plotted as individual graphs. The pitch, yaw and roll were calculated from the inverse tangents of values along the respective acceleration axes. Thess were then visualized as a 3D cube's rotation.



(a) (b) (c) (d) (e) (f)

Fig: 3(a) Processing Visualization 3(b)Car brakes 3(c)Smooth Road 3(d)Bad road quality 3(e)Speed Breaker 3(f)End of journey

3. How is this System helpful?

To our knowledge there is no tool to qualitatively and quantitatively measure the road's condition. The video analysis of the acceleration graphs revealed where the road was smooth, where there were bumps and speed breakers . More is the vibration along the respective axis in acceleration more bad was the road quality. Especially this test was more suited for the rugged road conditions here in India. The cube's vibration and sudden jerks were the same as that of the car. We feel this form of visualization is qualitatively better that just saying how good or bad the road is verbally. Also we were able to visually distinguish between the car applying brakes, the start and the end of the journey. We also feel this is one of the useful features of a cellphone which has not been explored much. The accelerometer can also be used to measure vibration of an automobile. The amount of vibration as measured by the accelerometer is not only a function of the road's quality but also depends on the quality of vehicles suspension mechanism. One need not install an external GPS to the car but connect a cellphone's GPS to the Car's computer to get GPS data. The same system can be implemented on any two wheeled vehicle like a motor-bike or a bi-cycle.

3.References :

[1]Video showing the car's test run and GPS tracking .
http://www.youtube.com/watch?v=rtS_pU9kyp8

[2]Video of screen capture showing the accelerations measured
http://www.youtube.com/watch?v=p5fUorY2ekM

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