Bicycle Vibration and Pavement Ride Quality for Cyclists

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Rongzong Wu, Stefan Louw, Hui Li, John T. Harvey and Calvin Thigpen
University of California Pavement Research Center, UC Davis and UC Berkeley

PROBLEM STATEMENT

- Cyclists complained about ride quality of newly applied chip seals
- Need to identify ways of measuring ride quality for cyclists

METHODOLOGY

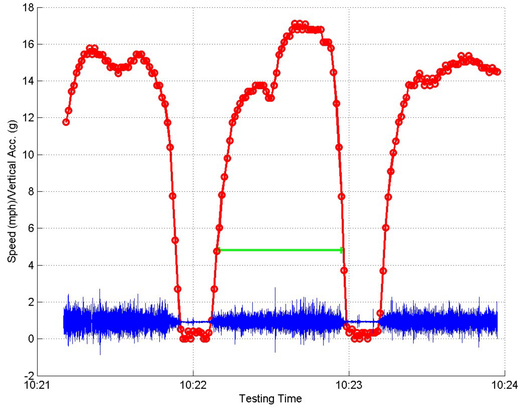
- Cyclist perception: ride quality survey on cyclists
- Direction measurement: bicycle vibration measured by accelerometer
- Physical characterization: surface macrotexture measured by profiler
- Check correlation of the three alternatives
- Focus of this paper: the bicycle vibration

BICYCLE VIBRATION MEASUREMENT

- ***Instrumentation***

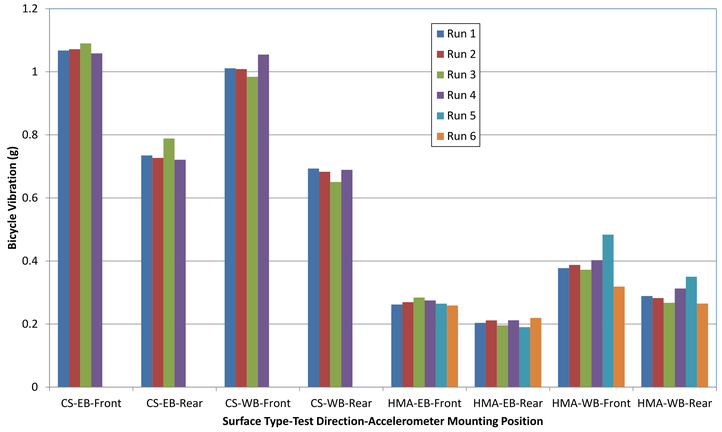
Bicycle instrumented with accelerometers (solid red circles) at three typical mounting locations and a GPS unit on the handle bar (blue circle).

- ***Data Processing***

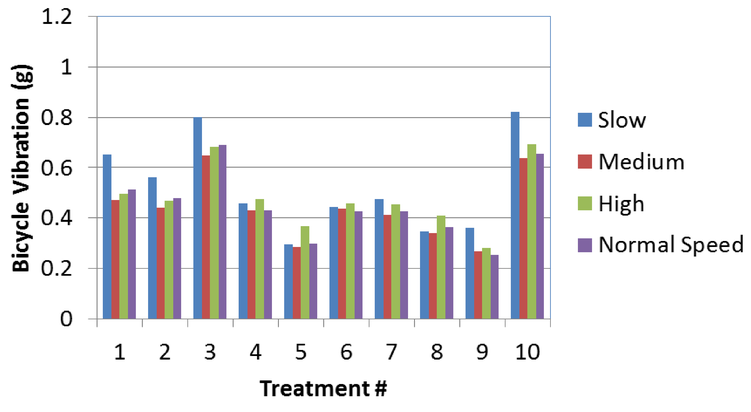


- ***Data Processing (continued)***
  - Average Deviation from gravity
  - Weighted average using travel distance as weight
  - Normalization to regular speed of 16 miles per hour

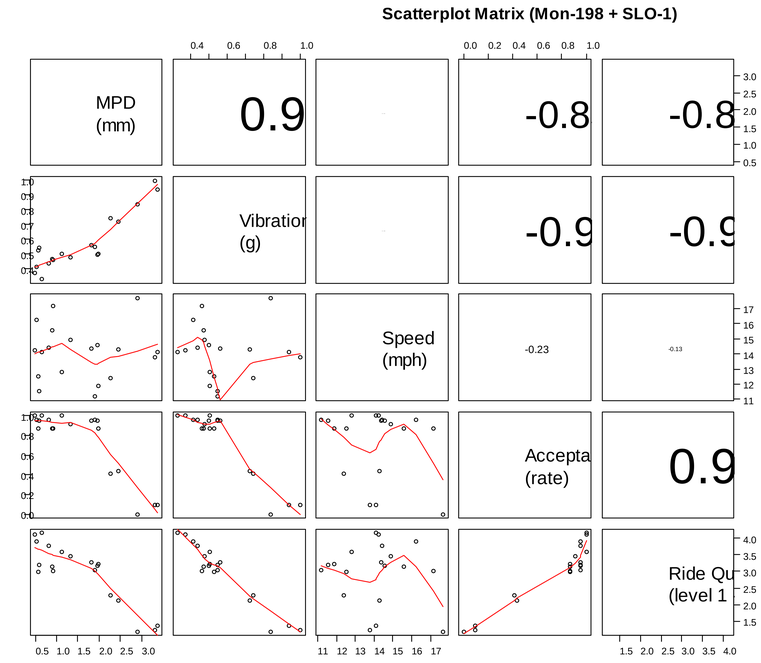
RESULTS AND DISCUSSIONS



Measurement variability and effect of accelerometer mounting position on bicycle vibration. *(Note:* CS = chip seal, EB = eastbound, WB = westbound, HMA = hot-mix asphalt)



Bicycle vibration measured at different speeds on different surface treatments



Correlations between MPD, bicycle vibration, bicycling speed, rider acceptability, and perceived ride quality level.

SUMMARY AND CONCLUSIONS

- Bicycle vibration was measured and used to evaluate pavement ride quality for cyclists
- Bicycle frame material, rider weight, accelerometer mounting position and tire pressure can all affect the measured value so need to be carefully controlled and accounted for
- Bicycle vibration has strong correlation with both macrotexture and perceived bicycle ride quality
- A threshold value for bicycle vibration exists that separates acceptable and not acceptable ride quality
- Bicycle vibration measurement is a viable quick and cheap way for evaluating ride quality for cyclist

ACKNOWLEDGEMENT

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