

Using Smartphones to Measure Cycleway Roughness

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SETTING THE SCENE

Many new cycleways introduced in Auckland



Data collection for maintenance and performance is relatively new on cycleways





WHAT IS ROUGHNESS?

“ *a change in elevation that causes vibrations in a vehicle travelling along a path* ”

- Measured in International Roughness Index (IRI)
- Used to determine ride comfort and maintenance
- Numerous Roughness measuring devices available





CURRENT MEASUREMENT SYSTEMS

Response Type Road Roughness Measuring Systems (Class 3)

- Inexpensive
- Rapid data collection
- Lack in repeatability

Profilometers (Class 1 & 2)

- High Precision
- Expensive
- Time Consuming





THE ROADROID

- A Smartphone application
- Measures roughness using a built in accelerometer
- Not a substitute for highly accurate devices
- Quick, highly portable, objective, easily operable



Pavement



Vehicle



Smartphone Roughness Capture





OBJECTIVE ONE

“ Can the Roadroid measure the roughness of cyclelanes”

OBJECTIVE TWO

“Determine if the data obtained by the Roadroid can demonstrate the true roughness of cycleways and reflect users opinion.”

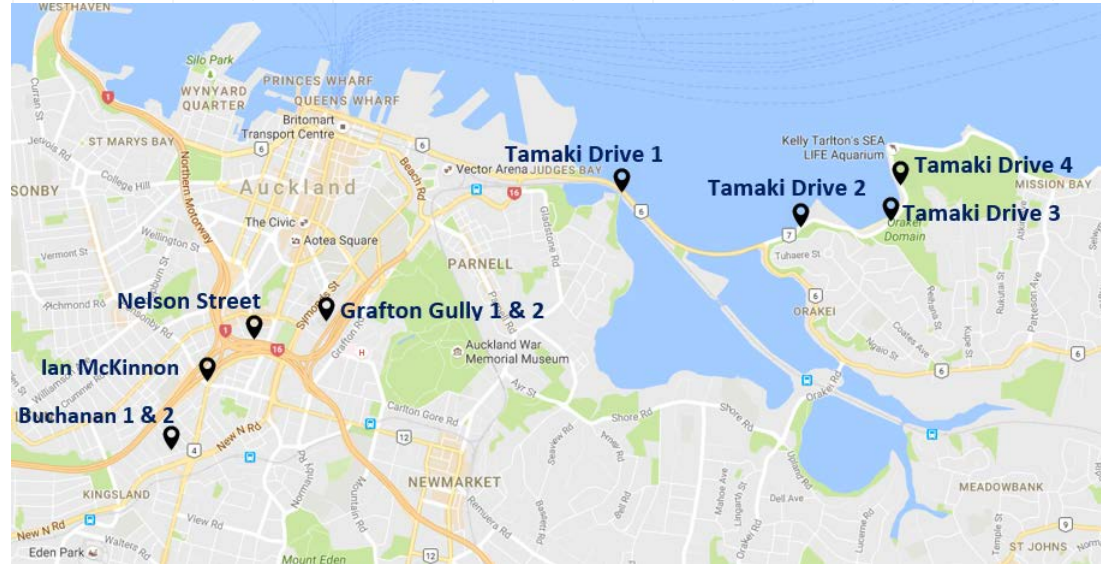




METHODOLOGY

Site Selection & Panel Selection

- Range of cyclolane conditions and pavement distresses
- Varied in age, gender and ride experience





METHODOLOGY

Site Selection & Panel Selection

Roadroid

- Download App
- Mount on bike
- Calibrate
- Start ride
- eIRI





METHODOLOGY

Site Selection & Panel Selection

Roadroid

Z-250

- *Cordon off section*
- *Walk z-250 over section*
- *Profile elevations collected every 250mm*
- *IRI*





METHODOLOGY

Site Selection & Panel Selection

Roadroid

Z-250

User Panel



- *Participants ride over section*
- *Constant speed*
- *Rate section from 0-5*



TESTING CONSTANTS



Start at end of each 100m was measured and marked for constant speed.



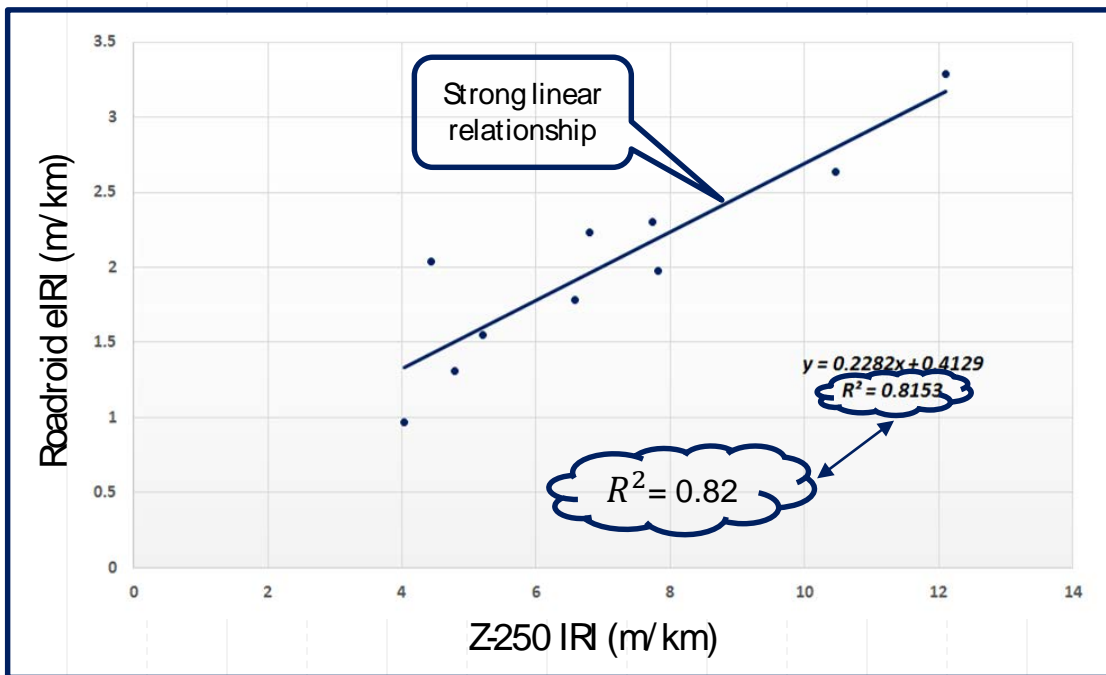
Tyre pressure checked before each test for constant ride comfort.



Control bicycle for testing



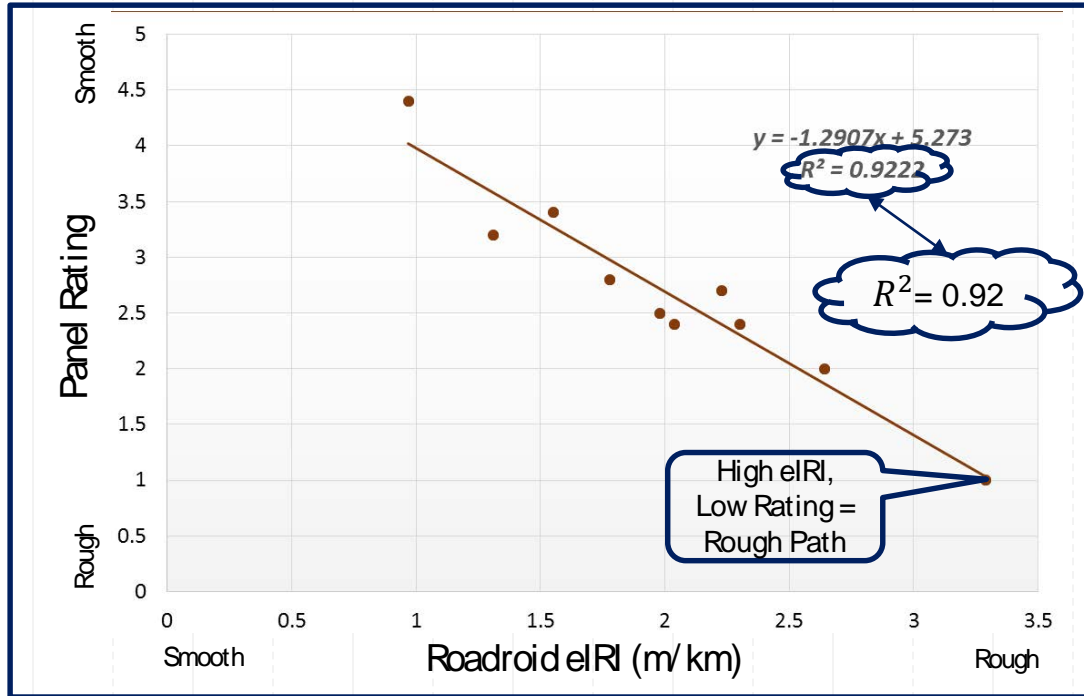
ROADROID v Z-250



- Roadroid smartphone is reliable as it aligns well with high precision measuring devices.



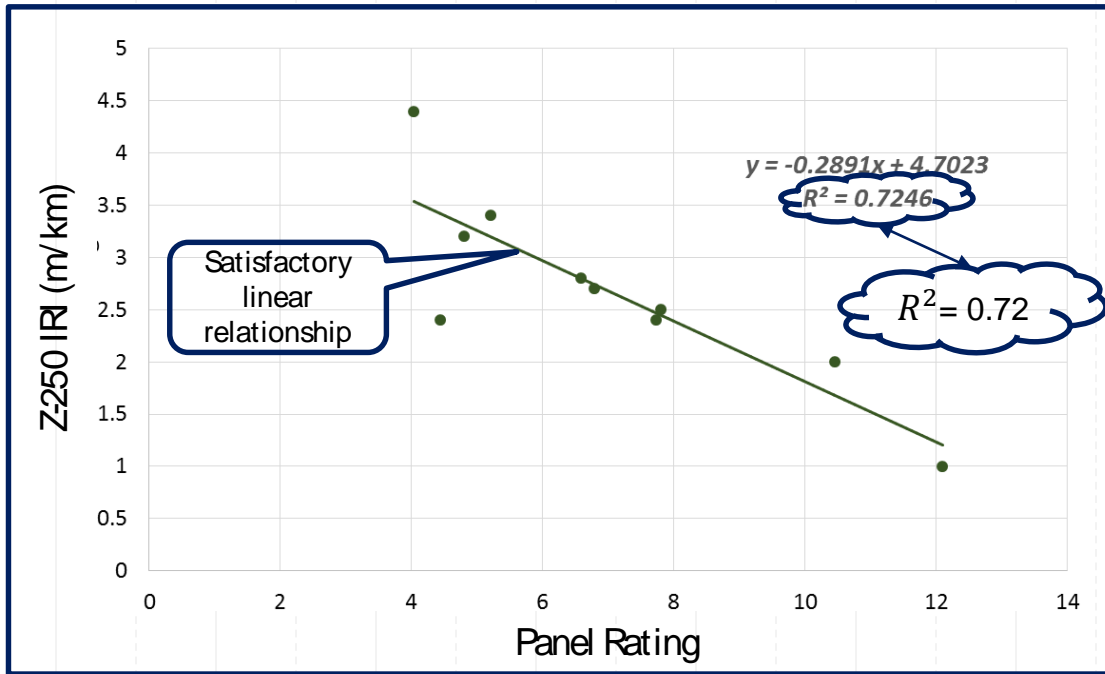
ROADROID v USER PANEL



-Roadroid values closely represent the user's opinion of comfort/pavement quality



Z-250 v USER PANEL

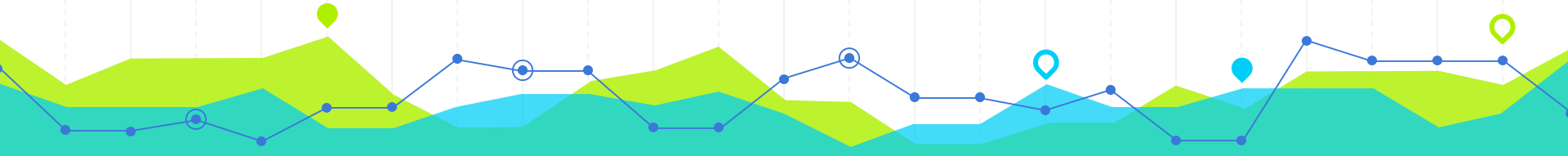


- Objective measurements of roughness can closely reflect user opinion. With slight difference of IRI.



CONCLUSIONS

- Strong linear relationships validate the Roadroid
- Results align with both user opinion and highly accurate Z-250 = accurate and reflects users opinion of comfort.
- Easy to use, reliable and economic. Convenient for large scale testing.
- Future research = investigation into different speeds and rider weight



THANK YOU

Any questions?

