BIKE PAVEMENT CONDITION ASSESSMENT
Most cities only use visual-checks and route preferences to assess bicycle-pavement conditions

- Surface profile not considered

Need for research on condition assessment methods for bicycle-dominated pavements
Conventional pavement rating tests are difficult and limited in execution

Need: develop a more feasible bike-pavement assessment method for cities to use
OBJECTIVES

1. Define the measurements that are critical variables to the pavement ride-quality
2. Determine how these variables are associated with biker perceptions of ride quality and safety
3. Specify the relationship between critical variables and traditional pavement rating tests
1. Roughness
2. Texture

<table>
<thead>
<tr>
<th>Texture</th>
<th>Mega</th>
<th>Macro</th>
<th>Micro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength</td>
<td>50 to 500 mm</td>
<td>0.5 to 50 mm</td>
<td>&lt; 0.5 mm</td>
</tr>
</tbody>
</table>

*Figure 1: Texture Categories*
MACRO TEXTURE MEASUREMENT

- Measured in two ways:
  1. Mean texture depth (MTD) – mean avg. vertical height differences of texture: Sand Patch Test
  2. Mean profile depth (MPD) – difference between avg. profile depth and avg. peak levels

*FIGURE 2: sand patch test (a) and inertial profiler*
Figure 3: MTD Results before summer 2018
BIKE SENSOR DATA

- Accelerometer - vibration
- Steering angle sensor
- GPS
- Distance Data

Figure 4: Mountain and Road Bikes with sensors
TEST SECTIONS

- 50 – 100 feet long
- 30 sections
- Only on exclusive paths

FIGURE 5: Distribution of test sections in Davis, CA.
Figure 6: Qualtrics Survey Questions

How would you rank your riding skill level?

Really Good

1 2 3 4 5 6 7

Biking Skill

How would you rank your ride comfort level?

Very Comfortable

1 2 3 4 5 6 7

Ride Quality

National Center for Sustainable Transportation
REGRESSION ANALYSIS

- Goal: determine which measured variables are correlated and significant to the survey responses for ride quality
- Ordered Logit Model
- Tools used: Rstudio and MATLAB
RESULTS & DISCUSSION
Figure 7: Bike Skill survey results
Figure 8: Ride Quality survey results
MTD is the only significant variable in predicting ride quality

Figure 9: Variables relating to ride quality significance
Road bike:
- Distance data is significant in predicting MTD

Figure 10: Road Bike Variables relating to MTD significance
Mountain bike:
- Acceleration in Z direction significant in predicting MTD

```
Coefficients:                              Estimate  Std. Error t value  Pr(>|t|)
(Intercept)                              1.50230    0.50420   2.980  0.00604 **
Distance.Data                            0.03646    0.01103   3.305  0.00268 **
Root.of.mean.square.Z.no.bump            -0.42023    0.71485  -0.588  0.56151
Steer.Angle                              -0.04621    0.02831  -1.632  0.11428
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Figure 11: Mountain Bike Variables relating to MTD significance
LIMITATIONS

- Human responses to assessing ride quality are variable and unique
- Survey data and sensor data collected separately due to time limitations
FUTURE CONSIDERATIONS

- Look into other regression model types
- Collect even more survey data and run regression analysis further
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