



# CALIFORNIA SCIENCE & ENGINEERING FAIR

## 2019 PROJECT SUMMARY

Name(s) <b>Isaac Anchattu</b>	Project Number <b>S1701</b>
<b>Project Title</b> <b>Measuring Road Quality Using Vibration Analysis</b>	
<b>Abstract</b> The objective of this project is to find the quality of a road by use of the process of vibration analysis. I believe that a frequency with a higher than average amplitude would indicate a poor road quality.	
<b>Methods</b> In my project, I used an accelerometer (x,y, z-axis) and a vibration analysis tool, as well as a car that would be used to travel on the roads I am testing. First, I collected accelerometer data for each individual road being tested. This data would be converted to its component frequencies through the use of the vibration analysis tool. The tool would categorize and calculate the road unevenness, in terms of bumps per distance, using these component frequencies. To separate component frequencies, I used a DFT algorithm implemented through a python program. Iterate this process a number of times to enable the production of more accurate results.	
<b>Results</b> I was able to come up with a scale based on the number of bumps/distance that could measure road quality that is termed Road Roughness Index (RRI). This Road Roughness Index took only values that were in the 75th percentile of the amplitude values. Relatively speaking, a higher road roughness index correlates to poorer road quality, while a lower road roughness index correlates higher road quality.	
<b>Conclusions</b> Through the process of vibration analysis, I was able to establish a reasonable measure of road quality in the form of the Road Roughness Index to quantify the quality of the road. Establishing this Road Roughness Index will help prioritize roads that are most desperately in need of repairs, could be useful as part of a navigation system.	
<b>Summary Statement</b> I used the process of vibration analysis to measure the road quality using a road roughness indicator (RRI), with a simple and cost effective method.	
<b>Help Received</b> My parents drove me around to allow me to collect data necessary for the project, and helped me review and guide me through the project.	