**Low-cost Sensor for Seamless Road Quality Monitoring**

ECE 445 Design Document — Spring 2022

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1. **Demo process**

Function test:

1. The first step is to ride bicycle with the sensor installed on to collect signals with an accelerometer and a GPS sensor. We will test on the roads with different condition and roughness around Building D.
2. The second step is to send the signal from sensor to the server part to analyze the signal. It will automatically judge the roughness of the road and whether there is an obstacle on the road. If the bicycle passes an obstacle, the acceleration signal received will be judged to be abnormal in our learning model, and and a json file including time and location will be produced
3. The third step is to demonstrate the results. The json file will remind system to print the location on the map, which will be labeled as red mark. The results will show on the phone, which includes the location of the roads, the condition of roughness and safety.

Interference Immunity Test;

1. After sensors are installed, the first step is to ride our bicycle and to move irregularly, such as to make a turn.
2. The second step is sending signals. When bicycle performs irregular moving such as turning, climbing uphill and downhill, acceleration patterns are different from either that of uniform straight motion and that of meeting an obstacle.
3. The third step is to judge whether our learning model can exclude the interference of external factors. If the acceleration patterns will not let our model to produce json file and our phone to show red mark location, our system can exclude external factors.

**2. Block Diagram**

**图示

描述已自动生成**

**3. Requirements**

**3.1 Exclude influence of noise**

The action of riding should influence the results a lot. For example, riding with different speed, doing acceleration, deceleration or turning, etc. We will do these action on the roads to see whether these actions will influence the results.

**3.2 Accuracy**

The result should show the real situation of the roads.

**3.3 Speed of processing**

The time spent on one couple of signals should be below 10ms. We will record the length of couples of signals sent into server and record the time spent on processing. By dividing the time with length, we will get the time spent on one couple of signals.