# Highly Sensitive Respiration Strain Sensor Based on Tuned Silver Nanowire Network

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Respiratory rate is the number of breaths a person takes in a given time period, and is one of the four key vital signs of the human body. Ordinarily, respiratory rate is measured manually, but is inaccurate and discontinuous. Alternative electronic devices have been created, but have many drawbacks including low sensitivity and low comfort. The sensor designed in this project not only provides a highly sensitive and reliable measurement of respiratory rate and respiratory function but is also comfortable to wear and easy to use. This sensor could provide health care professionals with valuable information surrounding breathing patterns and breathing disorders, such as sleep apnea and Sudden Infant Death Syndrome. To ensure that our strain sensor can detect the small body deformation of the throat caused by respiration, a silver nanowire network is fine-tuned with Laponite RDS clay spacers and is evenly distributed through spray coating. When tested, the sensor was attached to the throat to monitor respiration under different breathing conditions, and showed a repeatable performance under linear stretching. The respiratory rate as generated was within the accepted range of normal respiratory rate, showing the effectiveness of the created sensor. Additionally, the strain sensor had a high gauge factor, (deltaR/R)/(deltaL/L), of ~88 for a strain range of 0-1.5% and ~166 for a strain range of 1.5 – 5%, showing the extraordinary sensitivity of the sensor.

**Awards Won:**