No CoViD Past This Point: Non-Contact Vital-sign Detection

Lubecke, Lana (School: Kalani High School)

One deadly aspect of COVID-19 is that those infected can often be contagious before they exhibit overt symptoms. Current detection methods are either not reliable or require significant human and material resources. Often the earliest symptoms are breathing patterns, which can be difficult to quantify objectively. Doppler radar, however, can measure the physical chest motion associated with breathing to accurately measure rate. The goal of this project was to see if Doppler radar implemented with WiFi cards could sense breathing rate changes indicative of COVID-19. Using code-generated respiratory motion signals, and COVID-type breathing motion signals recorded at a 2-meter distance using a WiFi card as a radar, an algorithm was created to detect a subject's breathing rate and classify whether it is indicative of COVID-19. The algorithm was tested both on a robotic mover with a sinusoidal motion amplitude of 0.5 cm at various frequencies and on actual breathing. The average rate error was less than 1 breath per minute, even in the presence of significant environmental noise, which is accurate by medical conventions and provides sufficient resolution to detect small rate changes indicative of COVID-19. This technique provides a tool for early detection which can be used to pre-screen people and can be used and reused remotely, to minimize exposure to others and reduce cost. Relying only on WiFi equipment found commonly in homes, this technique could provide an accessible, cost-effective way to regularly track baseline breathing for individuals to catch the slightest respiratory changes indicative of COVID-19.

Awards Won: