

## A Wearable Sensor to Detect Face Touch and Prevent Spread of Infection

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### ABSTRACT

Awareness enhancement devices (AED) may play a vital role in controlling the direct and indirect spread of infectious diseases, particularly during the global pandemic. While respiratory droplets are known to transmit the COVID-19 virus and cause an infection, it is estimated that up to 10% of these infections are caused by surface to face transmission of the virus. Studies showed that on average, more than 20 face touch occur per hour. Therefore, an accurate wearable sensor that works as an AED may significantly reduce the surface-mediated transmission by lowering the frequency of habitual face touching. In this study, we proposed a wearable sensor-based method that would detect the face-touch motion of the hand, providing warning to the users and helping them reduce their habitual face-touching behavior. Eleven participants were recruited for this study. An inertial measurement unit (Physilog 5, Gait Up) that measured three-dimensional (3D) acceleration and angular velocity with the sampling frequency of 120 Hz was attached on their wrist for twenty minutes while performing daily activities and occasionally touching their faces. Also, they were asked to record the number and times that face touches occurred in a logsheet later to validate the detected face touch. The collected 3D acceleration and 3D angular velocity were pre-processed, manually labeled and randomized to create training, testing and validation databases. Then, dynamic time warping (DTW) was performed to extract the features needed for face touch detection. During this step, the similarity of the sequence of data with a sample face touch was obtained. The k-nearest neighbors (KNN) classifier was used to classify the data in the next step. After developing the feature space containing the feature vector obtained by DTW and creating the class labels, the accuracy of the DTW-KNN model in detecting the face touches was investigated on the validation set. It was observed that the DTW-KNN method (K=3) was capable of detecting face touches with accuracy, precision, and sensitivity of 79%, 92%, and 79%. This AED can potentially lower the infection risk for individuals working in high-risk environments during the pandemic.