

Abstract

World Health Organization (WHO) stated that 2.2 million people died in 2012 for high blood glucose and diabetes will be the 7th cause of death by 2030. To improve this situation, a continuous monitoring system of glucose level in blood is extremely necessary for the diabetes patients. The purpose of this study is to propose a signal processing model for the detection of glucose concentration with high accuracy in a non-invasive way. The study includes correction of NIR spectra collected from a mixture of components (glucose, urea, triacetin) through different preprocessing techniques, classify the preprocessed data through linear regression models and performance analysis of the applied techniques on the prediction of glucose concentration. The objective of the study is to identify the best model with optimum result. Baseline correction techniques such as Standard Normal Variate (SNV), Mean Scatter Correction (MSC), Asymmetric Least Square (ALS) and Savitzky-Golay Transformation (SGT) have been applied to remove the scatter from the collected NIR spectra. ALS along with SGT gives the best result in this case. Different filtering techniques have also been applied to remove the noise those came along with the NIR spectra. Chebyshev filter on the ALS+SGT corrected data has the best performance in noise removal. Different linear regression model like PLS, PCR are applied separately on the preprocessed spectra to bring out the targeted result. Several derivative order of PLS also applied and the 3rd order works well than the 2nd order here. The model that applies Chebyshev filter on baseline corrected data by ALS+SGT and do regression through PLS have given the most accurate and clinically acceptable result to isolate the glucose data from the NIR spectra and predict the glucose concentration level. Since this combination among different techniques that are found through this study is able to isolate the glucose data and predict the concentration level from a mixture of different components with high accuracy, we hope that the study will be valuable in realizing a continuous monitoring system of glucose level in non-invasive way in the near future.