ELECTRONIC NOSE BASED WIRELESS SENSOR NETWORK FOR SOIL MONITORING IN PRECISION FARMING SYSTEM

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ABSTRACT

The global climate variation, urbanization, population growth, and pollution have led to the complication of soil resources management which resulted in the loss of soil biodiversity. Alteration of soil biological diversity has negative impact on soil nutrients such as deteriorating of organic matter content which plays an important role in the processes of soil formation in the farmland. To preserve the domains of soil biodiversity sustainability and soil suitability of the farm, there is a need to correspond with definite tactics by parameterizing the optimization of soil assessment system. The modern approach of soil monitoring and analysis is by means of using sensors both physical and chemical that are inexpensive with simplicity in fabrication. In this research, the lab-made electronic nose designed by arrayed metal oxide gas sensors were deployed to acquire data via data acquisition (DAQ) card for analysis of soil nutrient level based on soil organic matter and discrimination of soil samples formally treated with organic and chemical fertilizers. The wireless electronic nose networking system was developed for real time soil monitoring and data acquisition integrated with software application. Principal component analysis (PCA) and linear discriminant analysis (LDA) were two statistical techniques used for analyzing and classifying soil volatiles. Various nutrient levels in soil were graded by electronic nose that were visualize through PCA and LDA. Soil volatile organic compounds (VOCs) pattern of organic matter content from electronic nose were in accordance with the laboratory test results. Soil moisture and soil temperature indicated positive correlation to the rate of emission of soil VOCs when compared via real time monitoring system. In the future, smart electronic nose system has potential to monitor the rate of soil degradation.

KEY WORDS: VOCs / ELECTRONIC NOSE / PCA/LDA/DAQ/SMART E-NOSE

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