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(54) Title: A METHOD AND APPARATUS FOR CROP HEALTH MONITORING AND NUTRIENT SUPPLY ANALYSIS FOR CROP CULTIVATION

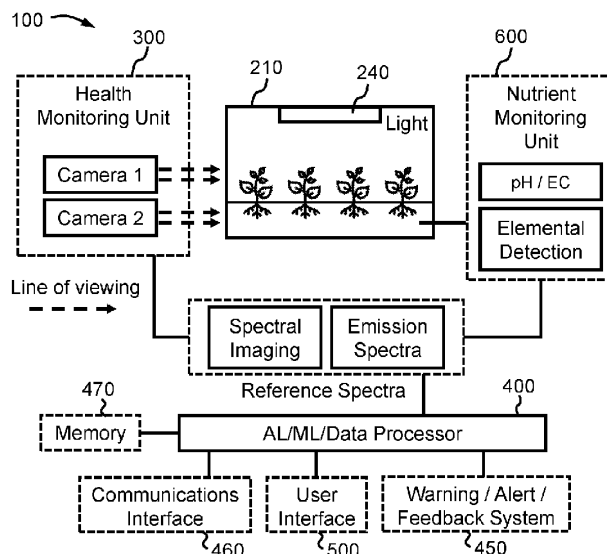


FIG. 2

(57) Abstract: A system and method of monitoring nutrient supply and crop health to perform crop health monitoring and analysis, including crop leaf health monitoring, crop root health monitoring, plant growth stages, stress and disease monitoring, root growth stages, disease monitoring, and exudates monitoring. Nutrient monitoring and analysis include elemental emission analysis, quantitative chemical composition analysis, including the nutrient levels in the system and specific elemental components of the nutrients. Real-time, onsite monitoring using reusable samples is possible, with no sample preparation required. Reference libraries are used as training data for machine learning models. Machine learning-based classification is applied to enable crop phenotyping and disease detection (including customized vegetation indices and spectral indices), in which the spectral information together with two-dimensional spatial information is used to identify the plant. The system may include UV-Vis-NIR imaging spectroscopes and a sample flow cell for use

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with a laser based elemental emission spectroscope.