Early detection of the crop diseases helps to prevent failure in the amount and the quality of the production. In agricultural robotics, the idea of a disease detection robot is a fresh and an innovative hot-button topic. The exclusion of the diseased parts from the strawberry plants for further analyses is one of the main tasks of a developed strawberry robot. To this purpose, the handling mechanism in the robot needs to achieve an accurate manipulation task to reach the target. Reaching, cutting and storing the diseased leaf are challenging and delicate processes during the procedure of the robot's operation in the field.

The manipulation task of the agricultural robots is succeeded when the inverse kinematic relations from workspace to joint space are defined properly. The inverse kinematic analysis is usually subjected to the restrictions due to the limitations in mechanical design of the mechanism, hardware components and operation environment of the robots as well as the morphology of the target.

This study proposes a set of analytical algorithms to solve the inverse kinematics problem under certain conditions. First, this analytical approach is based on the calculation of the joint variables by solving the position information of the target in the workspace only. Second, the mechanism has certain restrictions on its geometry and the actuators' capacity. Hence, these restrictions limit the range of joint variables. The effectiveness of the proposed algorithm is confirmed by comparing with a numerical solution namely, nonlinear constrained optimization method under same restrictions of inverse kinematics problem.

The proposed algorithm is validated by the simulations in MATLAB® and laboratory set-up experiments.

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The public is welcome to attend.