Kinematics analysis for five DOF fresh fruit bunch harvester

ABSTRACT

The existing mechanized oil palm harvester is claimed to be unsuccessful due to its inefficiency to harvest Fresh Fruit Bunch (FFB). It takes a lot of time compared to the conventional harvesting method, using human power. Therefore a study was carried out using Denavit and Hartenberg (D-H) approach to automate the five Degrees of Freedom (DOF) harvester manipulator. The general objective was to reduce the number of workers required for harvesting as well as to provide comfortable ergonomic for the operator of oil palm harvester. The D-Hôs convention was used for selecting frames of reference in robotics application which has become the standard way of representing robots and modeling their motions. In this study, the forward kinematics and inverse kinematics were used to deduce joint angles variables while the conventional Jacobian was used for motion velocity computation. The formulated inverse equations were tested manually on the harvester with given locations to obtain deduced joint angles. The results were ɗ1=129.64°, ɗ3=180°, ɗ4=90°, which were quite accurate. Thus, the kinematics analysis of harvester arm automation was done successfully.

Keyword: Kinematics; Degrees of freedom; Harvesters; Manipulators; Denavit and Hartenberg; Fresh fruit bunch