

Non-Confidential Description - PSU No. 4225
**“Methods for Selective Tree Fruit Thinning Using Mechanically
Controlled Brushes”**

Field of Invention/Keywords:

Selective Bud and Blossom removal and thinning,
Fruit Tree Husbandry, Peach, Apple, Automated
thinning

Status

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Inventors:

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Background

Fruit thinning has been practiced for centuries to improve the quality and size of fruit, reduce limb breakage and depletion of tree reserves, thereby extending the life and productivity of the fruit tree. Current practices rely on labor-intensive hand thinning to remove the blossoms from the tree. While mechanical devices have been developed various factors have prevented widespread adoption.

Invention Description

The subject invention consists of a mechanical blossom thinning end-effector utilized in a automated mechanized thinning system with an OEM robotic arm and/or as an autonomous hand-held device. The inventor designed and fabricated the end-effector to apply the appropriate level of force to remove the bud/blossom without damaging the branches. The end-effector is a critical component of a automated thinning system as it is the point of action between the mechanical automation and the flowering tree. The system fully and successfully integrated the robotic arm, end-effector, kinematic targeting and heuristic algorithms. Even without a vision system, the robotic arm was able to position itself within five percent (5%) of a targeted position ninety five percent (95%) of the time (120 repetitions). The robotic arm and end-effector was able to position itself within one (+/- 1) inch of the targeted branch position ninety five percent (95%) of the time. For the heuristic thinning tests, the end-effector successfully removed the unwanted blossoms in each case. The blossom thinning percentage for each case was one hundred percent (100%).

Status of the Invention

The inventors developed two (2) working prototypes that met all of the proposed design criteria set by the USDA specialty crop research initiative group. These prototypes were used in laboratory evaluations to demonstrate the effectiveness of the blossom and bud thinning end effector. The invention's likely initial commercial embodiment would be a partial system consisting of a robotic arm, an end-effector and heuristic software without a vision system. The inclusion of a vision system would automate the mechanical process of fruit thinning. This comprehensive product would allow for the reduction or elimination of manual labor inputs and further enhance favorable blossom removal.

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