Fabrication of Fruit Harvesting Machine

P. Murugan[1], A.Naveen kumar[2], M.Prabhu[3], M.Bharani[4], Mr.R.Ruthuraraj[5]
[1,2,3,4]*Department of Mechanical Engineering, SNS College of Engineering, Coimbatore*
[5]*Guided, Assistant professor, Department of Mechanical Engineering, SNS College of Engineering, Coimbatore*

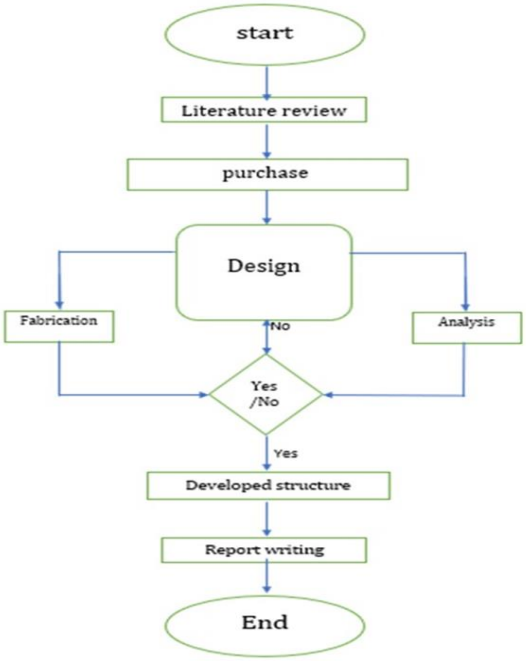
***Abstract* - In agricultural industry, customary reaping is finished by 'handpicking' strategies to evacuate several organic products such as citrus natural products in arbitrary spatial areas on the individual organic product trees. It is notable that gathering natural products in a huge scope is as yet wasteful and not practical. To fathom this difficult assignment, mechanical gathering frameworks have been researched and rehearsed to improve benefit and proficiency of green organizations. Anyway, they regularly harm natural products in the gathering procedure. Improvement of productive natural product evacuation strategies are required to keep up the organic products quality. This paper surveys organic product gathering frameworks from absolutely mechanical based frameworks in which administrator association is as yet required, to programmed mechanical gathering frameworks which require negligible or no human mediation in their activity. The explores on machine vision framework systems utilized in the programmed recognition, assessment, and the area of natural products for reaping are likewise included. The audit is centered around the citrus organic products because of the way that the examination on citrus natural product collecting instrument is more cutting-edge than others. Major issues are tended to in the camera sensor and channel structures and picture division techniques used to distinguish the organic products inside the picture. From this audit, the significant examination issues are tended to as future exploration heading**

1.INTRODUCTION

In recent years, the horticultural industry has funded the research and the development of novel fruit harvesting systems. Motivation for the research is to decrease harvesting cost and increase the value of their product to the consumer. Conventional harvesting method is highly labour intensive and inefficient in terms of both economy and time. Machine harvesting systems are a partial solution to overcome these issues by removing fruits from the trees efficiently thus to reduce the harvesting cost to about 35-45% of total production cost [1]. Two streams of harvesting systems have been researched and attempted through years since early 60's. They are mechanical harvester and automatic harvester. Mechanical harvesting systems are designed to achieve mass removal of the fruit during the harvesting season. This method has been practiced using such as shaker or air blast with chemical mechanics of abscission as pre-harvest agents to loosen the mature fruits. There are some issues in mechanical harvesting system such as the quality and size selection, the damage to the fruit and trees in some cases and the layout of the grove design for mechanical harvester. A post selection process can be appended to maintain the aesthetic appearance and value of product for the consumer. However, the mechanical system operates blind when it comes to removing quality ripe fruit. In the early 1960s, the concept of an automatic harvester was proposed and investigated by Schertz and Brown [2] using automatic robotic picking device. They proposed a system which uses a robotic arm to position a manipulator within the picking range of target fruit before detaching the fruit from the tree. The guidance for the manipulator is achieved by a machine vision system to detect the fruit. However, the nature of the horticultural environment makes the fruit detection challenging task. It is well known that the robust solutions are still largely underdeveloped. The issues are multifactor of such as the unstructured environment, limitations of the sensors, and a robust methodology. Hence this review paper is focused toward the novel sensor designs and image processing methods which aim to present the reader with an up-to-date account of useful methods found in literature to overcome such issues. The remaining of the paper is organized as follow. An overview of the mechanical harvester is outlined in section two. Relevant research articles regarding the development of automatic harvesting machines are reviewed in section three. In an automatic harvester,

the image sensor for data acquisition and computer aided processing are the main components used to successfully detect the fruit. Those are detailed in section four and five. The major issues are discussed in section six. Last section presents the summary on this review paper with the future directions of the research.

2.METHODOLOGY



3.MATERIAL SELECTION

Due to its excellent properties, mild steel has become an in-demand material in various industries. It has unparalleled weldability and machinability, which has led to an exponential increase in its usage. Carbon steels are metals that contain a small percentage of carbon (max 2.1%) which enhances the properties of pure iron. The carbon content varies depending on the requirements for the steel. Low carbon steels contain carbon in the range of 0.05 to 0.25 percent. There are different grades of mild steel. But they all have carbon content within the above-mentioned limits. Other elements are added to improve useful properties like corrosion resistance, wear resistance and tensile strength

MILD STEEL:

The term ‘mild steel’ is also applied commercially to carbon steels not covered by standard specifications. Carbon content of this steel may vary from quite low levels up to approximately 0.3%. Generally, commercial ‘mild steer’ can be expected to be readily weldable and have reasonable cold bending properties but to specify ‘mild steel’ is technically inappropriate and should not be used as a term in engineering. Mild steel is the most widely used steel which is not brittle and cheap in price. Mild steel is not readily tempered or hardened but possesses enough strength.

Mild steel Composition

Mild steel contains –C45

Carbon 0.35 to 0.45 % (maximum 0.5% is allowable)

Manganese 0.60 to 0.90 %

Silicon maximum 0.40%

Sulfur maximum 0.04%

Phosphorous maximum 0.04%

Mildest grade of carbon steel or mild steel contains a very low amount of carbon - 0.05 to 0.26%

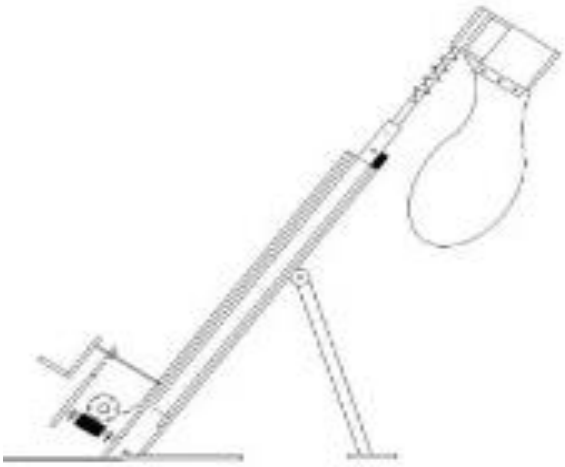
Tensile strength – 63-71 kgf/mm2

Yield stress -36 kgf/mm2

Izod impact valve min -4.1 kgf m

Brinell hardness (HB) - 229

4.2D DIAGRAM



5.RACHET MECHANISM

A ratchet mechanism is based on a wheel that has teeth cut out of it and a pawl that follows as the wheel turns. Studying the diagram, you will see that as the ratchet wheel turns and the pawl falls into the 'dip' between the teeth. The ratchet wheel can only turn in one direction.

6.WORKING PRINCIPLE

It consists of Mild steel, caster wheel, Tension spring, Ratchet wheel drive mechanism and GI cable for movement (non-corrosive), cutting tool, Nylon rope.
The cutting tool can be changed depending upon specimens. The cutter reaches the fruit and nylon rope is been triggered & fruit gets locked up.
As soon as the fruit is plucked the ratchet wheel mechanism is released so the fruit can be brought down without any damage to it.

7. CONCLUSION

The product we have developed will reduce the wastage in harvest by preventing the fruits falling to the ground. Hence, we propose that our project will reduce human effort and fatigue. In future the model can be developed in order to harvest big size fruits like jack fruit and fruits which is to be harvested in high distance from ground.

REFRENCE

[1] Sanders K F, Orange Harvesting Systems Review, Biosystems Engineering, vol.90, no.2, 2005, pp.115-125.

[2] Schertz C E; Brown G K, Basic considerations in mechanizing citrus harvest, Transaction of the ASAE, 1968, pp.343-346.

[3] Coppock G E, Picking citrus fruit by mechanical means, Florida State Horticultural Society, vol.1362, 1961.

[4] Coppock G E; Hedden S L; Lenker D H, Biophysical properties of citrus fruit related to mechanical harvesting, Transaction of the ASAE, vol.12, no.4, 1969, pp.561-563.

[5] Coppock G E; Jutras P J, Harvesting citrus fruit with an inertia shaker, Floriad Agricultural Experiment Stations Journal Series, vol.1538, 1962.

[6] Coppock G E, Harvesting early and midseason citrus fruit with tree shaker harvest systems, Floriad Agricultural Experiment Stations Journal Series, vol.2824, 1967.

[7] Coppock G E; Hedden S L, Design and development of a tree-shaker harvest system for citrus fruit, Transaction of the ASAE, vol.11, no.3, 1968, pp.339-342.

[8] Coppock G E, Harvesting 'Valencia' oranges with a limb shaker, Floriad Agricultural Experiment Stations Journal Series, vol.4217, 1971.

[9] Sumer Harold R; Hedden Scott L, Harvesting oranges with a full-powered positioning limb shaker, Floriad State Horticultural Society, 1975, pp.117-120.

[10] Jutras P J; Coppock G E; Patterson J M, Harvesting citrus fruit with an oscillating air blast, in American Society of Agricultural Engineers, no.62-155, 1962

[11] Whitney J D; Patterson J M, Development of citrus removal device using oscillating forced air, Transaction of the ASAE, vol.15, no.5, 1972, pp.849-860.

[12] Whitney J D, Design and performance of an air shaker for citrus fruit removal, Transaction of the ASAE, vol.20, no.1, 1977, pp.52-56.

[13] Summer H R, Selective harvesting of Valencia oranges with a vertical canopy shaker, Transaction of the ASAE, vol.16, no.6, 1973, pp.1024-1026.

[14] Futch S H; Roka F M, Continuous canopy shake mechanical harvesting systems, in Horticultural Sciences Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, no. HS1006, 2005

[15] Hedden S L; Whitney J D; Churchill D B, Trunk shaker removal of oranges, Transaction of the ASAE, vol.27, no.2, 1984, pp.372-374.

[16] Hedden S L; Churchill D B; Whitney J D, Trunk shakers for citrus harvesting part II: tree growth, fruit yield and removal, Applied Engineering in Agriculture, vol.4, no.2, 1989, pp.102-106.

[17] Whitney Jodie D, Field test results with mechanical citrus fruit removal devices, Proc. Fla. State Hort. Soc., vol.110, 1997, pp.89-92.

[18] Torregrosa A, et al., Mechanical harvesting of oranges and mandarins in Spain, Biosystems Engineering, vol.104, 2009, pp.18-24.

[19] Wilson W C, Abscission chemicals aid to citrus fruit removal, Floriad Agricultural Experiment Stations Journal Series, vol.522, 1977.

[20] [20] Wilson W C; Donhaiser J R; Coppock G E, Chemical and air shaker orange removal in South Florida (Labelle), Proc. Int. Soc. Citriculture, vol.92, 1979,