DESIGN AND FABRICATION OF MOBILE PHONE CONTROLLED BATTERY AND SOLAR POWER OPERATED COCONUT PICKER


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ABSTRACT

The project is to make a cost-efficient coconut-picking machine is to help farmers to cut coconut from the tree, which will reduce human labour. Most coconuts are picking by climbing on the trees and cutting the nuts down by hand. There are no branches for holding and support in coconut trees for that reason manually climbing is very difficult. The Coconut Picking Machine is a device constructed to overcome these problems. It makes use of an extendable frame that has extended by using chain and sprocket-lifting mechanisms (cascade lift) have run by a high-speed motor. It has two arms driven by eight motors for holding and cutting down the coconuts from the tree, it has attached on top of the extendable part. A DC battery powers both the extension and cutting operation. The battery can be energized by using solar panel. Mobile phones and cameras were used to control and monitor the operation. The entire setup mounts on to a framework supported by wheels to move the machine from one tree to another hence making it portable.

Keywords: Design, fabrication, coconut picker, battery, solar power, mobile phone control.

INTRODUCTION

Man has always looked for ways to make his work simpler and quicker. In today’s world, almost anything and everything is being automated. Growth in technology over the last few decades has a significant effect on how things work and how people lead their lives and has witnessed rapid development in technology. However, harvesting of coconuts, plucking of fruits and cutting off unwanted branches of high trees has always been done manually. This is a difficult and risky job. The safety of the worker and the increased labour charges are the primary concerns of the coconut farm owners now. Due to the height and lack of branches, it is very difficult for picking coconuts. A professional climber with proper training could only be able to climb a coconut tree. Due to the risk, involved nowadays very fewer people are coming forward to climb on a coconut tree. Considering this scenario, equipment that will help the user to pick coconut from a tree and easily will be useful for the people who are having coconut farms or even on residents. These types of devices will encourage more people to come forward into the agricultural sector. Hence, any impact in coconut cultivation sector can adversely have an effect on these industries and their markets. P.Adithya et.al forklifts are used for lifting heavy goods. The idea is to lift the load and transport the material, heavy load that cannot be lifted by humans. Akshay Prasad Dubey et.al the low-cost coconut tree climbing and harvesting robot have manually controlled by the end-user from the ground. The robot motion has designed by referring to the motion of coconut harvester.

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Ankit.P.Jaiswal et.al a crane is specially design structure equipped with mechanical means for a load by raising or lowering by electrical or manual operation. Biswas Palok et.al a crank mechanism to converts linear actuation displacement to angular displacement of the arm. There are Two control systems were designed for the robotic arm: programmable logic controller and Arduino “UNO” microcontroller. G.Elatharasan et.al in this work, style and fabricate the automated mechanical cutter by exploitation the crank and slotted lever mechanism, for cutting agricultural merchandise like sugarcane for cultivation. Engin Tanık et.al similarity conditions for the transmission angle of the compliant slider-crank and its rigid body counterpart square measure devised via two theorems. A real model is factory-made and one in each of these theorems is verified through an experiment. M.Hari Prasad et.al this paper explains the concept of lead screw mechanism of a lathe to lift platform for lifting operations. This is a simple mechanism where platform height can be easily adjusted by rotating the motors. High loads have to be lifted using these types of power screws.

N.Jahan et.al in this paper traditional coconut tree climbing equipment replaced by the use of this low-cost coconut tree climbing equipment. Justin Cinkelj et.al this paper presents the development of commercially available hydraulic telescopic handler with robotic control system. P.Kali Sindhur et.al this project is to style a mechanism for cutting by giving intermittent feed. This intermittent feed is given by continuous rotation of the circular disk in the Geneva mechanism. C.R.Kemparaju et.al in this paper, the cutting of branches or pluck coconuts from trees by use of an extendable hollow cylinder to extend a multi-point cutting tool. Kenan Koser et.al in this project, the kinematic performance analysis of a slider-crank mechanism-based mechanism arm. Kuat Telegnov et.al in this project, they
offered robotic grippers are unit typically costly and do not seem to be straightforward to switch for specific functions. S.Maheswaran et.al this project focuses on the design of a tree-climbing robot, which is control from the ground using a remote control. Mohammed Azarudeen et.al in this paper, we use low-cost aluminium pipes have used to construct the automatic coconut harvesting system. Mosam.K.Sangole et.al the main study is to develop a safety system of the wood cutting table saw, which is based on image processing. Nagasanark et.al this paper is to fabricate Hydro-pneumatic crane (HPC) which could be used for removing and setting up heavy objects like engines and transmissions from vehicles. J.O.Oyedide et.al this paper focuses on the designed and fabrication of a single acting hydraulic crane.

Qu Jiadi et.al this paper developed a novel redundant dual-arm robot motion learning method based on human-arm coordination characteristics. It can develop the human-like coordination motion of a dual-arm robot in both Cartesian space and joint space. Rahul Basu et.al this paper enables discrimination of objects and sorting into separate bins or stacks. Simple robotic concepts like the degree of freedom, gripper action, palletisation, pick and place, with online simulators where factory robots are simulated. Rishabh Tripathi et.al in this project, rack and pinion mechanism to convert the rotary motion into linear motion to reach the elevated height.

C.Santosh et.al this paper consists of two cylinders, a shaft works with lead screw mechanism, it is capable of rotational motion of arm to converting motion of piston with help of using compressed air. B.Satish Kumar et.al in this work, it has proposed to design and fabricate the automatic mechanical cutter by using the crank and slotted lever mechanism, for cutting agricultural products. R.Shah et.al the paper makes the objective of the project is to develop the low-cost robotic arm which can be utilized in any industry. Sujit Pardeshi et.al a flexure primarily based mechanism is developed for achieving geometric amplification of input motion. Finite element analysis (FEA) simulation is used to validate the geometric model and PRBM and results are corroborated with experimental ones. Tatiana A.Minav et.al in this paper, the modeling and testing of an electro-hydraulic lifting and lowering system and a forklift with two lifting zones are carried out and analyzed. Venkatesh Babu et.al this work aims to propose a unique style for fast come mechanisms, and the new mechanism consists of a generalized Oldham coupling and a slider-crank mechanism. D.Vijayakumar et.al this project is to fabricate and modify the elevator mechanism with a mechanical advantage. It was used to reduce the input effort in the pulley mechanism. Yang Cheng et.al This paper focuses on the analysis work of excavator attachment that in the main includes those aspects, like the kinematic analysis, dynamic analysis, structural analysis, flight designing and management, fatigue life analysis and structural optimization design. Yuanshen Zhao et.al this work is based on human-robot collaboration. An unnatural conducted by an operator through marking the tomato object on the graphic user interface is used for tomato recognition and localization. In this, present work a mobile phone controlled battery and solar power operated coconut picker is designed and fabricated to minimize the human fatigue and coconut pickup time.

COMPONENTS OF COCONUT PICKER

Winch DC motor

Brushless DC motors are utilized in this to work the lifting mechanism. The magnets within the rotor and electromagnets on the motor housing for the stator. The motor controller can precisely control the timing, phase, etc., of this within the rotor coils to optimize torque, conserve power and regulate speed. Advantages of brushless motors include long era, little or no maintenance, and high efficiency.

Robot arm DC motor

Geared DC motors are often called as an extension of DC motor that already had its Insight details demystified here. A geared DC Motor incorporates a gear assembly attached to the motor. An idea where gears reduce the speed of the motor but increase its torque is understood as gear reduction. The geared DC motor is placed for the movement for robotic arm.

Rope and pulley system

A rope and pulley system is characterized by the employment of one continuous rope to transmit a tension force around one or more pulleys to lift or move a load, the rope is also a lightweight line or a powerful cable.

Extension rectangular frames

The rectangular frames used for the extension of the arm with cutting tool are made up of aluminium and are placed one inside the other. To obtain high levels of elevation multiple rectangles can be used. In this case, we make use of three rectangular frames that are each two-meter long. The top frame is attached to a rope at its lower end the other end of the rope is connected to the base frame via pulley. The second frame is attached to a rope at its lower end the other end of the rope is connected to a winch via pulley.

Winch

Winches are the premise of such machines as tow trucks, steam shovels and elevators. Designs that are more complex have gear
assemblies and may well be powered by electric, hydraulic, pneumatic or combustion drives.

**Movable base frame**

It is the main supporting structure of a coconut picker, to which all other components are attached to it. It is made from mild steel. This base has two rubber and two plastic wheels that make moving coconut picking machine from one tree to another tree. The two plastic wheels are one direction wheel it is fixed at the front of the base and two-rubber wheel are all direction wheel it is fixed at the backside of the base. These rubber wheels are used to change the direction of the base.

**Robotic arm**

A robot arm may be a sort of robot consisting of parts linked together within the same way as those of a person's arm, mounted on a stand. The most common manufacturing robot is that the robot arm which is typically made from several metal segments. Sensors were fixed to the robot arm to detect whether there have been humans on the brink of the robot. A robot arm may be a sort of robot consisting of parts linked together within the same way as those of a person's arm, mounted on a stand.

**WORKING OF COCONUT PICKER**

The coconut picking machine work on a principle of rope and pulley cascade lifting mechanism. The rope and pulley system is used to lift the frame to required height the lifting is controlled by mobile phone via winch. Once it reaches required height, the winch is stopped and we control robot arm via mobile phone. Using mobile phone, we positioning the jig saw cutting blade on the tender coconut bunch and start cutting operation to cut down the coconut from the tree. The entire circuit is powered by using solar panel and battery, and controlled by using mobile phone. The entire setup is mounted on the movable base frame it is used to move the picking machine from one tree to another.

![Three-dimensional CAD model of coconut picker](image)

**Calculations for winch motor speed reduction**

\[
S_{\text{TAT}} = S_{\text{BTB}} = S_{\text{CTC}} = S_{\text{DTD}} = S_{\text{ETE}} = S_{\text{FTF}}
\]

Where,

\[
S = \text{Speed}, \quad T = \text{Number of teeth on gear} = T_A = 7, \ T_B = 34, \ T_C = 12, \ T_D = 30, \ T_E = 12 \text{ and } T_F = 40
\]

\[
S_{\text{A}} = 2750 \text{ rpm}
\]

\[
S_{\text{TAT}} = S_{\text{BTB}} = 2750 \times 7 = S_B \times 34 = S_B = 566.1764 \text{ rpm}
\]

Gear B and C are mounted on same shaft

\[
S_B = S_C; \ S_{\text{CTC}} = S_{\text{DTD}}; \ 566.1764 \times 12 = S_D \times 30 = S_D = 226.4705 \text{ rpm}
\]

Gear D and E are mounted on same shaft

\[
S_D = S_E; \ S_{\text{ETE}} = S_{\text{FTF}}; \ 226.4705 \times 12 = S_F \times 40; \ S_F = 67.9412 \text{ rpm}.
\]

**CONCLUSIONS**

Our project is very much useful to the coconut harvesters. Coconut picking is a very laborious and difficult job. A lack of tree climber’s results in agriculturists not being able to sell their nuts in time. It offers an advantage of coconut picker is user-friendly, good energy-efficient, low power consumption, and more economic. It provides the safety and protection to the tree climbers. We can operate the coconut picker by using the mobile devices. In the future, the climber can be fully automated. Instead of manual controlling, the operation can be programmed into a microcontroller. A robotic arm will be wanted to harvest coconuts. The whole frame is made up of aluminium (Al). The automatic climbing is easily controlled and operated by using smart phone. This method, which is proposed, is comparatively faster, as it is manually controlled and will be adjusted to be apt for the structure of each tree.

**REFERENCES**


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