Automatic Coconut Tree Climber with Expropriator

P. Sethupathi, E. Srinidhi, K. R. Kousick Raj, M. R. D. Youvasri, D.Karthikeyan

Abstract: ***In this new era, modernization plays a key role. Many human tasks are now being replaced with innovations and robots. There is an urge to handle modern technology. Only a few are interested in climbing trees due to many disparities faced by hikers but demand high pay. This results in a tremendous demand for tree climbing manpower. There are different approaches available for the climbing of coconut trees, however, they require people to accompany the mechanical structure. The idea of a smart remote-controlled tree climbing mechanism is proposed to make the climbing process easier and convenient. Coconut tree climber is a machine used without human effort to climb coconut trees and harvest coconut. It consists of a hexagonal frame holding all the devices inside it and by adjusting the driver circuit, the complete structure can be driven up and down. This mechanical frame set-up is made of lightweight material. Gear motors are powered by the driver circuit wherein the battery supplies. The treewidth usually differs between 45 cm and 55 cm. By considering the tree structure the frame size is designed accordingly. Since width changes between trees, the mechanical frame is constructed with various diameters using spring mechanism. Grip wheels are used to produce friction. Gear motors are used which produces small quantity of regeneration. The battery can store this energy and reuse it. The Robotic arm is placed on the mechanical frame to pick the coconut without any crew from the tree. The machine's cost is about ₹ 20k. This automated remotecontrolled coconut climber is supposed to be very obligatory for farmers.***

Keywords: Coconut tree, Climber, Robotic arm.

I. INTRODUCTION

Agriculture plays a pivotal role in the economy of developing countries across the world. It retains a crucial part in the income and employment of rural people of developing nations. It affords the food to all the living creatures in the globe. According to the Food and Agriculture Organization of the United Nations(FAO) in the year 2000, the total share of the agricultural population is 67% such that agriculture accounts for 39.4% of the GDP and 43% of all the export goods comprise of agriculture-related goods. In many developing countries like Europe, North America, Australia, Brazil, India and China that are becoming skillful at raising yields.

In India, the Indian Council of Agricultural Research stated that agriculture assists to overcome hunger and starvation, deteriorating poverty and to bring the economic transformation among the rural families.India is the world's second-largest producer of several dry fruits, roots and tuber crops, pulses, farmed fish, eggs, coconut, sugarcane and numerous vegetables. Tamil Nadu is widespread with a lot of coconut trees. As the globe is reforming, different approaches and methods for cultivation are being developed and incorporated. Over almost every stage of farming and cattle care, farmers utilize machines.

Additionally, there seems to be a huge need for a coconut climbing crew. Since mishaps occur in a huge way that can lead to skin bruise and bone cleavage. It is quite hard to learn the skills needed to climb coconut trees. People barely attempted to get a few feet off the ground the first few times. The skin of the hand, neck and feet may be affected during the initial climb. The traditional method of snatching coconut is manual harvesting There are many difficulties in the traditional method of coconut climbing and it is life-threatening. It needs skilled coconut tree climbers. Farmers use their coir rope to hold on the tree.

Two forms of manual climbing are available. One is the front foot climbing, the other is the frog-foot type climbing. The tree climbing technique at the front of the foot is very similar to rock climbing. The second method is the frog-foot approach whereby the climbers put the legs on two sides of the trunk like a frog. For coconut tree farmers, the lack of availability of workers and labor costs become a drastic issue. So many climbing devices are developed that are available on the market to avoid this problem.

Appachan's Coconut Tree Climber can be used to climb a coconut tree. It is easy to use because of the fine gripping. It includes two metal loops for holding the legs down and a handle for a handgrip at the top. Even though it has fine gripping, it's precarious to be handled by humans. Cocoman coconut climber is a climber of the sitting type that also requires human needs. It consists of a double locking mechanism. The kit contains high bearing capacity upper and lower contacts and connecting rope, safety harness and safety belt. Although labor can accompany the setup by sitting alongside it, it also requires manpower to operate.

Diesel Engine operated coconut tree climber requires a diesel engine attached to the climber set up. A human accompanies the climber but does not require manual work. It is safer when compared to the above-mentioned methods. It is costlier and not eco-friendly. The main drawback of this method is a heavyweight. To overcome all those above-mentioned drawbacks, the idea of an automatic coconut tree climber is proposed. It will be very helpful to farmers.

Revised Manuscript Received on March 05, 2020.

P. Sethupathi, Assistant Professor, Department of Electrical and Electronics Engineering, Kongu Engineering College, Erode, Tamil Nadu, India.

E. Srinidhi, Student, Kongu Engineering College, Perundurai, Erode, Tamilnadu, Tamil Nadu, India.

K. R. Kousick Raj, Student, Kongu Engineering College, Perundurai, Erode, Tamilnadu, Tamil Nadu, India.

M. R. D. Youvasri, Student, Kongu Engineering College, Perundurai, Erode, Tamilnadu, Tamil Nadu, India.

D. Karthikeyan, Student, Kongu Engineering College, Perundurai, Erode, Tamilnadu, Tamil Nadu, India.

II. LITERATURE SURVEY

Tin Lun Lam Yangsheng Xu et al [1] developed a "Treebot" which has high maneuverability on a crooked tree environment and surpasses the phenomenon of climbing the tree. Treebot's structure is a maneuver setup that has high degrees of freedom and superior extension ability. Treebot also equips with a pair of omni-directional tree grippers that enable it to adhere to a wide variety of trees with a wide range of gripping curvature. By combining these two narrative designs, Treebot can reach many places on trees including branches. Treebot can maneuver on a complex irregular tree environment, by only five actuators are used in this mechanism. As a result, Treebot is compact in size and light in weight.

Hariskrishna TV et al [2]developed a modelentitled "Design of Climbing Mechanism for a Tree Climbing Robot" in which the tree climbing technique for coconut treeshas been proposed but it is almost straight like palm trees, poles, etc. The approach used in this robot is a bio-inspired mechanism. It is originally obtained from an organism known as Stomatapod. This phenomenon appears to be more responsive when compared to other available techniques but the main drawback is that it is being used only for a small class of trees. They also experimented with this technique using a prototype ofthe robot and tested the efficiency of the slinky type gripper but only on few trees. In this mechanism, software simulation was done. Their future work involves the addition of agricultural types of equipment like harvester sprayer etc.

Akshay Prasad Dubey et al [3] designed and implemented an inexpensive autonomous coconut tree climbing and garnering robot which is automated using Arduino Uno, drivers, sensors and other supporting circuits. The proposed work is entitled International Conference on Computational Modeling and Security (CMS 2016). The prototype of the coconut tree climbing robot has been tested auspiciously. The overall estimation of the product is less than Rs.4000. So farmers can remunerate the robot at this cost. Depending on the end effecter fixed to the robotic arm, it uses can be extended broadly. Usage of pneumatic pistons in place of the threaded rods, fast climbing can be achieved.

Dr.S.Maheswaran et al [4] developed an "Automated Coconut Tree Climber" in which the remote control methodology with automatic climbing has experimented. The automatic climbing is much easily controlled and operated as compared to other methods. This method is relatively faster, as it is manually controlled and will be adjusted to be suitable for the shape of each tree. The prototype has been assembled and taken into the test. Future work for this project involves altering a plucking and climbing unit for boosting the climbing and plucking. Here the design is the compact multi-axis robotic blade for snatching the coconuts.

Mohd Ashiq Kamaril Yusoff et al [5]designed the "Wireless Mobile Robotic Arm" in the year 2012. In their proposed work, they inquired about the increased usage of the wireless application, the demand for a system that could easily connect devices for transfer of data over a long distance without cables, became stronger. They invented a wireless mobile robot arm. A mobile robot that functions the pick and place operation and it was controlled by using a wireless PS2controller. It can move front and back, turn right and left for a specific distance according to the controller specification.The robotic origination is based on a microcontroller platform that will be interfaced with the wireless controller to the mobile robotic arm. The analysis was made on the parameters such as speed, distance, load that can be lifted to test its performance. This model is expected to vanquish the issue such as placing or picking objects that are far away from the user, pick and place the hazardous object in a fast and easy way.

Prof M. S. Patil et al [6]developed a "Coconut Harvesting Machine" in the year 2017. The main objective is to minimize the human workforce required for climbing the trees. The time for climbing can be reduced. This robot has six wheels which are fitted on three locations. Each wheel is on the lower and the upper frame of the climber. Each wheel is connected alternately to each other. Every six wheels are excited by 10 rpm dc motor to locomote in both upward and downward directions. A spring-guide mechanism for the diametric adjustment of the tree trunk is used. The trunk of the tree will narrow among the different trees. Along with this mechanism, spring expands and provides tension to the setup. The whole setup is wired controlled and it can be operated from the bottom by an operator.

III. PROBLEM STATEMENT

Coconut and coconut products find a variety of uses. Coconut and coconut milk is used for cooking. Coconut water is a drink that is safe and refreshing. Coconut shells and husks can be used to make different household and flooring materials. Coir and stuffed mattresses are made from coconut husk. Coconut oil is another major product. It has a major role in Ayurveda treatment. Most of the medicinal ayurvedic oils are made of coconut oi l. And we have plenty of coconut trees in our country and all over the world. The problem that we are facing is harvesting the coconuts. The tree's structure and height is the problem. It requires skilled labor to climb and also it is a very risky job. If the person climbing the tree loses the grasp on the tree or i f, when he hits the top side, he struggles to grip, there is a ris k that a proper gripping system will come into play that will help people ascend. It is time that we look for an alternate solution in which we can harvest coconuts without manpower.This may be a potential solution for robotics and automation.We have to solve issues like how the robots hold the tree, how much user-friendly, how much durable, etc. Different mechanisms have to be applied. Designing a vertical climbing robot is a difficult one than several normal rover bots. And also the structure of the tree is an important parameter to be considered. Tree cross-sectional areas may vary in each tree and it may vary in the same tree from top to bottom. The height of the tree is another parameter which plays an important role in the case if we are controlling it from the ground. Proper communication channels have to be chosen for controlling the robot. Likewise, there are so many parameters that have to be considered while designing such a system. This paper deals with different possibilities and mechanisms for harvesting coconuts.

IV. PROPOSED WORK

The proposed project consists of following hardware components such as designed mechanical frame, gear motors, springs, steel rods, grip wheels, batteries, switched-mode power supply and wires. The idea of the project is to make a complete coconut climber at a low cost to help the farmers. Here the whole set up weighs only 10 kg. This can be lifted because we use grip motors in this idea. Gear motors tightly hold the tree when the supply is switched off. This is the reason for using a gear motor.

V. HARDWARE COMPONENTS

A. Hexagonal Frame

The mechanical frame is hexagonal. It holds the motor wheels in it. It is accompanied by a set of springs(spring mechanism). The hexagonal frame's each side makes an angle of 120 degrees.

Instead of using a circular frame, a hexagonal frame is used to reduce the huge size of the climber. There is an opening mechanism to make the fitting of the frame in a sophisticated way. Adjusting the spring mechanism is suitable for varying lengths of the coconut tree

The advantages of using hexagonal mechanical frame are

- It is compact.
- It can easily be lifted as it is lightweight.

The CAD diagram for the proposed project that has been drawn using the software tool used is ZWCAD 2019 English. The CAD diagram for the proposed project is shown in figure 5.1

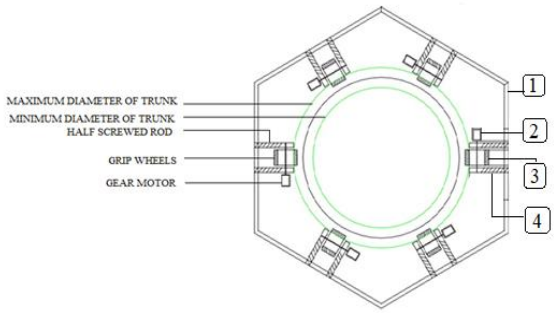

Figure 5.1 Hexagonal Frame: CAD Design

The detailed description of the number specified in thefigure:

1-Mechanical Frame
2-Gear Motor
3-Grip Wheels
4-Spring Mechanism

Dimensions

S.NO	DESCRIPTION	DIMENSIONS(cm)
1	Maximum diameter of the trunk	60
2	The average diameter of the trunk	55
3	The minimum diameter of the trunk	45
4	Side of a hexagonal frame	37.5
5	Gear Motor	3 * 2.15
6	Grip Wheels	5 * 3.5

B. Wheel Arrangement

Wheels are used for the movement of the mechanical frame in a trouble-free manner on the trunk of the tree. There are six wheels attached to the hexagonal frame. These wheels are arranged alternately to each other. Three wheels are arranged on the top side hexagonal strip of the frame and the other three on the bottom side hexagonal strip of the frame. The wheels are coupled with the gear motor. The wheels can be adjusted front or back using the spring mechanism and it can be tightened with the help of screws. Wheel along with gear motor arrangement is to make grip fitting of the frame with the tree and adjust with the varying lengths of the tree. It provides smooth operation. The wheel arrangement in the mechanical frame can be clearly understood by the figure. The wheels are aptly fitted to the coconut trunk along with the adjustable spring mechanism. As the diameter of the trunk varies among the tree, it is necessary to automatically adjust to it. This wheel arrangement along with the spring mechanism gives a perfect solution to the above-mentioned problem. The segmented view of the gripping wheel in CAD diagram is shown in figure.

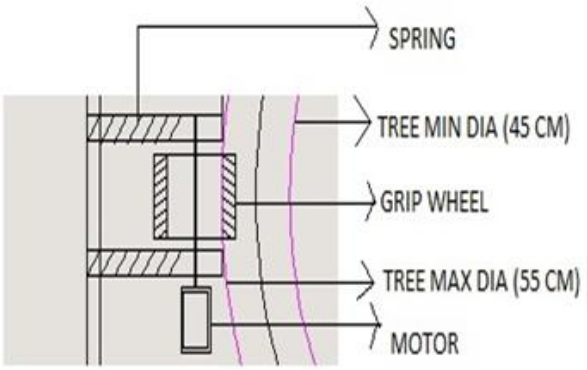

Figure 5.2 Segmented view : Grip Wheel

The grip wheel used in the framework is shown in figure 5.2.The wheels used here are the grip wheels. It is griply attached to the trunk of the tree which provides smooth operation. The wheel diameter is 5cm. There is a hole in the center of the wheel to fit the shaft. It is 2mm in size.

C. Spring Mechanism

As the shape of the tree is not uniform on all sides, it is necessary to automatically adjust according to the tree's surface. The spring mechanism is to make the smooth operation of the wheel on the trunk of the tree. Spring is 7.5 cm in length. A half screwed rod of length 12 cm is used to connect the wheel and the frame. Spring can be easily adjusted using the nut attached to the end of the rod in the outer side of the frame.

The application of spring mechanism in coconut tree limber can be clearly understood by referring the figure 5.6. Spring requires a tension to adjust automatically to the diameter of the tree. It is the major advantage of the coconut tree climber. It can be expanded to the maximum length of 9 cm of spring. Spring along with the wheel setup is shown in figure 5.6.

Figure 5.6 .Spring Set-up

D. Gear Motor

A DC motor is one of a class of electrical rotary machines which converts electrical direct current into mechanical energy. The most common types depend on magnetic-field effects.. Nearly all types of DC motors have some internal mechanism, either electrochemical or -electronic; to periodically change the direction of current flow in part of the motor."Gear drive" means a combination of an engine plus a gear reduction train. These are often conveniently packaged together in one unit. The gear reduction (gear train) reduces the engine speed, with a corresponding increase in torque. Gear ratios range from just a few to immense.With a single gear-pair, a small ratio can be achieved, while a large ratio involves a number of gear reduction steps and thus more gears. There are many different types of gear reduction.

In the case of a small transmission ratio N, the unit may be back drivable, meaning you can turn the output shaft, perhaps by hand, at angular velocity w and cause the motor to rotate at angular velocity Nw.

A greater transmission ratio N will make drivability of the unit non-back.Drivability back not only on N but also on many other variables. For big N, the actual torque of output is often limited by the power of the final gears, rather than by the torque of the motor by N times. A gear motor is an all in one engine and gearbox combination. Adding a gear head to a motor reduces speed whilst increasing.

The most important parameters in regards to gear motors are speed(rpm), torque and efficiency(%). The gear motor is used for the convenient mobility of the climber. The motor shaft is 3mm in diameter and 5cm length. Six gear motors are connected to the wheel arrangement. The shaft of the gear motor is connected to the center of the gripping wheel. Johnson's gear motor is used here. The application of gear motor in the coconut tree climber can be clearly understood by referring the figure 5.6.. The gear motor shaft is directly connected to the gripping wheel.

Here it is connected by using the dummy. So there is no need for extra welding to the wheel and the shaft of gear motor. This will gradually reduce the weight of the whole setup. Each gear motor can lift to 5kg. As the battery is placed in the land, only wires are accompanied with the whole frame set-up. So there is no problem of lifting the frame with the battery, as the battery's weights vary with the charging and discharging. Each gear motor rotates at the speed of 30rpm. The gear motors do not rotate at a normal state. It rotates only after supply is given.

Specification

S.NO	PARAMETERS	SPECIFICATIONS
1	Name	Johnson Gear motor
2	Voltage	6V to 18V
3	Torque range	10-15 Kg-cm
4	No-load rpm	30
5	Current	7 Ah
6	Load current	up to 9 A (max)
7	Dimensions	3.7 * 11 * 3.7 cm
8	Quantities	6

E. Battery

A battery is a device consisting of one or more electrochemical cells provided with external connections to power electrical devices such as flashlights, mobile phones, and electric cars. When a battery supplies electric power, its positive terminal is the cathode, and the anode is its negative terminal. The terminal marked negative is the source of electrons that flow to the positive terminal through an external electric circuit.When a battery is connected to an external electric chare, a redox reaction converts high-energy reactants into lower-energy products and delivers the free-energy difference to the external circuit.

Historically, however, the term "battery" applied primarily to a device made up of multiple cells, the use has expanded to include devices made up of a single cell. Primary batteries are used once and are discarded; during discharge, the electrode materials are irreversibly altered.Common examples are the alkaline battery used for flashlights and a multitude of portable electron devices. Secondary batteries can be discharged and recharged multiple times using an applied electric current; the original composition of the electrodes can be restored by reverse current. Examples include lead-acid batteries used for portable electronics such as laptops and mobile phones.

In these, we have used secondary batteries in the entire system operated in DC and powered by 12V DC Battery. The battery 12V 14 Ah/10 Hr is used effectively for the motor and movement operation. The battery used for the operation is Ampere Sealed Lead - Acid Battery. This battery can be recharged again.

Specification

S.NO	PARAMETERS	RANGE
1	Name	Ampere Sealed Lead-Acid Battery
2	Voltage	12V
3	Current	14Ah/10Hr
4	Quantities	6

F. Driver Circuit

The electrical circuit in the coconut climber refers to the driver circuit along with motoring operation. It involves the movement of the whole framework up and down on the trunk to pick off of the coconut from the tree.

The electrical set-up is completely based on the work of the driver circuit. The driver circuit controls the operation of gear motors. Each gear motor is attached through shaft fitted to the hole of the grip wheels. The driver circuit is used for the control operation of motors for up-down movement. It is connected to the motor terminals. The supply is given by the battery. It can also be used using the AC source. In the case of Ac supply is used, the Switched Mode Power supply is used. In the driver circuit, the switch concept is used. Here the forward and backward operation of the motor is implemented. The driver circuit controls the upward and downward movement of the climber. It is controlled using the switch in the driver circuit. The upward and downward movement of the frame is made by reversing the polarity of the gear motors. If the battery is discharged, it is possible to run the frame using the supply. Switched Mode Power Supply can be used as an alternative to the battery. It works on the AC supply.

G. Robotic Arm

A robotic arm (not a robotic hand) is a type of mechanical a rm that is typically programmable and has similar functions to a human arm; the arm can be the sum of the mechanism o r it can be part of a more complex robot.We have used a 4-axis robotic arm in which the stepper motor is used for its movement. The arm is further controlled by the controls in the driver circuit.This arm has a 360 degree rotatable base with a flexible lengthening middle axis.The arm is used for cutting of coconut from the apex of the coconut trees.This robotic arm perform the functions similar to that of the human hand.The mid-axis can be expanded upto a length of 30 cm .The arm is also driven by the same power supply along with the gear motors, Fig 5.7 shows Robotic arm.

Fig 5.7 Robotic arm

VI. WORKING

Initially, the hexagonal frame is fixed to the trunk of the coconut tree. Now the up/down movement of the mechanical frame setup is controlled by the switches in the driver circuit manually. The driver circuit is powered by the battery that is connected to the driver circuit. Finally, the automatic coconut tree climber is made to climb the coconut tree for plucking coconuts. The robotic arm is tend to cut the coconuts from the coconut tree.

VII. HARDWARE AND EXPERIMENTAL RESULTS

The proposed project shows the advantages of the existing implemented methods. This idea provides farmers a good solution to meet labor insufficiency consequences. The complete hardware setup in the tree is shown in figure 7.1

The whole setup is made up 1-inch steel road. Before that, we made a Computer-aided design in a hexagonal shape. It is very useful in the time of making the frame. The frame each side has 60 degrees and a height of 25 cm. Half an inch rod was used to make wheel arrangements with adjustable springs.

Figure 7.1 Top view: Hardware

The open and close arrangements at one end of the hexagonal frame. It is useful for various coconut tree sizes. The full setups are made with six half road wheels with spring adjustments and wires are parallelly connected with six wheels and finally connect with a driver circuit and the driver circuit is connected with batteries. The proposed idea is implemented in the coconut field. The coconut tree climber can move up and down along the trunk of the coconut tree without the accompany of the human. It is enough to operate the driver circuit from the ground. The whole setup can be easily lifted using the gear motors. These gear motors tightly hold to the tree. This idea gained attention towards the farmers during our implementation in the coconut field.

Figure 7.2 Hardware Implementation

Now we have made an effort to move the Automatic tree climber up and down on the coconut tree. The process is done with the switching operations among the help of manually controlled wired controllers with batteries. In the period of making this automatic tree climber, we learned plenty about the coconut tree and the problem faced by the farmers for dropping the coconuts from the tree. There are also several existing methods by using engines, ropes and other equipment but our method is easiest and safer for dropping coconuts from the tree. The entire system is operated in DC and powered by 12V DC Battery. The battery 12V 14 Ah/10 hr is used effectively for the motor and movement operation. The battery used for the operation is Ampere Sealed Lead - Acid Battery. This battery can be recharged again. The implementation of the project on the coconut tree is demonstrated in figure 7.2

VIII. CONCLUSION AND FUTURE SCOPE

The present difficulties in coconut snatching can be overcome by using this unmanned robot. There are many intricacies involved in the existing system like insufficient workforce, the varying diameter of the tree trunk, inclined coconut trees, rough tree trunk bark, irregular surface of the bark and wet climbing surface during the monsoon season. This will also lead to low production and a rise in the price of coconuts. Some of these challenges can be overcome by our Coconut plucking robot as it doesn't require any trained manpower for its operation. It is user-friendly and Cost effective and encourages all farmers to buy this product and get utilized for good Coconut Harvesting.

This working model can be extended in the future by many ways to serve many purposes such as Additional functions like cleaning the treetops and spraying pesticides that can be incorporated in the future. It will improve the Growth of the tree along with proper Maintenance. It monitors the conditions of the upper part of the Coconut Tree through the use of a Camera. It gives the Absolute Prediction for Coconut Harvesting.

This system is so designed that it can be controlled by a common man as it does not involve any complex procedure. For Instance, the Wireless Control of Coconut plucking robot can be done through Mobile Phones. In the future, this coconut tree climber can be made to pick off the coconut using the robotic arm. Here this idea is being implemented to climb the coconut tree without human labor along with this setup. Further development of the robotic arm is in progress along with the camera. The camera is used to identify the ripened coconut and to eliminate the tender coconut.

REFERENCES

1. Tin Lun Lam and YangshengXu, A Flexible Tree Climbing Robot: “Treebot –Design and implementation”, ‘2011 IEEE International Conference on Robotics and Automation Shanghai International Conference Center, Shanghai, China,pp.5849-5854,2011.
2. Hariskrishna TV, Vineet Pandey and PDPR Harshavardhan, Design of Climbing Mechanism for a Tree Climbing Robot´, International Journal of Mechanical Engineering and Research,ISSN 2249-0019, Volume 3, Number 6 (2013), pp. 647-654 [12]. Mark W Sponge, Seth Hutchinson and M. Vidyasagar, ³Robot Dynamics and Control´, 2nd Edition
3. Akshay Prasad Dubey, Santosh Mohan Pattnaik , Arunava Banerjee , Rajasree Sarkard , Dr. SaravanaKumar R.” Autonomous control and implementation of coconut tree climbing and harvesting robot”, International Conference on Computational Modeling and Security (CMS 2016),vol.4,pp.755-766,2016
4. S Maheswaran, S Sathesh, G Saran, B Vivek “Automated Coconut Tree Climber", International Conference on Intelligent Computing and Control 2017 (I2C2) ,vol. 4, pp.184-189,June 2017.
5. Mohd Ashiq Kamaril Yusoff, Reza Ezuan Samin, Babul Salam Kader Ibrahim,”Wireless Mobile Robotic Arm”,June 2012.
6. Prof M. S. Patil , Atul Patil ,TejasNawale ,Atul Mane and Rahul Chaudhary, "Coconut Harvesting Machine", 2015.

AUTHORS PROFILE

P. Sethupathi, is currently working as an Assistant Professor in Department of Electrical and Electronics Engineering, Kongu Engineering College, Erode. She obtained her B.E., (Electrical and Electronics Engineering) in 2009, M.E., (Electrical machines design modelling and control) in 2014 from Kongu Engineering College,Erode. His area of interest is Electrical machines design modelling and control. She has published 2 international conferences.

E. Srinidhi, is the student of kongu Engineering College, Perundurai, Erode, Tamilnadu. She is Currently pursuing her UG degree in Electrical and Electronics Engineering. She is currently doing her under graduate project in the area of electrical. She has published 3 papers in conferences.

K. R. Kousick Raj, is the student of kongu Engineering College, Perundurai, Erode, Tamilnadu. He is Currently pursuing his UG degree in Electrical and Electronics Engineering. He is currently doing his under graduate project in the area of electrical. He has published 3 papers in conferences.

M. R. D. Youvasri, is the student of kongu Engineering College, Perundurai, Erode, Tamilnadu. She is Currently pursuing her UG degree in Electrical and Electronics Engineering. She is currently doing her under graduate project in the area of electrical. She has published 2 papers in conferences.

D. Karthikeyan, is the student of kongu Engineering College, Perundurai, Erode, Tamilnadu. He is Currently pursuing his UG degree in Electrical and Electronics Engineering. He is currently doing his under graduate project in the area of electrical. He has published 2 papers in conferences.