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Wireless Monitoring and Controlling Areca Nut Trees against Pests and Plucking Nuts Using Robotic Arm

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ABSTRACT— Agriculture is the art and science of cultivating the soil, growing crops and raising livestock and plays a crucial role in the life of an economy. It is the backbone of our economic system. Agriculture not only provides food and raw material but also employment opportunities to a very large proportion of population. The areca nut palm is one of the important commercial crops of India. The crops is mainly grown in states of Karnataka and Kerala. Arecanut or betlelnut is an extensively cultivated tropical palm. The project basically is a
stepping stone towards bringing advancements in the field of agriculture by introducing high end technology devices like automatic pesticide sprayer to areca nut trees, plucking the nuts and so on. Meanwhile reducing the use of manpower and giving security for farmer's life. The Project uses Embedded Technology with wireless communication system to establish a secure network between the person who is operating the device and a device which is doing the task. And work can also be done within the preferable time.

Key Words: Areca nut tree,ARMcontroller, Bluetooth, Main frame, Mobile, Plucking, sprin.

I. INTRODUCTION:

The people in rural areas of south India like Karnataka and Kerala mainly depend on agriculture for their livelihood. The main crops grown are Areca nut and coconut. For spraying and applying insecticides on the crown and

also for harvesting, skilled labourers have to climb manually up the tree. Such a process looks easy, in reality it is a laborious and dangerous task. Areca nut trees attain a height of about 60-70 feet. It is mandatory to climb the trees a minimum of five times a year for a successful harvest - twice for the preventive spray against fungal disease, and thrice to harvest the areca nut.

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Only skilled labourers can carry out these farming operations. They have to climb the trees using muscle power. In an acre that has 550 trees, a labourer has to climb a minimum of 100 to 150 trees. As this involves real hard, physical exertion, nger generations of labourers are losing interest, with potentially harsh implications for areca nut cultivation. The spraying is done in monsoon, while harvest time is typically in summer. It requires skill to climb an areca nut tree. Skilled areca nut tree climbers have become scarce and farmers are finding it difficult to spray the insecticides.

Wireless Monitoring and Controlling Areca Nut Trees against Pests and Plucking Nuts Using Robotic Arm is a new invention against these harvesting problems. An automatic robot control by the user climbs and plucks the Areca nuts with respect to user input.

The design of the device has to be simple enough for villagers to operate, yet work efficiently to appeal to the majority. In present days the climbing methods that are been used by the farmer are Rope climbing method and Rectangle wooden seat climbing method. Rope climber is economical and simple in design which consists of rope of length one meter twisted to the shape of the sandal, the user wears this sandal and climbs the tree manually. In rectangle wooden seat climber the user hangs the wooden seat on his back and climbs the tree manually, once he reaches the tree top he ties the wooden seat to the tree and rest on the seat to harvest the areca nut. Although this two methods are simple and economical. It is not safe and cause physical strain to the user. In summary although many device were invented to climb the areca tree it was not economical and user friendly. In this

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project aimed to overcome these deficiencies by developing a smart multitalented robot for areca nut farming.

II. LITERATURE REVIEW:

The robot which would eliminate the need of manually climbing the Areca nut tree in order to spray pesticides. The robot consists of square frame which is fitted with four wheels. The up and down movement of robot is performed by dc motor with gears. This robot carry tank with it and two spraying unit are used which provide 180degree rotation to the arm by dc motor. The power supply is provided by batteries and signal from user is transmitted using RF transmitter and receiver .Then totally robot was controlled using remote. This designed robot reduces the dependence of labour and spray pesticides with good level of accuracy[1].

The people in rural areas of Karnataka and Kerala mainly depend on agriculture for their livelihood. Skilled areca nut tree climbers have become scarce and farmers are finding it difficult to harvest the nuts. Here we are designing and fabricating remote controlled areca nut plucking machine. The tree climber has two rings, two pulleys, rollers, rope, spring, cutter, collector and the main frame. The power from the motor is transmitted by rope pulley mechanism. The machine is placed around the tree and clamped to it by using two rings. Rotation of the motor allows rope to wind and rewind on to the drum. Cutting will happen along the movement of the machine. There is no separate mechanism for cutting to make the system simple. Control over the motor is done by a Bluetooth connected via mobile. Tree climber is mainly focused on two units RH and LH .The RH unit create the downward movement of the pedal, through which the steel wire rope is stretched and locks the areca tree. Now the LH unit is lifted up by pulling the handle attached to it to climb and the same process is repeated to reach the required height. To descend the tree the pedal of RH unit is pushed down and the handle of the LH unit is also pulled down alternatively till the bottom of the tree [2].

The deficiencies by developing a smart multitalented robot for arecanut farming. The machine is useful for climbing and spraying pesticides on single tree to multi trees. Observing the crops on the tree by the help of camera and it helps to harvesting like cutting the bunch of arecanut and collecting it in a basket [3].

Machine works on timely gripping and release of the tree by two metal wire ropes locked to the moving frame. By this design the structure is absorb a load of 100 kg .It is flexible to change the height of the equipment up to 100mm according to the equipment of the user. It has easy maintenance. This structure will be beneficial to middle class [5].

Methodology—

The first step was the collection and study of various data regarding the design and mechanism of the new product. The limitations of the current available systems were studied and analyzed, these results helped in creating a new design. A number of areca nut palms were observed and it was found that their diameter varied from 8-20cm. So, the robot was designed so it could cope with varying diameter. The power supply for the robot can be provided from a DC battery or an AC current by using an adapter. The robot consists of two mechanisms: climbing mechanism and harvesting mechanism.

Design—

Advanced methods for climbing and harvesting areca palm trees are very necessary in present scenario. The conventional methods include an experienced climber climbing the areca tree. This takes about 2-3 minutes alone just to climb the tree (This doesn't include cutting the areca nut and return trip). In more developed areas, methods of climbing and harvesting which involves rope-climbing gears and spiked shoes are used but are inefficient and impractical for large scale usage. Most climbers must climb around 20-30 trees per day in order to earn a meager income. In Kerala, a climber makes about rupees 750 per day. A climber climbs about 30-40 trees per day. In addition to pitiable wages, harvesters are looked down upon for doing the country's unwanted jobs. Hardly no-one aspires to become an arecanut harvester because of the unsafe conditions, low income, and social stigma, resulting in a virtual vacuum in the job market. This is because of the traditional idea of it being a man's job as areca nut harvesting is extremely strenuousFurthermore, this job is mostly male oriented.. The goal is to create a device that would allow operation by women and teenagers (as no hard labour would be necessary), thus creating an additional income opportunity for poorer families.

Technology –

Although there are any mechanisms that can climb walls or trees, there are currently no robotic devices for climbing and harvesting areca nut trees in specific. One drawback of this mechanism is that they take much longer to climb a tree than human. One of the few specifically related

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devices we have found in our research is a climbing and harvesting device that aids in climbing a palm or coconut tree. The inventor asserts that his device ensures the user's safety and quickens the climbing process. However, the device still requires a person to physically climb the tree and therefore does not properly address the society's needs. The above mechanism doesn't require human to climb the tree, but one has to drive it with the help of rope. It consists of a cutting blade and a climbing mechanism. Ropes are connected in such a way that by pulling the rope from bottom, the mechanism climbs upward. Holders are attached below the blade in order to hold the falling areca nut bunches. The grippers and rollers make the system move upwards and hold the mechanism in position. With the pulling action of the rope, the cutting blade gets enough power to perform the cutting.

Parts Used—

OPEN COIL HELICAL SPRING: A coil spring, also known as a helical spring, is a mechanical device, which is typically used to store energy due to resilience and subsequently release it, to absorb shock, or to maintain a force between contacting surfaces. They are made of an elastic material formed into the shape of a helix which returns to its natural length when unloaded. One type of coil spring is a torsion spring: the material of the spring acts in torsion when the spring is compressed or extended. The quality of spring is judged from the energy it can absorb. The spring which is capable of absorbing the greatest amount of energy for the given stress is the best one. Metal coil springs are made by winding a wire around a shaped former- a cylinder is used to form cylindrical coil springs.

Fabrication—

Climbing Mechanism :

The climbing mechanism consists of a hexagon frame which can be opened and closed with help of a hinge. Tyres are fixed on to a clamp and are powered by DC motors. The main parts of climbing mechanism are:

Hexagonal Frame :

It forms the base of the climbing mechanism. The shape for frame under considerations was hexagonal, round and rectangular. A hexagonal frame was selected as it required less material for providing the same amount of support compared to a rectangular frame and easiness of fabrication compared to a circular frameFor fabrication, GI pipe was used as the material because of its greater strength, less weight, weldability and economical. It can withstand considerable stress without failure. The length of each link was 25cm. Each alternative link had holes in it for holding the tyres. The frame also had a locking arrangement for attaching to the tree.

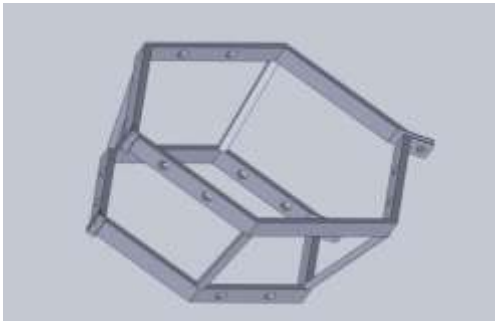

Fig 1:Hexagonal Metal Frame

U-Clamp and Motors

A u-shaped clamp is used to hold the tyre with the provision for attaching DC motor. Rods were used to fix thee clamp to the frame. Springs were used in the rods so that the frame can adjust to the variation in diameter of the areca nut palm. The springs were designed for 4cm deflection, internal diameter 1cm and wire diameter 0.2cm.

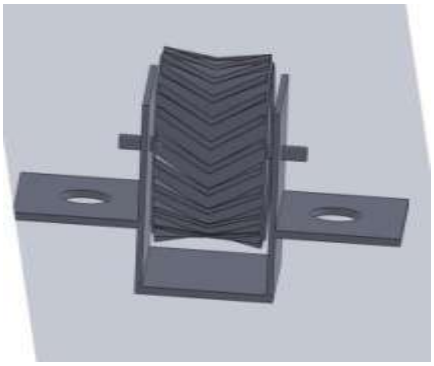

Fig 2:U-Clamp and Motors .

The dimensions of the clamp were determined relating to size of the tyre and motor. The speed of the DC motors was 30rpm. This motor was chosen as it provided enough torque to lift the robot. Also, this motors provided a self locking so that the robot did not climb down due to gravity. The tyre diameter was decided based on the size of the frame.

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Harvesting Mechanism :
The harvesting mechanism consists of a rotating blade capable of movement in an arc. A rotating harvesting mechanism was used so that it could harvest the areca nut if present on both sides of the tree without having to align the robot manually. The main parts of harvesting mechanism are:

Base Frame :
Wireless monitoring and controlling areca nut trees against pests and plucking nuts using robotic arm for areca nut is designed and tested for various areca nuttrees.The unit is capable of climbing tree for about 30feet. A semi-circular shaped base frame was attached to the top the hexagonal

Johnson Motor:

Fig 3: Johnson Motor.

This motor comes with a current controlled drive for Industrial grade high torque dc motor with various types of input signals. It supports UART/I2C/PPM/Analog signals directly for speed and direction control. The drive even works well at very low speeds.The Motor is an Industrial grade 600RPM high torque motor with a massive torque of4.5kgcm in small size. The motor has a metal gearbox with all high quality metal gears andhas an off-centred shaft.

III. RESULTS AND DISCUSSIONS

The goal of the agricultural is additional than simply the appliance of robotics technologies toagriculture.

Conclusion

The adopted technology makes the climbing of machine and pesticide spraying wireless. There is lot of work already done in this area but there are no devices which are100% accurate. They are various designs which are giving positive results but contain lot of complexities. The project proposes wireless robot for agriculture that guarantees to over come positive challenges that consists the present day agriculture .it encourages the use of technology to spice up the productivity in agriculture .so we conclude that the proposed machine is a safe, reliable, efficient and manual tree climber which reduces the problem in climbing the arecanut tree and also it solve the problem of spraying pesticides on areca nut and it branches. The agricultural vehicle for spraying pesticides proposed in this project might be a collaboration of all basic attainable technologies, to bring out a new and therefore provides personal safety. There are needy vehicle to assist farmers in tasks involving risks .Projects like this encourage people to take up cultivation of full time and half time jobs. Thisis essential in developing countries, especially Asian nation, where agriculture is the backbone of the economy.

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