KARNATAKASTATECOUNCILFORSCIENCEANDTECHNOLOGY

Indian Institute of Science campus, Bengaluru

Telephone: 080 -23600978, 23341652 || Email: spp@kscst.org.in

Website: www.kscst.iisc.ernet.in/spp.html or

www.kscst.org.in/spp.html

SYNOPSIS

1.	**Reference no: 46S_BE_4557**
2.	**Project Title:"DESIGN AND FABRICATION OF ARECANUT TREE CLIMBER AND SPRAYER"**
3.	**Name of the college: VIVEKANANDA COLLEGE OF ENGINEERING AND TECHNOLOGY, PUTTUR**
4.	**Department: Mechanical Engineering**
5.	**Name of project guide:** **1. Mr. DEEPAK KUMAR SHETTY K**
6.	**Name of the Team Members:** 1. **MUHAMMED SHIHAB P B** (4VP20ME404) 2. **AVINASH C H** (4VP19ME008) 3. **B ASHLESH RAI** (4VP19ME009) 4. **UMARUL FAROOQUE G M** (4VP20ME409)
7.	**Team Leader of the Project:** **1.MUHAMMED SHIHAB P B**
8.	**Keywords:** **Areca nut, pesticide.**

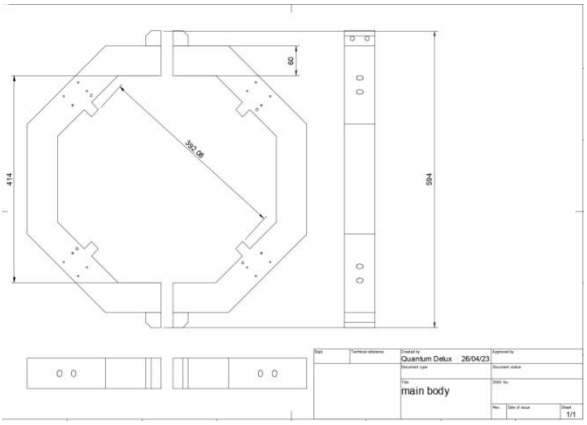
9.	**Introduction:** The people in rural areas of Karnataka mainly depend on agriculture for their livelihood. The main crops grown are areca nut and coconut. For harvesting the nuts, for spraying and applying insecticides on the crown, skilled laborers have to climb manually up the tree. Such a process looks easy. In reality it is a laborious and dangerous task. It requires skill to climb an arecanut tree. Skilled areca nut tree climbers have become scarce and farmers are finding it difficult to harvest the nuts. To avoid the laborers climbing the tree and spray the fungicide solution, here it is proposed to address problem by developing a climber that can semi-autonomously spray fungicide solution on areca nut tree. A quad copter drone with payload capacity of 8kg is developed with Pixhawk Flight Controller in it. Controller takes responsibility for drone actions and drone behaviors. As a complete implemented drone system updated with aurdupilot has suitable conditions in order to meet circular trajectory tracing feature in the controller itself. This project solves all the problems regarding the climbing and spraying of arecanut tree, thus developing a safer, reliable and an economical system. A prototype of the above model was made and was tested. The test was successful and the performance was satisfactory.

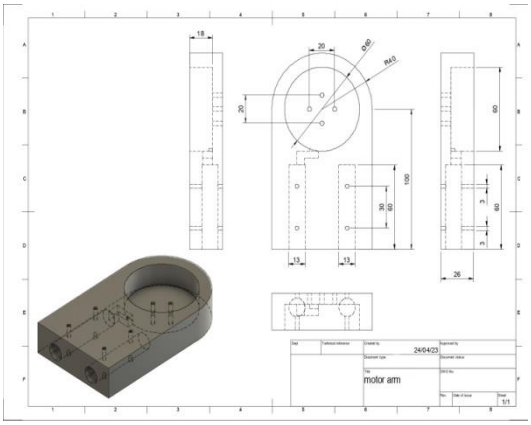
10. **Objectives of the project:**

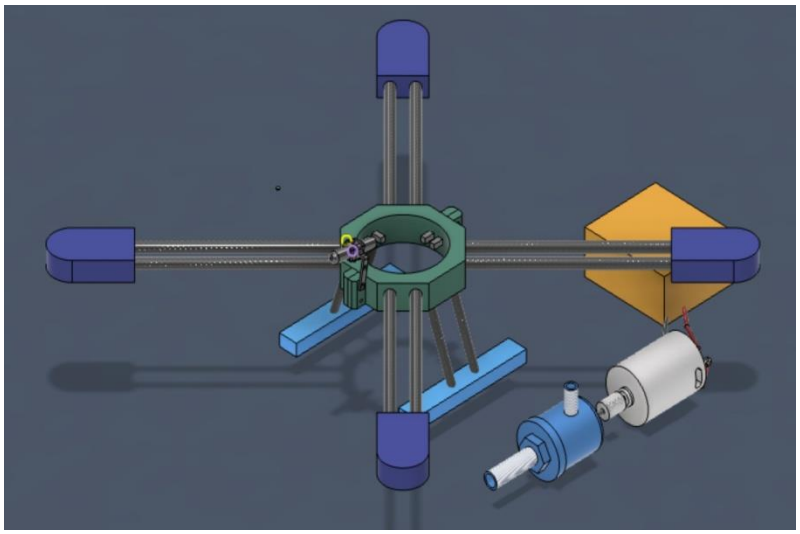
- ❖ To operate the machine from ground.
- ❖ To enable both men and women to operate the device easily.
- ❖ To spray the pesticides directly to the areca nuts without wastage.
- ❖ The machine will be able to climb the tree easily compared to traditional methods of climbing.

11. **Methodology:**

Sketch:







Working:

The detachable frame is fixed to the tree by attaching both the sides of the frame to each other. Drone motor is one of the most crucial parts of the propulsion system. Battery powers the motors, causing them to rotate at high speed. As a result, the motors rotate the propellers, creating a lift. The pump supplies the pesticide above the ground about 70 to 80 feet. The flight controller uses the data collected by the accelerometers and barometer, magnetometers, controller to stay in the air. The propellers have to rotate in different direction to generate lift and maintain the drone in the air. As they rotate, they create a zone of low pressure. Air moves

	from low-pressure regions to high-pressure regions. That's how the drone is able to move up, depending on how the speeds at which the propellers rotate. The sprayer is switched on for operation, which basically switches on the microcontroller and establishes the connection with RF transmitter through the RF receiver attached to the flight controller. The first instruction would be to arrange the exact position of the nozzle arm. Then simultaneously start the booster pump and automate the arm movement which will be moving at a constant speed. Once a complete round of pesticide is sprayed, the booster pump is switched off and the nozzle arm is also stopped. After the task is done the climber unit is brought down by adjusting the thrust of the motor. The frame is detached in the same way it was fixed by removing the spring connectors. After every 15 trees the pesticide is filled into the container manually which is kept below the tree.

Materials selection:

S.NO.	Component	Material selected	Reasons
1	Frame	PLA+	light weight
2	Drone leg	Carbon fiber	Stiffness, light weight
3	BLDC Motor	350kv	High torque
4	Propeller	Carbon fiber	Stiffness, light weight, strong
5	Electronic Speed Controller (ESC)	40amp	FETS on the ESC don't become damaged From the amperage.
6	Flight controller	F7 flight controller	It operates at low voltage and current, while the drone motors operate at a high current.
7	Battery	li-ion 4s 4200mah	Charge faster, last longer, high power density, less weight

12.	**Results:** This is the most suitable climber for spraying pesticide to the arecanut. The climber is attached and removed from the tree easily. After the climber unit has been attached, springs are used to fix the climber firmly to the tree. The climber operates on 12V 42 Ah battery and climbs the required height very quickly. Once the robot reaches the required height it stays there without slipping. The sprayer covers a wide angle and sprays pesticide to the arecanut bunch on the nearby tree up to a radius of 15 to 20 meters. After spraying is done it smoothly descends the tree. This climber reduces the time and also dependence on labour. A solenoid valve is used to stop or resume the flow of pesticide. All the above functions of the robot are controlled by remote. The average time required for climber unit is about 2 mint 50 seconds. At a one time it can spray only one tree. In one hour it can spray around 35 trees.

13. **Conclusion:**

The arecanut tree climber and sprayer is capable to meet the objectives of the purpose it was designed. The project was aimed to come up with a technological solution which can replace human labour to spray the pesticide safely. The designed system is affordable, simple, easy to set-up and control by anyone with minimum training given at the initial stage. The prototype was developed using the components locally available in the market and the software tools that are open source in nature. This arecanut tree climber and pesticide sprayer is a unique model which serves the farmers having little or no technical knowledge. The project concludes that the arecanut tree climber and pesticide sprayer is a safe,reliable,efficient robot and reduces the risk involved in manual climbing and spraying to a great extent.

14. **Scope for future work:**

The prototype will be undoubtedly a gift for the farmer as it ensures safety and protect them from directly getting exposed to the pesticide which was affecting their health. The prototype was then tested and desired results were noted down.

The future scope of the project would be to work on the design aspect with minimum number of motors to be used and making it more efficient. The design would also include a remote controller with display for better visualization.

The future improvements for this project are as follows:

- Computer vision can be added to identify the health areca nut.
- The process of spraying pesticide can also be made fully automatic using image processing sensor.
- Wheels with better frictional co-efficient can be designed.
- Automation movement of the sprayer nozzle can be adopted to the spray the pesticide to the nearby trees.