TREE CLIMBING ROBOT WITH PESTICIDES SPRAYING AND VIDEO STREAMING IN REAL TIME USING MICROCONTROLLER

Project Reference No.: *47S_BE_3530*

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Keywords:

Climbing-mechanism, Agricultural-robotics, Labor-saving technology, Tree maintenance, Sensor-equipped climbing etc..

Introduction:

Researchers all around the world work on developing climbing machines, most of these climbing machines are capable of climbing regular structures like poles, walls etc. But a very few are capable of climbing trees, main reason being irregular surface and variation of diameter with length. It also requires greater agility and high manoeuvrability to be used as a product. Also, the bark of some trees may not be strong enough to bear the weight of the climbing device, hence conventional climbing machine cannot be used for tree climbing applications.
Many trees like coconut tree, arecanut tree, and palm trees are so tall that climbing them becomes risky. Hence harvesting fruits and nuts and maintaining them becomes difficult. So, development of a unique tree climbing mechanism is necessary which may be used for maintaining and harvesting applications. In recent years, labour scarcity has emerged as one of the foremost challenges in farming. One crop that has been most affected by this is the arecanut. Arecanut 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 arecanut.

Objectives:

- This project aims to solving the issue of spraying pesticides to the area coconut trees by providing a low cost yet efficient technological solution.
- The objective of the project is to design and develop an automatic spraying machine which operates on rechargeable battery.

- The kit must be controlled via microcontroller which becomes a medium between human and the operation of kit.
- The kit should be designed in such a way that it can be easily assembled, dissembled and can be carried from one place to another.
- The number of motors used must be precisely selected along with the electrical power rating and torque requirements as it directly effects the battery requirements.
- The kit is semi-automatic with most the controls in the hand of user

Methodology:

- This includes specifying the desired functionalities, such as climbing ability, pesticide spraying mechanism, and real-time video streaming capabilities.
- Select Microcontroller Platform Choose a suitable microcontroller platform for controlling the robot's operations
- Design the mechanical structure of the robot to enable climbing on tree trunks and branches. Consider factors such as stability, weight distribution, and attachment mechanisms for the pesticide spraying system and cameras.
- Integrate Pesticide Spraying Mechanism Develop and integrate a pesticide spraying mechanism into the robot's design.
- Implement Real-time Video Streaming Integrate cameras and communication modules into the robot's design to enable real-time video streaming.

Conclusion:

The design of the robot, virtual analysis of the design concept, development of electronics compartments was done. When considering areas where it is dangerous for human, this mobile robot can be used. The design can be taken as the basic concept for improvements in the seed harvesting and maintains in-trees like coconut and palm tree the study conducted above can be used for fuming and harvesting the tall trees in a safe manner. The integration of pesticide spraying capability and video streaming in a tree-climbing robot offers a multifunctional solution for agricultural management.

Scope for future work:

- Autonomous Navigation Future versions of the robot could incorporate advanced AI and machine learning algorithms for autonomous navigation.
- This would enable the robot to identify optimal paths for climbing trees, avoiding obstacles, and efficiently spraying pesticides.
- Advanced Sensors Integration of more advanced sensors, such as LiDAR (Light Detection and Ranging) or advanced cameras with computer vision capabilities.
- Precision Agriculture Beyond pesticide spraying, the robot could be equipped with additional sensors for monitoring plant health, detecting pests and diseases, and even performing targeted treatments.

- This would enable precision agriculture practices, leading to increased crop yields and reduced environmental impact.
- Multi-Robot Collaboration Future systems could involve multiple tree climbing robots working collaboratively to cover larger areas more efficiently.
- These robots could communicate with each other to share data, coordinate tasks, and optimize their collective performance.
- Environmental Monitoring In addition to agricultural applications, similar robotic platforms could be used for environmental monitoring in forests and other natural ecosystems.