

Automated System for Climbing and Spraying Pesticides on Areca Nut Trees

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Abstract: - In this study, an Areca nut tree climber which can also be used as a pesticide sprayer to provide an alternative to the existing methods of human climbing the areca nut tree and spraying the pesticides which avoid direct contact of humans with pesticides while spraying the pesticides on a tree to tackle the problem of unavailability of areca nut tree climbers is developed.

The machine consists of a base frame. At the bottom of the machine there are two conical rollers that are connected to two motor drivers. These motor drivers are worked by a remote control to make the machine to move up and down the tree. The model is placed around the tree and held firmly to the tree using springs. Two spouts are mounted on top of the machine with motor arrangement so as to make it rotate completely in all directions. The pesticides can be raised to the spouts using an electric pump in order to spray it to the trees. Arduino Uno programming is used to spin the motors clockwise and counterclockwise.

This robot lowers the dependence on work as well as it can save time. The pesticide flow is controlled remotely. The user interface is straightforward.

Keywords: Areca nut tree climber, pesticide sprayer, motor drivers, Arduino Uno programming.

I. INTRODUCTION

The production of areca nuts in India is the largest in the world, according to the Food and Horticulture Association. Lately, job shortages have become one of the major growing challenges. Areca-nut trees reach heights of around 60-70 feet. For a fruitful harvest, there is a need to climb trees at least five times a year: twice for spraying the pesticides and three times to collect the areca nut. Only talented workers can perform these agricultural tasks. On a plot of land with 550 trees, a worker must climb at least 100 to 150 trees. Since this involves really hard physical exertion, the younger age workers lose interest, with potentially cruel ramifications on the development of the areca nut [1].

Koleroga is another common disease in regions with high rainfall. This disease increases in intensity during the southwest monsoon and causes severe damage to crops. Putrefaction, food rot, stem breakage, inflorescence dieback, stem bleeding are other diseases that affect Areca and cause varying degrees of damage [2]. The yellow leaf disease has caused a lot of damage to the areca nut. This disease is classified by the yellowing of the leaves of the leaves. As a result, the leaves and walnuts decrease in size, there is less

stem waste, and the walnut ripens. It is estimated that between 35 and 40% of the areca plantations in Kerala are affected by this disease [3].

To avoid the above problems, areca nuts are often sprayed with pesticides, similar to coconut palms [4,5]. Pesticide waste is reduced. Farmers are exposed to the toxicity of pesticides and suffer from pesticide poisoning [6].

II. METHODOLOGY

In this work, the main aim is to control the motors that are used to climb the tree. The motors should be synchronized so that the machine operates efficiently. The motors are controlled using headlamp relays since the motors are of high current ratings. Headlamp Relays will be controlled by 4-channel SPDT relays and these SPDT relays can be controlled by a controller through a Bluetooth command which can be sent through a smart phone.

A 12V battery connected to the motors is used to power only the motors. Another 6V battery is used to power all other components in the circuit through a regulated power supply. The LCD screen is used to show the current status of the device. Whenever there is a necessity for ON/OFF of the sprayer, it can be done through a command via Bluetooth using a smart phone. The system is operated through a Bluetooth application through a smart phone. Based on the commands, the system can climb the areca nut tree with motorized roller mechanisms. Through the sprayer fitted to the system, pesticide is sprayed to the areca nut and can be controlled remotely.

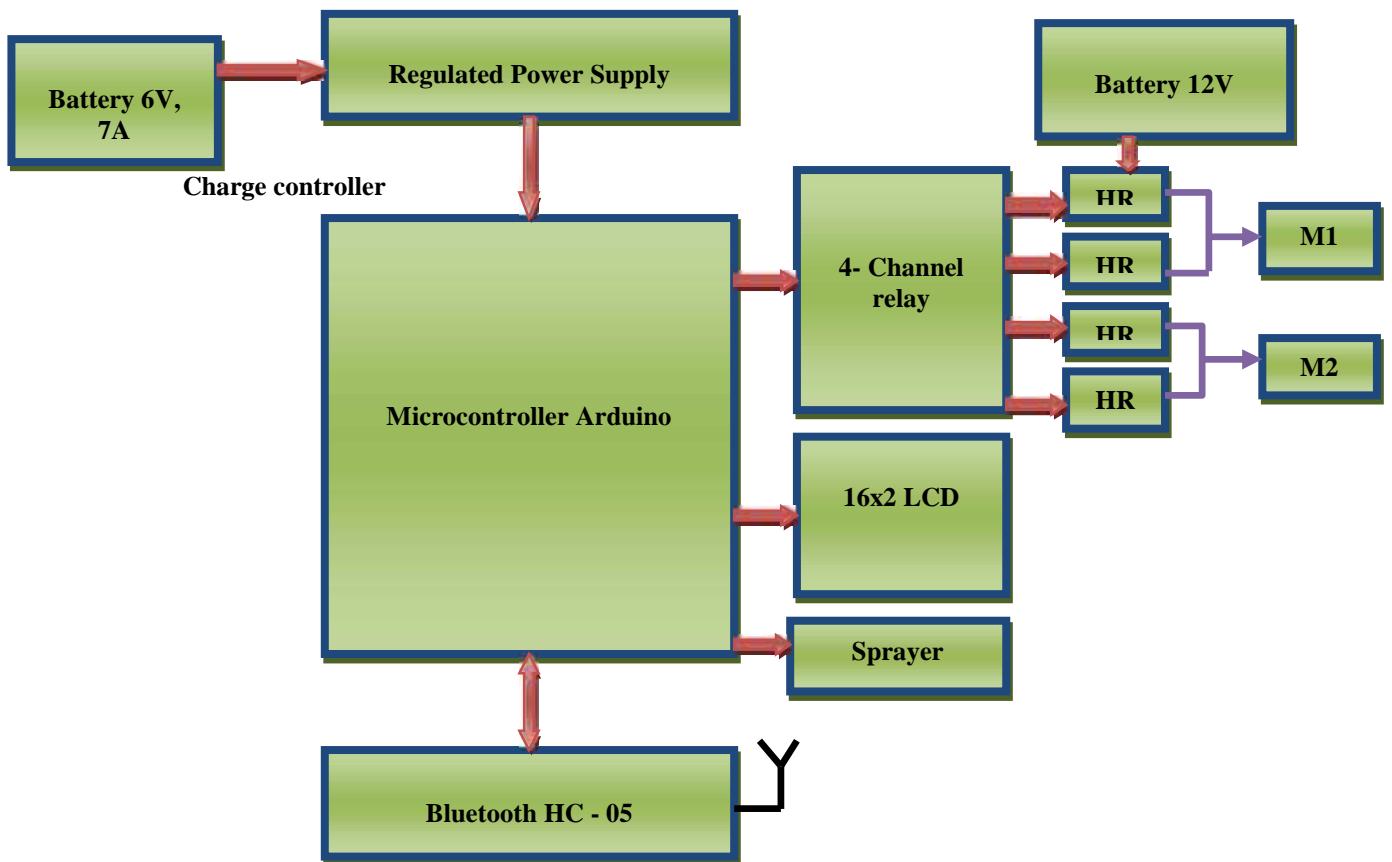


Figure 1. Block diagram of Areca nut Climbing System

The Arduino microcontroller which is an 8 bit controller is the heart of the system. Through proper programming of this microcontroller, the entire system operation can be controlled. The movement of motors and spraying mechanism are controlled remotely from the user end.

III. Experimental results

The scope of this work is to climb areca nut trees having circumference between 30 and 50 cm. Therefore, maintaining sufficient friction force capable of handling the self-weight, maintaining the stability of the structure while in motion, reducing the total weight, and achieving the precise gripping are the important parameters that have to be considered. The machine should be capable of adjusting to the varying cross-section of the tree during upward and downward movements. The machine grabs the tree firmly to maintain its positions during the operation. The motor is powerful enough to carry the payloads and weight of the machine. The tension maintained by the spring is good enough to maintain the gripping force between the roller and the tree.

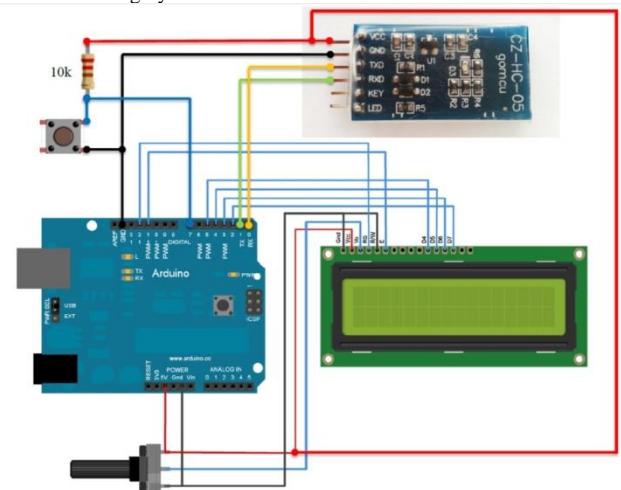


Figure 2: Connection between Bluetooth and Arduino



Figure 3: Interfacing of components



Figure 4: Areca nut Tree Climber Setup

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IV. CONCLUSION

This study proposed the development of a machine aimed at replacing traditional work-of climbing areca nut tree. Also it included spraying processes with a cheaper and more environmentally friendly system that relies on electricity, reducing the time and energy dependency on work. It is easy to attach and remove from a tree. It operates at a safe distance without exhibiting the ranchers to the dangerous effects of pesticides. This machine also helps to solve the problem of scarcity of experienced areca tree climbers.