TITLE OF INVENTION: Cotton picking rover using computer vision

FIELD OF THE INVENTION:

[0001] This invention is associated with agritech, which is the application of technology in agriculture to enhance yield quality and quantity by computer vision-based identification and selective picking of cotton bolls, hence mitigating the need for human labour.

BACKGROUND OF THE INVENTION:

[0002]Cotton was traditionally picked by hand, with the use of mechanical stripping, chemical defoliation, manual picking equipment, etc. Typically, farmers begin hand-picking

Cotton bolls in the afternoon and work non stop until dusk.

[0003] Throughout the season, cotton bolls open at various periods. A bloom typically takes about 1.5 months to develop and become ready for harvesting; however, high temperatures accelerate this process and make it more difficult to harvest the cotton boll since different bud open at different times.

[0004] These methods presented a number of difficulties, including labor-intensive tasks, sluggish processes, inefficient chemical use, ongoing oversight, etc. It takes longer to pluck the cotton bolls as a result of these procedures.

[0005] The utilization of vision-based systems in harvesting robots gained attention mostly due to its prospective benefits, including reduced equipment and maintenance expenses and the capacity to do selective picking. Because they are small and have a low weight, these tiny robots also have the benefit of entering a field without causing any damage to the soil.

OBJECTIVES OF THE INVENTION

[0006] The main objective of this presented invention is to provide a rover that can contribute to the Agritech for picking and collecting the cotton bolls using the computer vision based system.

[0007] Secondary objective of this is to reduce the physical work of picking the cotton bolls which is the traditional way and increase the production in much lesser time. The rover can go to the field multiple times for the purpose of plucking.

[0008] Another objective is to present a system based on Computer -vision that identifies the cotton ball in real time and separates it from the plant and collect it in a bucket.

[0009] This system uses Deep Learning that enabled the rapid detection, localisation and recognition of the object from the image. Deep learning are now being used in many applications related to agriculture and farming for detection, location and classification of the object in crops.

[0010] The robotic arm that is capable of accurately plucking the bolls and that is lightweighted and won't damage the whole plant in itself. This invention also makes sure that the maintenance is easy and the model is cost efficient with less complications.

SUMMARY OF THE INVENTION

[0011] The aim of this invention is to reduce the human power by some amount and help the farmers to have surplus amount with good quality. The delay in plucking the cotton bolls affects both the quality and the quantity of the final product. Weather conditions also comes into play and can have extremely negative impact.

[0012] The aim of this invention is to identify the presence of the cotton bolls , pluck it and collect it without damaging the rest of the plant. It's small size won't affect the soil and will move through the spacing between plants.

[0013] Another aspect of this present invention is to collect and make a dataset containing sufficient amount of images of cotton plants with different buds and bunches. Some cotton plants have a bunch of 4-5 Cotton bolls while others can have only 2-3.

[0014] Another aspect of this present invention is to use that dataset for training , testing and deploying the model for real time identification , recognition, and processing of the cotton images and picking it with the robotic arm to yield maximum production in much less time.

[0015] Another aspect of this present invention is to recognize the cotton bold by its position, colour, orientation , shape with the help of training the model through multiple images that were collected in the dataset.

Detailed Description:

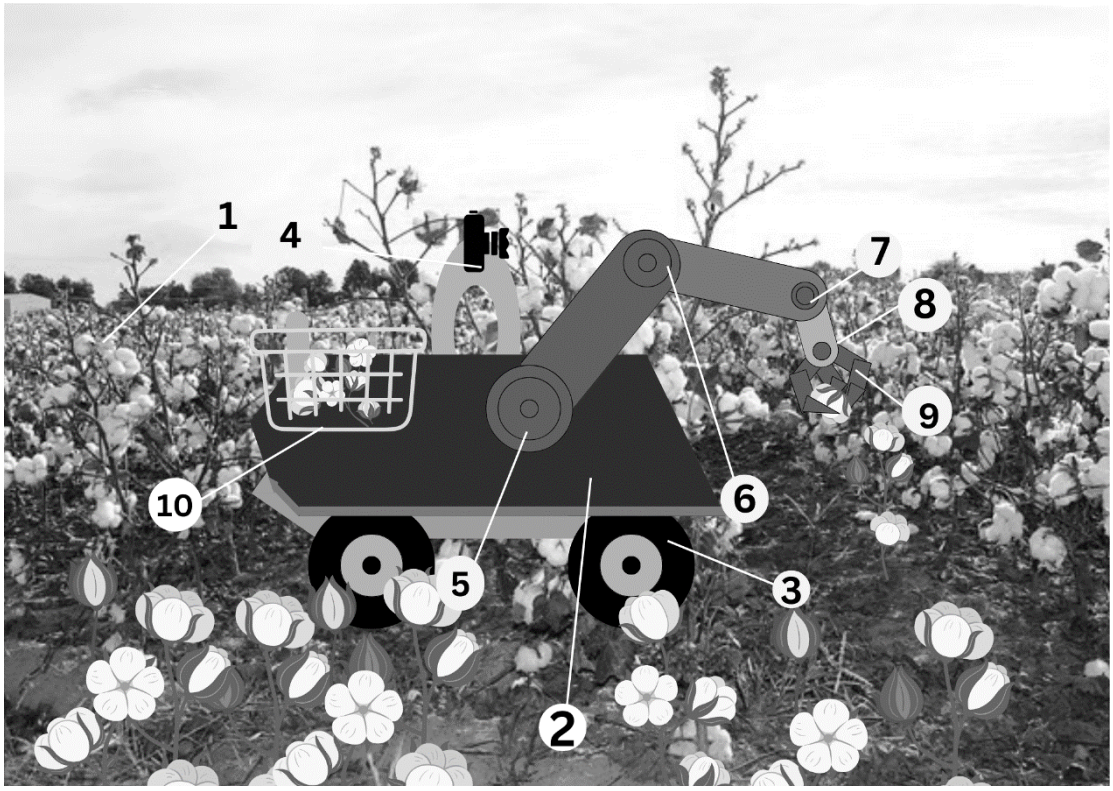
[0016] The autonomous cotton picking rover comprises of a platform that is equipped with wheels for traversal through cotton fields. There is a hand extension that is mounted on the rover capable of reaching and gently plucking mature cotton bolls from plants.

[0017] The rover's cameras and sensors allow it to take detailed pictures of the cotton plants. Computer vision techniques are utilized to process these images in real-time, enabling the identification and differentiation of mature cotton bolls from other plant elements including leaves and stems. The computer vision system precisely identifies mature cotton bolls by analyzing multiple visual cues, such as size, texture, and color.

[0018] The rover's control system determines the best path and location for the hand extension to reach and pluck a mature cotton boll after it has been spotted. Because the hand extension has actuators, it may be used to carefully and precisely remove the cotton boll from the plant.

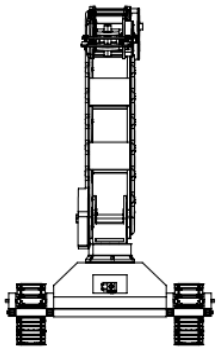
[0019] For effective field coverage while preventing collisions with obstructions, it is configured with established paths and obstacle avoidance algorithms.

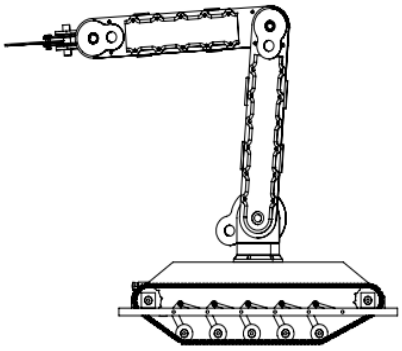
BIEF DESCRIPTION OF THE DRAWINGS

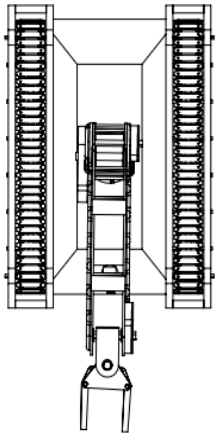


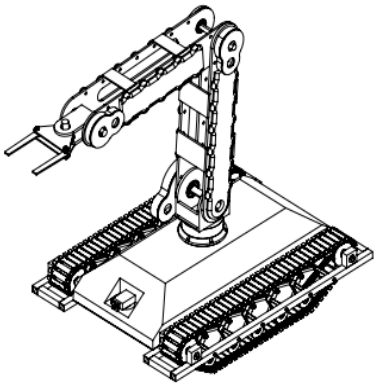
[0020]The image depicts a cotton field (1) with rows of mature cotton plants stretching into the distance.

[0021] In the foreground of the image, an autonomous cotton picking rover (2) is positioned amidst the cotton plants. The rover is a compact, wheeled vehicle (3) with a sturdy frame designed for rough outdoor environments.









[**0022]** Reference is made first to FIG.1. are the different angles in which the rover is being displayed.

Fig 1.1 Shows the schematics of front view of the rover .

Fig 1.2 Shows the schematics of side view of the rover .

Fig 1.3 Shows the schematics of top view of the rover .

Fig .4 Shows the schematics of the side-top view of the rover.

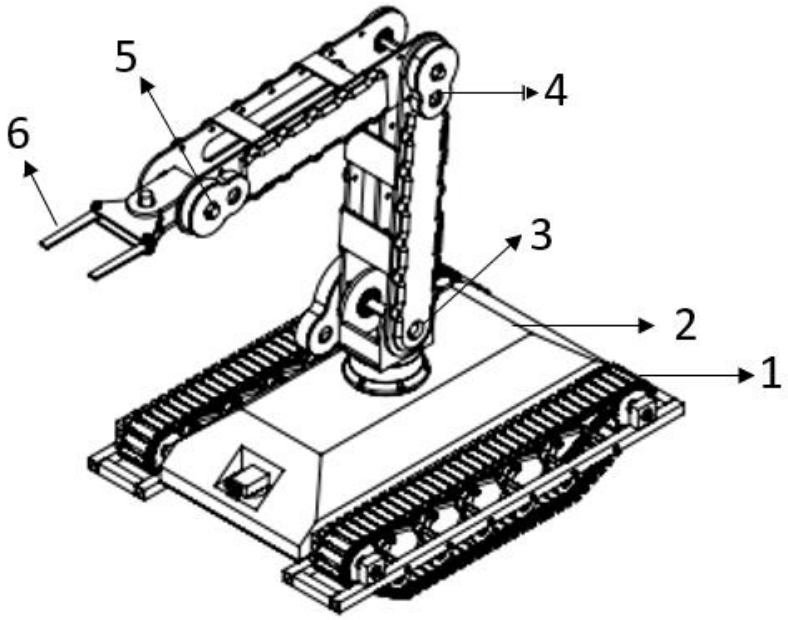


Fig.2

[0023] Fig2. shows the complete clear view of the rover.

[0024] The (1)belt chain underneath helps the rover to navigate through the rough patches of the field without causing any damage to the soil .

[0025] The surface (2) on which the rover arm is mounted supports and provides the solid surface to the arm. The rover's specialized hand extension mechanism is prominently featured, extending outward from the front of the vehicle.

[0026] The hand extension consists of multiple articulated segments(3) (4)(5), allowing it to bend and flex with precision, resembling the movements of a human hand.

[0025] At the end of the hand extension are delicate grippers (6) equipped with soft, rubberized pads designed to gently grasp and pluck ripe cotton bolls from the plants without causing damage.

[0026] At the end of the hand extension, delicate grippers (6) are fixed, equipped with soft, rubberized pads to ensure a gentle touch. These grippers are specifically designed to selectively grasp and pluck ripe cotton bolls from the plants with utmost care, avoiding any damage to the delicate fibers or surrounding vegetation.

We Claims:

1. An autonomous cotton picking rover comprising:

   a. Vehicle designed to move across the terrain of cotton fields.

   b. A custom-designed extension arm mechanism, installed on the mobile platform, is employed to harvest mature cotton bolls from plants.

   c. Cameras and sensors for capturing images of cotton plants,

   d. Computer vision system for processing images and selectively detecting the cotton bolls,

   e. An actuators and grippers for manipulating the hand extension to pluck cotton bolls,

   f. A control system for coordinating the operation of the rover and hand extension, and g. A navigation system for autonomous traversal through cotton fields.

2. The autonomous cotton picking rover of claim 1, wherein the computer vision system analyzes visual cues including color, texture, and size to identify mature cotton bolls.

3. The autonomous cotton picking rover of claim 1, wherein the hand extension mechanism is designed to mimic the precision of human hands without causing damage to the plant.

4. The autonomous cotton picking rover of claim 1, further comprising obstacle avoidance algorithms to navigate through the cotton field while avoiding collisions with obstacles.

ABSTRACT

COMPUTER VISION BASED COTTON PICKING ROVER

The current invention illustrates an autonomous cotton picking rover equipped with and extended hand for selecting the mature cotton bolls from their plants. The rover deploys the cutting edge robotics technology, that has an platform transversing through the cotton fields with precision. Its specialized extended hand, noticeably positioned at the front of the vehicle, comprises of segments that mimic the dexterity of a human hand. At the end of extension there is a grippers with soft rubberized pads, that make soft and delicate plucking possible. Utilizing the computer vision for image processing, the rover identifies and targets mature cotton bolls that ensures the efficient and precise harvesting. This innovative solution aims to revolutionize cotton harvesting practices, offering increased efficiency , reduced labor costs, and improved yield for cotton farmers.