

## Design and Development of Sugarcane Bud Cutting Machine

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**Abstract** - Automation in agriculture is necessary to reduce human efforts as well as human errors. In India sugarcane is a widely cultivated crop. Now day's sugarcane plantation is done using a polybag technique. For this technique proper bud from sugarcane with proper shape is important factor. In this paper we are considering the issue like shape of bud, real time image processing and complete automation for bud cutting. Solution is provided to change the compare capture method of image processing to reduce the requirement of large database.

**Key Words:** Image Processing, Automation, cutter, buds, sugarcane

### 1. INTRODUCTION

Sugarcane planting with traditional method is costly, time-consuming, requires great human force and high volume of sugarcane stalk. Also, the existing manually operated sugarcane bud cutting machines used for bud chipping of sugar cane are unsafe because of risk of injury is too high and need skill and training to operator. However, traditional machines do not have control on cutting location. Sometimes, cut may appear on the bud as well, which results into no germination of the bud and we lose the seed. This paper deals with solutions to overcome this problem.

Probably, the sugarcane bud cutting machine using image processing uses the method in which image sensed by camera is compared with the reference image stored in database. That method required storage space we are using train feature algorithm which gives an efficient result.

### 2. PROPOSED METHODOLOGY

Automation in sugarcane bud cutting machine is implemented using an image processing with the help of MATLAB software. First step to cut the bud from sugarcane is to detect the bud and to do that camera is used. Camera is placed at the top of the sugarcane to capture images continuously. Helical motion is given to sugarcane to rotate and to move in forward direction. This helical motion is provided with the help of wheels attached to the motors and inclined at some angle. Here the friction between sugarcane and a wheel is useful for the forward motion. MATLAB software is used to detect the bud and provide the commands for further task that means whether to stop and cut the bud or to continue rotation of the sugarcane. This command is given to the Arduino to start the motor attached the cutter so that cutter can move and cut the bud if detected. Arduino is working as a mediator between PC i.e. MATLAB and motor driver.

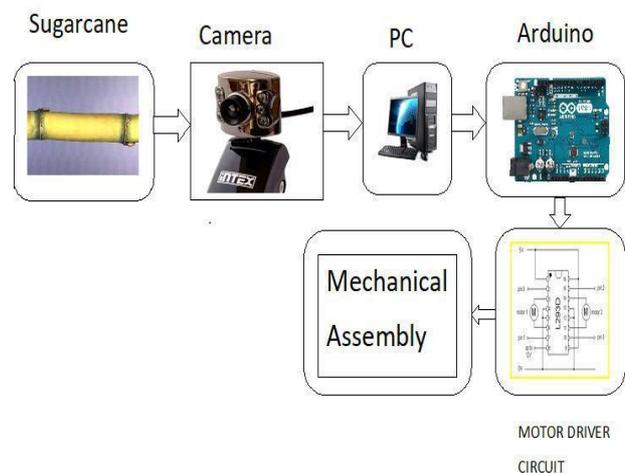


Fig -2.1: Block Diagram

### 3. WORKING PRINCIPLE

The automated sugarcane bud cutting machine is made by using the image processing software (MATLAB) and Arduino as a controller the steps involve in this process is as follows.

1. Motors are given a power supply so that to rotate the wheels.
2. Sugarcane which is placed at the position now starts moving in forward direction in helical pattern when program is start running in MATLAB.
3. MATLAB which is a software used in image processing is going to send a signal to the camera to start capturing the images.
4. The image acquisition is done using the image acquisition tool.
5. Once image is captured the software processes on the captured image and generates signal according to requirement.
6. Generated signal can be positive or negative i.e. bud can be present or cannot be present in captured image.
7. If the bud is present i.e. result is positive signal is send so that motors can stop the rotation and hence the movement of sugarcane is stopped.
8. Motors receives signal from the PC send through the Arduino board which is connected to the PC.

9. The communication between the Arduino and PC is done using UART (universal Asynchronous Receive transmits).
10. Now bud is detected on sugarcane and this bud we want to cut. To cut the bud cutter is placed which is moving in forward and backward direction.
11. Motors are attached to the Arduino board through motor driver module. This motor driver module is used to avoid the damage of Arduino board and to transit the voltage and current directly.
12. Motor diver module circuitry uses a basic IC i.e. L293D.
13. Cutting of Bud should be done in such a way that the sugarcane should not divide in two or more parts.
14. Since we can use the sugarcane for the further process in industry which will decrease the wastage.

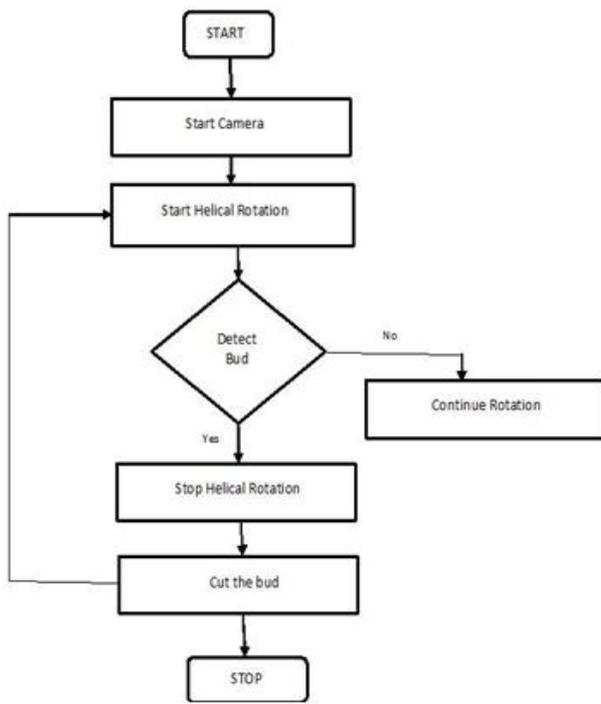


Fig-3.1: Flow chart.

Table -3.1: Working in MATLAB.

Sr. No.	Name of Tool/App	Work
1	Image Acquisition	1) To acquire image. 2) To set ROI position.
2	Image Labeller	1) To crop required portion of sugarcane. 2) Label it as a bud while

		creating positive instances. 3) To extract feature to create .xml file.
3	Instrument control	1) For interfacing Arduino with MATLAB. 2) To give command for driving motors.

#### 4. DISCUSSION

Due to helical motion sugarcane is moving in forward direction along with the rotation. Newly designed machine uses the MATLAB for image processing. Algorithm used to detect the bud from the sugarcane is train feature detector. Train feature detector needs to generate the positive and negative instances for proper detection of bud. To create this instances MATLAB provides a new tool name as image labeller. Image labeller is to create the ROI of image so that the set of these ROI images can create .xml file for positive and negative instances individually.

Steps involved in detection of the bud are as follows,

1. Rotate the sugarcane in helical motion.
2. Start the train feature detector algorithm to find out the position of bud on sugarcane.
3. Stop the movement of sugarcane and start the cutter movement.
4. Cut the bud with sawtooth cutter-drill assembly

#### 5. RESULT

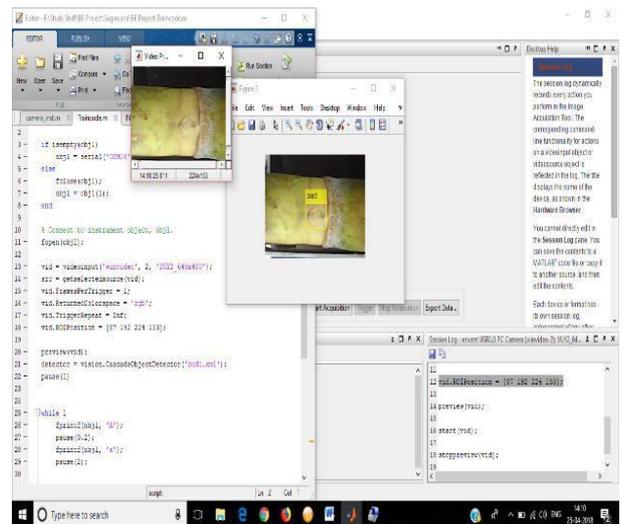


Fig -5.1: Detection of Bud Is Done Using Train Feature Algorithm.

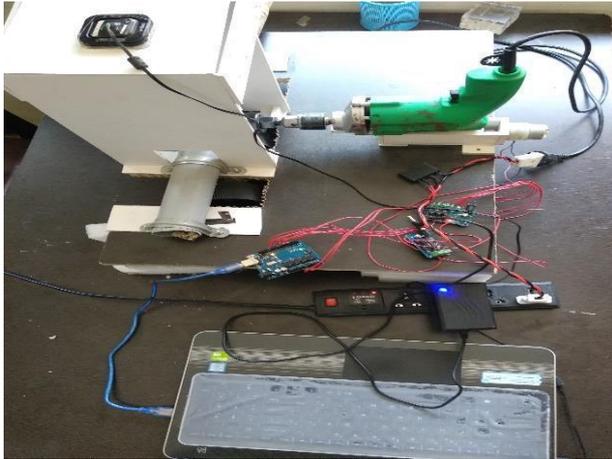


Fig -5.2: Final Model of Sugarcane Cutting Machine.

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Fig -5.3: Cutting Process of Sugarcane.

## 6. CONCLUSIONS

1. The helical motion provides ease in movement of sugarcane in forward and circular direction which helps to capture images of whole sugarcane by camera.
2. Train feature algorithm saves the storage space, and reduces process time.
3. This machine reduces the human efforts.
4. Reduces the wastage due to which productivity of a sugarcane increases.

## REFERENCES

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