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# A Review on Detection of Plastic Mulching Films in Cotton using Hybrid Approaches

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***Abstract* - For removing the plastic mulching films from the cotton, the use of machine vision using the image processing methods is useful. This image processing is basically a specially designed software programs that can run the image in different ways. This paper presents various techniques for detection of plastic mulching films. A Hybrid approach is being used under which different parameters of the image is contributed to identify the error particle in machine vision system.**

***Keywords: Plastic mulching film, Hybrid approach, Machine vision system.***

## 1. INTRODUCTION

Plastic mulching films is usually used for preventing the crop from the atmospheric conditions such as temperature, rain and air. Plastic mulching films is usually 1.1 to 1.5 mils thick, 4 to 6 feet wide, in rolls of 1,000 to 4,000 feet long. And can be either transparent or any colored. The growth of the crop is also dependent on the color of the PMF sheets.

As some of the color benefits will be there as Black are Economical, it provides weed control and warms the soil. White color is the coolest of all colors. White over Black color are cooler then black but yet to be preventing more weed growth than white. Silver over Black color reduces population of certain insects and weed inhibitor too. Clear or say transparent color solarizes soil killing many soil-borne diseases without fumigants. Red color increases yield in certain vegetables.

Color Significant in case of Plastic Mulching Films are as :

**Black-** Most of the used color of plastic mulching films is black. It is having less manufacturing cost. But it is having more grower benefits such as providing heat to the bottom area of the crop via absorption of solar heat. It also provides a barrier to the light towards weed pressure.
**White-** As white color reflects light so it is the coolest color among all the colors i.e. it provides a significantly cooler bed than almost any other color. It is best used in climates that are exceedingly hot.
**Clear / Transparent –** Clear/ Transparent film is mostly used for solarization and solar heat is being used here as it passes directly through the film. The soil is then heated below killing weed spores and bacteria living in the bed.
**White/Black-** It provides the combined benefits of black film and white film all in one product. White color as it provides ample coolness but the underlying black layer still absorbs enough light to inhibit weed growth and it is still a very effective film for hot climates even it is not typically as cool as pure white films.
**Metalized-** Metalized films provide extra light to the plant. It reflect a range of light which can partially deter disease carrying aphids and white flies, Also it has been shown to provide a narrower range of soil temperatures between the heat of the day and the cold of night and It has been proven to have significant barrier properties which will allow a farmer to cut the rate of fumigation used or increase the efficiency of a standard applications.
**Other Colors-** There is a host of other colors that come and go over time. They are typically expensive. Some of these colors have merit in a controlled setting like a laboratory. But still it does not perform well in the field due to discoloration by copper applications, dust and fading, etc.

| Film Color | Benefits | | | |
|---|---|---|---|---|
| | Weed Control | Coolness | Heat | Sterilization |
| Black | Good | Poor | Good | Poor |
| Transparent | Poor | Poor | Good | Good |
| White | Poor | Good | Poor | Poor |
| White-in-Black | Good | Good | Poor | Poor |
| Metalized | Good | Good | Fair | Poor |

Table 1: Benefits of film colors

Basically there are three Methods of Detection of Plastic Mulching Films.

1. **Manual vision method:** It is the earliest and oldest method of detection of plastic mulching films in the cotton. In this a manual detection of film particles are identifying with the workforce and due to this, time consumption and cost of the operation is high [1]. In this manual process, accuracy is very less.

2. **Gravimetric mechanical method:** in this method mechanical machine work is used. A kind of conveyor belt and encoders are used. Cotton containing plastic mulching film is placed on the conveyor and encoder is installed at the shift of the conveyor driven by the belt[1]. Due to high use of mechanical parts, the cost of this method is high and also efficiency of system reduces.

3. **Electro Optical Method:** This method is a combination of software and hardware system. In case of software system we have software such as MATLAB installed on a computer and in case of hardware we have a Camera through which the image of the target is placed in the computer for processing.[1]

4. **Ultrasonic Means Method:** this is a method in which we use ultrasonic waves to detect the plastic mulching films. In this we radiates ultrasonic waves from one end, these waves will pass through the cotton containing mulch films. The waves will block at the place where mulch film presents and left will pass through the cotton. This method is not usually used because these ultrasonic waves are harmful for the health of human beings who are working in that area.

## 2. REVIEW ON DETECTION OF PLASTIC MULCHING FILMS USING HYBRID APPROACH

In Hybrid approach usually have different steps under which firstly detection of unwanted objects then its region identification and then the exact location of the unwanted object are being identified.

### *2.1 Detection of unwanted objects*

During the detection of unwanted objects, different parameters of the object image are being analyzed such as multiscale saliency along with color contrast, edge density and super pixel straddling. After analyzing these parameters, a framework such as Bayesian Framework is applied and higher scored value seems to be the region of unwanted objects. Figure 1 shows the flowchart for detection of unwanted objects.[2]

#### 2.1.1 Multiscale Saliency

This technique will identify the region which looks extraordinary and special appreance. In this section the whole image is being analyzed and the special appearance particles are highlighted [5]. Fourier transform algorithm, spectral residual and guassian filter is being used in this to identify the special appearance particle.

#### 2.1.2 Color Contrast

It will identify the different color area to its surrounding area. In the Target image, we have three different layers such as background layer, cotton layer and unwanted material i.e. PMF layer [10]. Each layer attains separate appearance and this color contrast will distinguish these appearances with the PMF image appearance.

#### 2.1.3 Edge Density

Edge density measures the density of edges near window boundaries. It will identify the pixel drawn on the edges of the image. Also by using the canny edge filter the blurred image is being filtered and then edges of the image are clearer.[8]

#### 2.1.4 Superpixel straddling (SS)

A superpixel straddles window if it contains at least one pixel inside the window and at least one outside the window. Most of the surface of an object window is covered by superpixels contained entirely inside it. Usually it is used to find the range between the outside pixel and the inside pixel. By contrast, most of the surface of a ‘bad’ window is covered by superpixels straddling it. Superpixels can capture the closed boundary characteristics of PMFs and segment that image into small regions of uniform color or texture. PMFs are different in color and texture from cotton fibers and the background.

#### 2.1.5 Bayesian classifier

To combine the four parameters i.e. Multiscale saliency, Color contrast, Edge density and Superpixel straddling, this Bayesian classifier is trained to distinguish between positive and negative values and a natural way to combine the cues is to model them jointly.

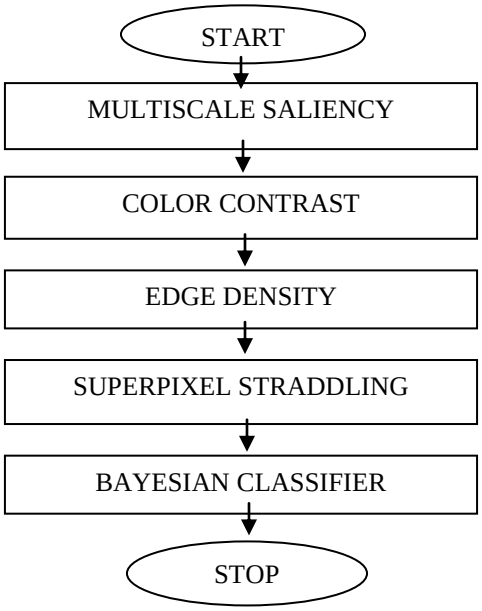


Figure 1: flowchart for detection of unwanted objects.[2]

*2.2 Region enhancement*

The desired behavior of an objectness measure is that a detection window fits tightly to an object so that excess cotton will not be removed. As in an image we have Different potential object areas have various shapes and sizes and these Large and small areas do not fit the size of real objects. Therefore, we must eliminate bad areas. Using this method to binarize potential object areas, we count the percentage of positive pixels in the binary segmentation area.

*2.3 Identification of the best region*

Using the positive percentage results for every potential area, we identify the area with the highest positive percentage: the best region will fall under the maximum true positive percentage over total area. Using this strategy, very large areas can be eliminated and cotton targets (a type of false detection) are removed and most of the PMF areas are left and correct targets can be detected.

## 3. PERFORMANCE PARAMETRES

**1) Time consumption:** The time consumption needed to be less and thesis work are to be done on the basis of time taken to complete the operation. Time taken at different stages will be calculated.

**2). Ease of operation:** The complexities in performing the operation needed to be less and also lesser the complexity, higher the performance of the system.

**3). Performance consistency:** The performance level of the system should be consistent. The consistency of the system by applying the algorithm on the different images needs to be checked.

**4) Speed of Detection:** The speed of detection of the system depends upon the time taken to complete the operation. Lesser the time taken, greater will be the speed of the operation.

## 4. CONCLUSION:

This paper has provided the review of detection of plastic mulching films in the cotton. Researchers till engaged in designing a methodology for detecting plastic mulching films using the hybrid approach under which identification of unwanted objects, image enhancement and then identify the presence of plastic mulching film particles in the cotton. This hybrid approach is having complexity as it is having several stages as which will lead to increase the operation time.

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