A PROJECT REPORT ON

AN APPROACH FOR COUNTING OF BLISTER CARDS WITHIN DRUG PACKAGES

SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY,

PUNE IN THE PARTIAL FULFILLMENT FOR THE AWARD OF THE DEGREE

OF

BACHELOR OF ENGINEERING IN INFORMATION TECHNOLOGY

BY

SHREYA ALOK SINGH	Exam No: B150138563
PRANJAL ANIL WARADE	Exam No: B150138578
APURVA SANJAY PATIL	Exam No: B150138551
MANALI MANOJ SURYAWANSHI	Exam No: B150138567

UNDER THE GUIDANCE OF

PROF. SHILPA MENE

DEPARTMENT OF INFORMATION TECHNOLOGY
K. K. WAGH INSTITUTE OF ENGINEERING EDUCATION & RESEARCH, NASHIK-3 (2020-21)

CERTIFICATE

This is to certify that the project report entitled

AN APPROACH FOR COUNTING BLISTER CARDS WITHIN DRUG PACKAGES.

Submitted by

SHREYA ALOK SINGH	Exam No: B150138563
PRANJAL ANIL WARADE	Exam No: B150138578
APURVA SANJAY PATIL	Exam No: B150138551
MANALI MANOJ SURYAWANSHI	Exam No: B150138567

is a bonafide work carried out by them under the supervision of Prof. Shilpa Mene and it is approved for the partial fulfilment of the requirement of Savitribai Phule Pune University for the award of the Degree of Bachelor of Engineering (Information Technology).

This project report has not been earlier submitted to any other Institute or University for the award of any degree or diploma.

Prof. Shilpa Mene	Prof. Dr. Preeti D. Bhamre
Internal Guide	Head of Department
Department of Information Technology	Department of Information Technology

External Examiner	Prof. Dr. K. N. Nandurkar
Date:	Principal
	K. K. Wagh Institute of Engineering, Education and Reasearch

Date:

Place:

ACKNOWLEDGEMENT

I express my gratitude and appreciation to all those who gave me the possibility to complete this project.

I would like to take this opportunity to express my respect and deep gratitude to our project guide, Prof. Shilpa Mene for giving us all the guidance required for our project. It was indeed our privilege to have worked with her.

I express my genuine regard to the principal of our college Dr. K. N. Nandurkar and head of our department Prof. Dr. P.D. Bhamre for allowing us to proceed with our project and providing access to lab facilities.

I would also like to place on records my sincere thanks to all the staff members of Department of Information Technology for their encouragement and help throughout the project and also thanks to my classmates who have helped us along the way.

Last but not the least we owe our parents for their blessings and motivation.

SHREYA ALOK SINGH (B150138563)
PRANJAL ANIL WARADE (B150138578)
APURVA SANJAY PATIL (B150138551)
MANALI MANOJ SURYAWANSHI (B150138567)

ABSTRACT

Nowadays the intelligent defects and anomalies recognition throughout the supply chain have come to be an integral part of quality control systems, in particular, in the food and pharmaceutical industries. So with the rapid development of technologies, machine vision has been used widely in these industries. The main applications of machine vision in industrial product lines are quality control (QC) and quality assurance (QA). In these industries, quality control (QC) and quality assurance (QA) are the legal requirement in manufacturing processes which can lead to minimizing the total number of defected products as well as maximizing the performance. In this project, the machine vision has been utilized to monitor and control the proper packaging of drugs in pharmaceutical product lines. The main goal is counting the number of blister cards within a drug package. A new model based on edge detection, feature extraction, and classification is proposed to tackle this problem. This model will detect the number of defected drug package having more or less number of blister cards, which will help the manufacturer to discard that particular drug package.

Key Words: Quality Control, Edge Detection, Edge Counting, Blister Counting.

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CHAPTER 1

INTRODUCTION

This chapter introduces the project topic, relevance, aim and objective behind choosing this topic.

1.1 INTRODUCTION TO PROJECT

Quality control (QC) is a set of operations such as measurement or testing which is applied to a product to determine whether its specifications comply with technical standards or not. One of the main duties of a quality control system is to supervise production and in the case of any problem, it should be capable to cease production line and prevent the production of low quality or damaged products. The pharmaceutical products quality has great significance for healthcare services providers, assurance companies, standardization organizations, and patients. Hence its inspection has become more crucial and urgent with increasing attention. In addition, so as to release zero defect QC systems, machine vision systems have emerged as intelligent technologies for visual inspection of various attributes in wide selection industries. A vision-based quality control system for pharmaceutical factories is modelled in this work. To the simplest of our knowledge, there's a couple of works concentrating on counting blister cards within a drug package while occupation a conveyor belt. So we targeted designing and developing such a system based on computer vision techniques. In this paper, drug packages are detected using some object detection algorithms like Canny algorithms. After that features are extracted .In the end, our algorithm would be finalized with classifiers to form a choice about the amount of blisters within a package.

1.2 RELEVANCE

Nowadays the intelligent defects and anomalies recognition throughout the supply chain have come to be an integral part of quality control systems, in particular, in the food and pharmaceutical industries. So with the rapid development of technologies, machine vision

has been used widely in these industries. The main applications of machine vision in industrial product lines are quality control (QC) and quality assurance (QA). In these industries, quality control (QC) and quality assurance (QA) are the legal requirement in manufacturing processes which can lead to minimizing the total number of defected products as well as maximizing the performance.

1.3 PROJECT UNDERTAKEN

1.3.1 Aim of Blister Card Counting

- Our aim is to develop a three-phase Blister cards monitoring system using Machine Vision (Image Processing) kit.
- The main task is to design a quality control system that supervises production procedure to prevent any defect and damage in final goods.

1.3.2 Objective of Blister Card Counting

- To replace existing monitoring systems that have inferior precision.
- To Replace low sensitivity, and require laboratory analysis.

1.4 ORGANIZATION OF REPORT

The following are chapter-wise contents of the report:

Chapter 1: Introduction

Consist of introduction to our system and motivation.

Chapter 2: Background

Consist of brief information about previous system which are implemented for Counting Blister Cards based on Machine Vision.

Chapter 3: Specification

Consists of problem statement and information about the proposed system i.e. the methodology and the software and hardware requirements of our system.

Chapter 4: Design

Consists of system architecture diagram and description and high level diagrams i.e. DFD, use case, sequence and activity diagram of our system and information about the working modules of the project.

Chapter 5: Implementation

Consist of main code of the system also it consist module of the system.

Chapter 6: Result and Evaluation

Chapter 7: Conclusion and future work

In the next Chapter we will study about the background of the proposed system.

CHAPTER 2

BACKGROUND

This chapter shows the various analysis and research made in the field. It helps us to set our goal for analysis. It represents the ground study of the project.

In this project, a replacement model for blister counting within the pharmaceutical assembly line is presented. The main task of a quality control system is to supervise production procedure to prevent any defect and damage in final goods. For designing an efficient machine vision system, every aspect of the procedure from the dataset to the implementation phase should be considered accurate. To generate a proper dataset, in this project several important terms are taken into consideration: intensity and colour of the light source, angle of view, distance, and moving object's speed.

For the task of counting the blister cards within drug packages we need following steps:

2.1 Object Detection

2.2 Feature Extraction

2.3 Classification

2.1 OBJECT DETECTION

The main step of our model is the Object Detection. Object detection algorithms has lot of applications. Generally, Template Matching Algorithm and Haar Cascade Algorithms are used in order to compare detection accuracy but we will be building our own algorithm according to the lead of the project. In this project we are using gausian filter and edge detection library for detecting the object.

2.2 FEATURE EXTRACTION

Obtain the foremost relevant information from the first data and represent that information during a lower dimensionality space is the goal Feature Extraction. Suppose data to an

algorithm is too large to be processed and it is suspected to be redundant (much data, but not much information) then the data is transformed. Feature Extraction is conversion of input data into the set of features. The objective of both Feature Extraction methods is to avoid overfitting of data. In image processing and pattern recognition, feature extraction is a special form of dimensionality reduction. It is expected that the features set will extract the relevant information from the input data, if feature are carefully chosen in order to perform the expected task using Pattern recognition is an emerging field of research within the area of image processing.

2.3 CLASSIFICATION

The purpose of Classification and decision making is to classify features extracted through blister counting algorithm. Through Decision making we will ensure number of blister cards present in package. Objective of classification and decision making is to obtain extracted features into proper classifier and to obtain results. It will also count the number of accepted and rejected Blister cards.

In the next chapter we will see the specifications of the proposed project.

CHAPTER 3
SPECIFICATION

This Chapter tells us about the specifications of the project.

3.1 PROBLEM STATEMENT

An approach for counting of blister cards within drug packages.

3.2 INTRODUCTION

3.2.1 Purpose

The purpose behind the implementation of this system is to replace existing monitoring systems that have inferior precision. Replace low sensitivity and require laboratory analysis. Design a quality control system that supervises production procedure to prevent any defect and damage in final goods.

3.2.2 Intended Audience and Reading Suggestions

This project is a prototype for the counting blister cards within drug packages. This has been implemented under the guidance of college professors. This project is useful for the Pharmaceutical Industries. It reduces the total number of defected products and maximizes the performance. System helps Pharmaceutical Industries to monitor and control the proper packaging of drugs in pharmaceutical product lines.

3.2.3 Product Scope

Future research will focus on improving the current system, for example by differentiating the number of accepted blister cards and number of rejected blister cards.

3.3 OVERALL DESCRIPTION

3.3.1 Product Perspective

The Blister Card Counting System has the following information.

- **Libraries:**

The Blister Card Counting needs following Libraries that need to me installed in order to take the input:

1 skimage for image preprocessing.
2 cv2 for impage processing, video capture and analysis including object detection.
3 numpy for counting the number of edges in blister card.
4 matplotlib for creating plotting area in the figure.

- **Loaded Template:**

The Blister Cards are placed in front of the Camera with steady background and the video is captured, been processed and then the result is generated.

- **Masking and Contour Generation:**

Masking is done and contours are been find using the OpenCV libraries.

3.3.2 Product Function

- **User Module**

User has to keep the blister card on a particular platform with a steady background.

- **System Module**

The System then captures the video, masks the image taken from the video, creates contours for edge detection and then given the result.

3.3.3 User Classes and Characteristics

The person using system has to just place the blister card box on a particular place given and have basic knowledge about the system and its use. This system is specially developed for Pharmaceutical Industries. Other application like counting of products within a package can also use this system.

3.3.4 Operating Environment

Operating Environment for the counting of Blister cards is as listed below:

- Operating System: Windows

- Platform:
- Database: Inbuilt system database is use by the software

3.3.5 User Documentation

The product is under design phase and requires a complete implemented prototype to explain the user documentation. Once the prototype is designed and implemented online manuals, user manuals can be provided.

3.3.6 Assumptions and Dependencies

- The libraries need to be installed in order to run the system.
- The user need to place the blister card in front of the system manually.
- The user need to take away the blister card after the result.

3.4 EXTERNAL INTERFACES REQUIREMENTS

3.4.1 Software Interface

- Operating System:

We have choosen windows operating system for its best support and user friendliness.

- Anaconda IDE:

It is used for developing the blister card application.

3.5 SYSTEM FEATURES

- The main task is to design a quality control system that supervises production procedure to prevent any defect and damage in final goods.
- In this project a replacement model for blister counting within the pharmaceutical production line is presented.
- Objective behind Machine Vision based counting blister cards within drug package is to replace existing monitoring systems that have inferior precision.
- Replace low sensitivity, and require laboratory analysis.

In the next Chapter we will see the system design,workflow and component requirements.

CHAPTER 4

DESIGN

In this chapter we will study about the workflow, component requirements and high level diagrams of project.

4.1 WORKFLOW

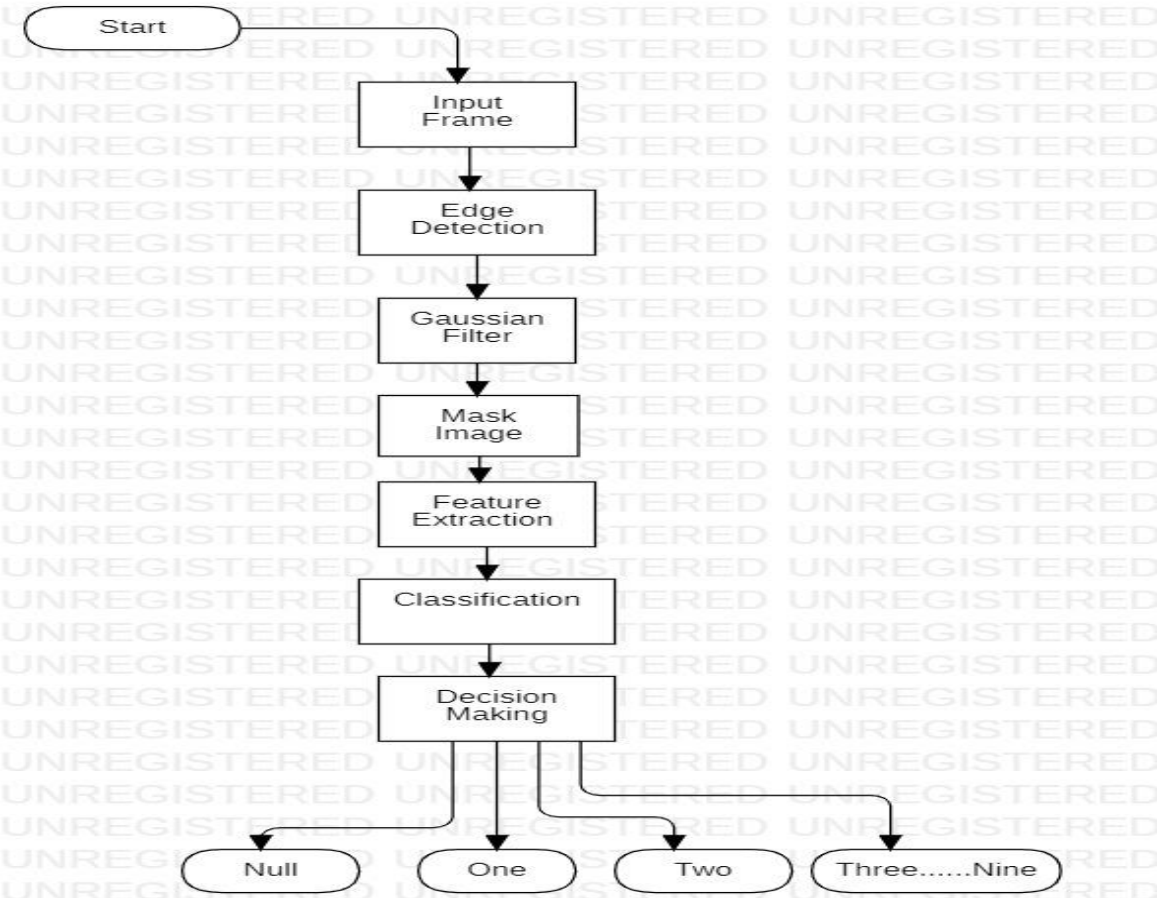

Figure 4.1: Workflow

First the user has to start the system and then check the frame. Then the user has to open the image for training. Then object detection will take place .Then the feature extraction will take place. Area filter will be conducted. Mask the image taken with the template image

for matching the features. Hence the process of classification will take place. After classification the result would be generated showing the blister cards accepted or rejected.

4.2 COMPONENTS REQUIRED

4.2.1 Hardware

- Laptop or any other Camera for Object Detection.

4.2.2 Software

- Anaconda IDE, NumPY, Scipy Libraries, Python Imaging Library (OpenCV).
- OS: Windows 8 and above.

4.3 HIGH LEVEL DESIGN OF THE PROJECT

4.3.1 Data Flow Diagram

Figure 4.1 and 4.2 shows DFD level 0 and DFD level 1. DFD diagram shows the flow of data through an application system. Level 0 contains only one process node that is Blister Card Counting System while level 1 shows how the system is divided into subsystems.

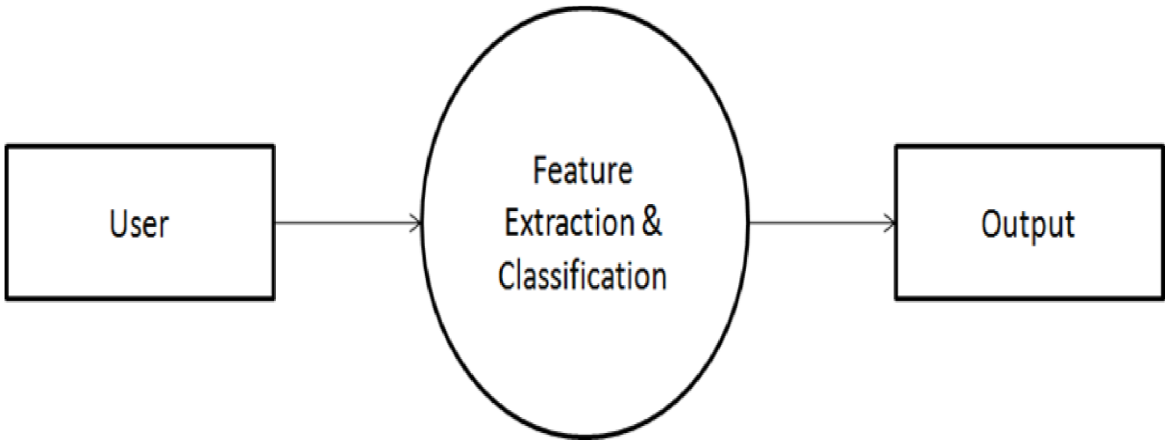

Figure 4.2: DFD Level 0

Diagram 4.2 shows DFD 0 flow of Smart Waste Management System. The features would be extracted and classified and expected output would be displayed.

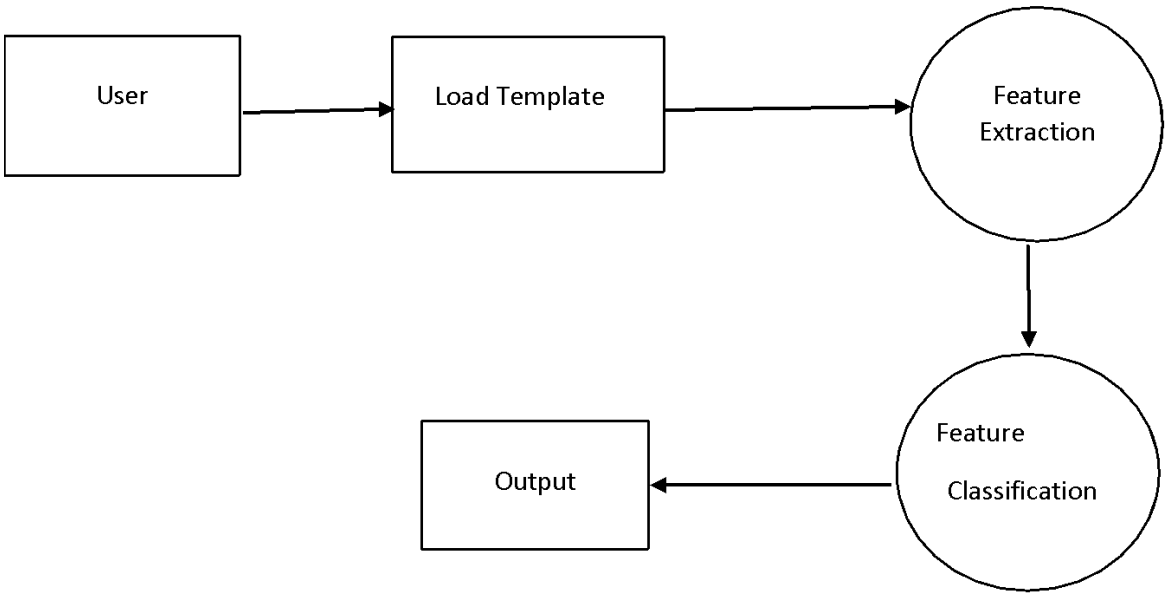

Figure 4.3: DFD Level 1

Diagram 4.3 shows DFD 1 flow of Counting Blister Card System. The user will adjust the frame. Then the features from the image would be extracted and classified and the output would be produced.

4.3.2 Use Case Diagram

The figure 4.4 shows use case diagram of Counting Blister Card System. In the above use case diagram, user and application are identified as actors. The respective functionalities are also identified. User loads the template and adjusts the frame in to the application after which the process of feature extraction and classification takes place.

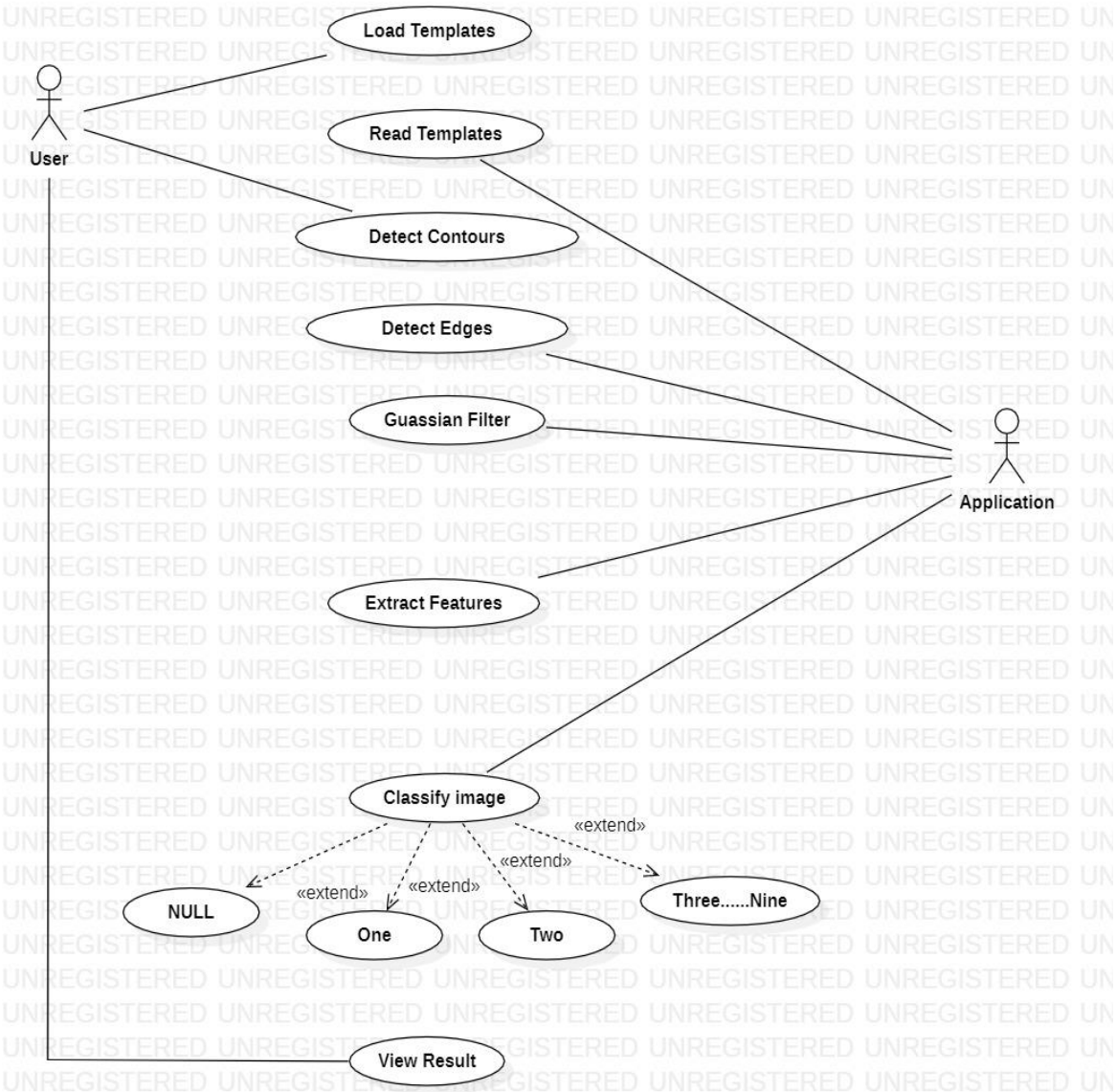

Figure 4.4: Use Case Diagram

4.3.3 Activity Diagram

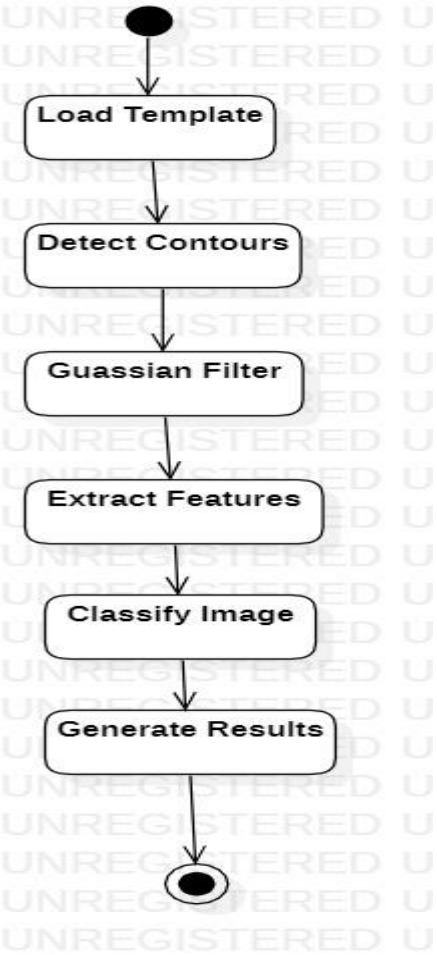

Figure 4.5: Activity Diagram

The fig. 4.5 shows the flow control of Counting Blister Card System. The activity diagram represents the flow of various activities in the system. After the user has load the template in to the system he/she will adjust the frame. Then the gaussian filter will be applied to detect the contours and the edges. Then features would be extracted. Then the image would be compared to check the number of blister cards in the drug package.

4.3.4 Sequence Diagram

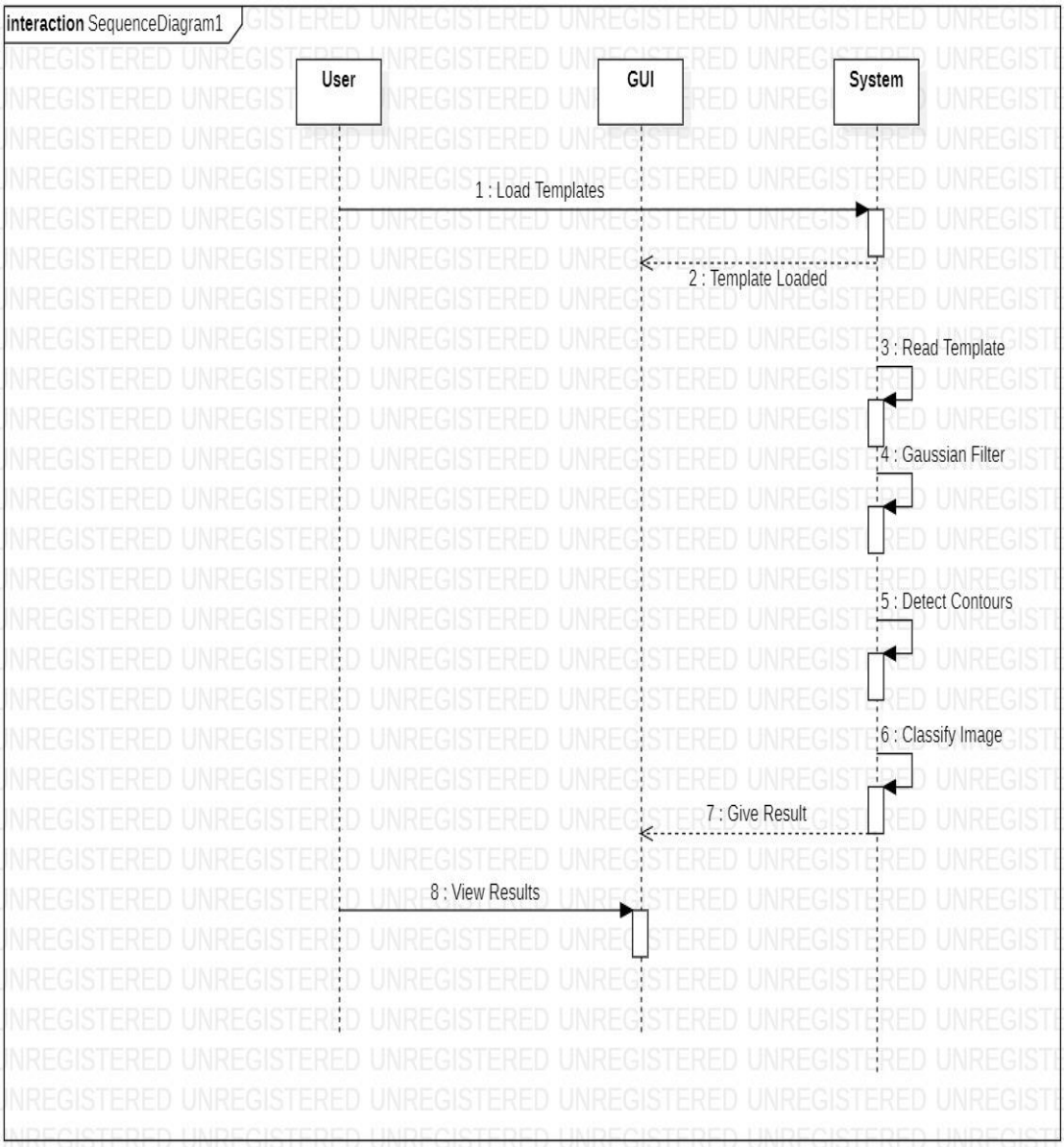

Figure 4.6: Sequence Diagram

Sequence diagram of Counting Blister Card System shows how objects are interacting with each other as shown in fig 4.6. In the above sequence diagram the objects are represented

in rectangles that are User, GUI and System. The messages are shown on the horizontal rows. The vertical line represents the lifeline of each object.

Next Chapter is about how the system will be implemented and the technologies involved.

CHAPTER 5

SYSTEM IMPLEMENTATION

In this chapter we will study about the actual code and flow of the system.

5.1 FLOWCHART

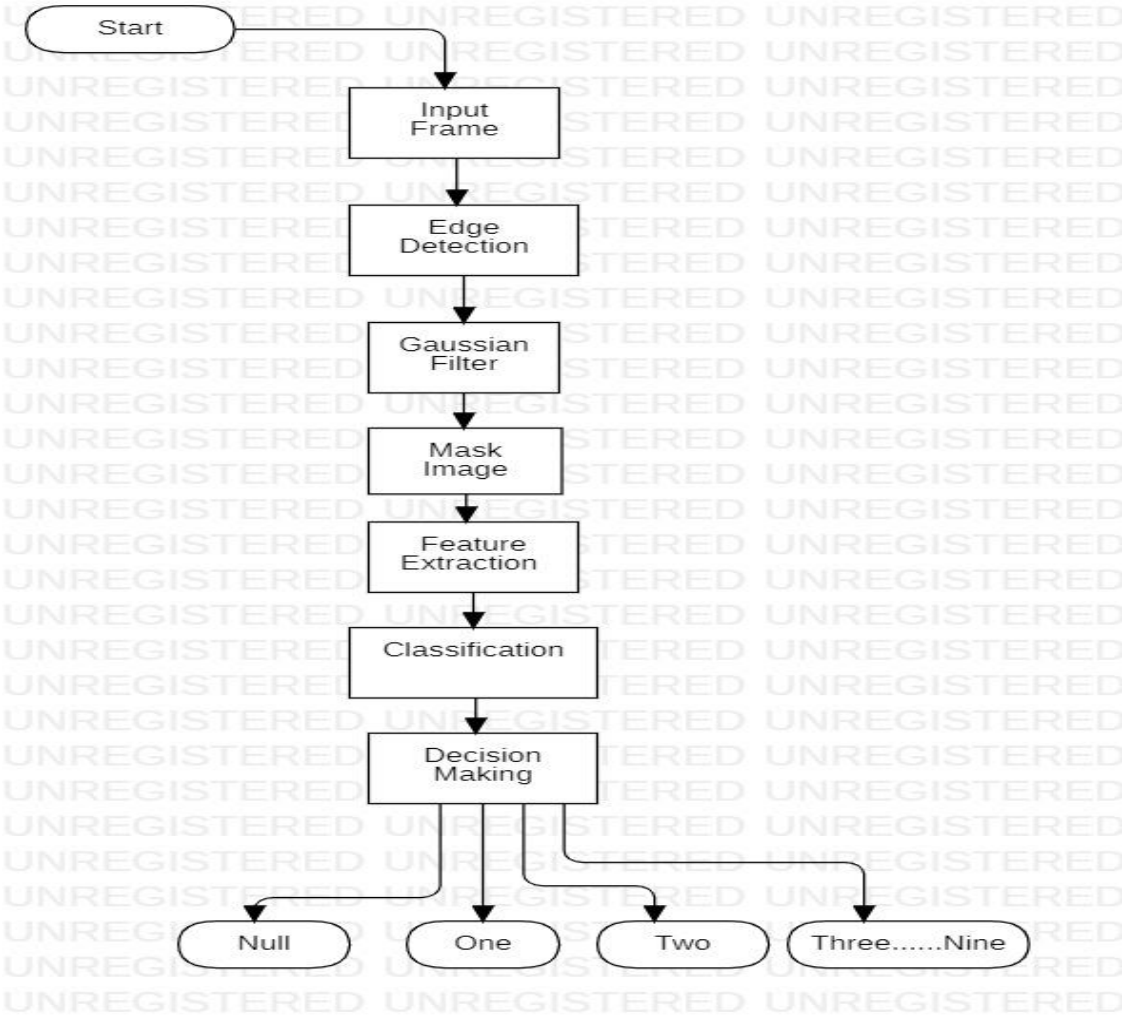

Figure 5.1: Flow Chart

Figure 5.1 shows a flowchart of Counting Blister Card System. First the user has to start the system and then check the frame. Then the user has to adjust the image at a certain angle. Then edge detection will take place. Then the feature extraction will take place. Gaussian filter will be applied. Mask the image taken with the template image for matching the

features. Hence the process of classification will take place. After classification the result would be generated showing the blister cards accepted or rejected.

5.2 CODE

```
import skimage.io as sk
import cv2
import imutils
import numpy as np
import matplotlib.pyplot as plt

cv2.namedWindow('Tbar')
def no(x):
    pass

cv2.createTrackbar('l_h','Tbar',0,179,no)
cv2.createTrackbar('l_s','Tbar',0,255,no)
cv2.createTrackbar('l_v','Tbar',0,255,no)
cv2.createTrackbar('u_h','Tbar',179,179,no)
cv2.createTrackbar('u_s','Tbar',255,255,no)
cv2.createTrackbar('u_v','Tbar',255,255,no)
cap=cv2.VideoCapture(0)
while(1):
    ret,img=cap.read()
    blur = cv2.GaussianBlur(img,(15,15),5)


    hsv=cv2.cvtColor(blur,cv2.COLOR_BGR2HSV)
    lh=cv2.getTrackbarPos('l_h','Tbar')
    ls=cv2.getTrackbarPos('l_s','Tbar')
    lv=cv2.getTrackbarPos('l_v','Tbar')
    uh=cv2.getTrackbarPos('u_h','Tbar')
    us=cv2.getTrackbarPos('u_v','Tbar')
    uv=cv2.getTrackbarPos('u_s','Tbar')

    lower=np.array([lh,ls,lv])
    upper=np.array([uh,us,uv])
    mask=cv2.inRange(hsv,upper,lower)
    result=cv2.bitwise_and(img,img,mask=mask)
```

```
    edge=cv2.Canny(mask,75,200)
    cnts,hierarchy = cv2.findContours(edge, cv2.RETR_LIST, cv2.CHAIN
    _APPROX_SIMPLE)
    nums=int(len(cnts))
    n=nums/10
    n=int(n)
    num=str(n)

    cv2.drawContours(img,cnts,-1,(0,0,255),3)
    cv2.putText(img,"total = "+ num,(10,25),cv2.FONT_HERSHEY_SIMP
    LEX,0.7,(0,0,255),2)

    if num=='3':
        cv2.putText(img,"RIGHT ",(100,125),cv2.FONT_HERSHEY_SIMP
        LEX,4,(0,255,0),2)


    cv2.imshow('og',img)
    cv2.imshow('Detected',result)
    cv2.imshow('Detected1',mask)
    k=cv2.waitKey(30) & 0xff
    if k== 27:
       break

cap.release()
cv2.destroyAllWindows()
```

In the next chapter we will study about the evaluation and results.

CHAPTER 6

EVALUATION AND RESULTS

This chapter gives the brief about the modules of the system and the results.

6.1 WORKING MODULES

6.1.1 2 Blister Card Output

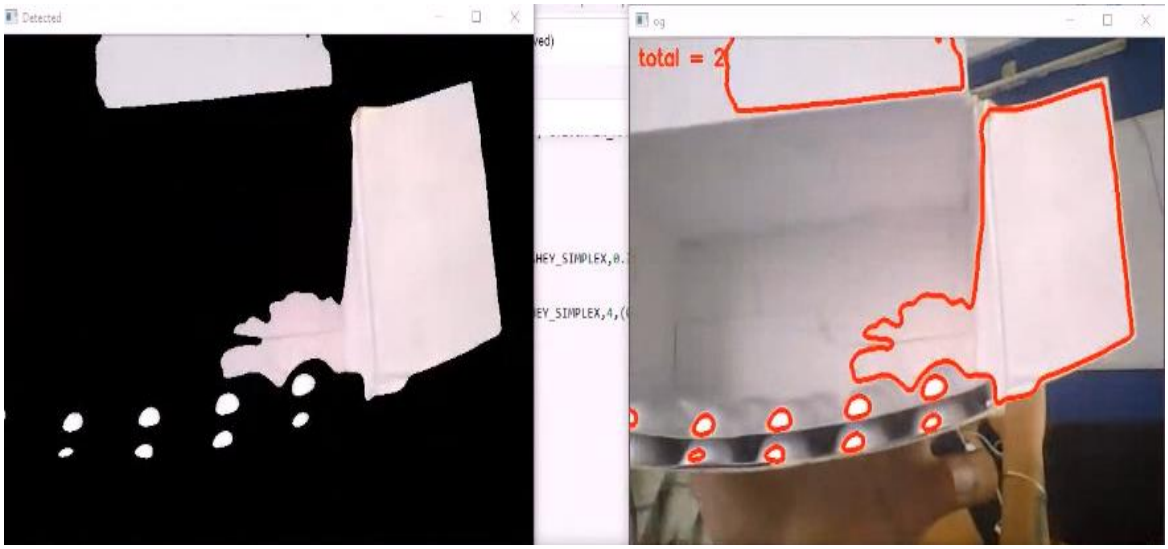

Figure 6.1: Output Showing 2 Blister Cards

Above fig 6.1 shows that when two blister cards are placed in the frame of camera it shows the total number of blister cards as two (total=2). The left side of the fig 6.1 is the masked image and the right one shows the edges which is in red color.

6.1.2 8 Blister Card Output

Below fig 6.2 shows that when eight blister cards are placed in the frame of camera it shows the total number of blister cards as eight (total=8). The left side of the fig 6.2 is the masked image and the right one shows the edges which is in red color.

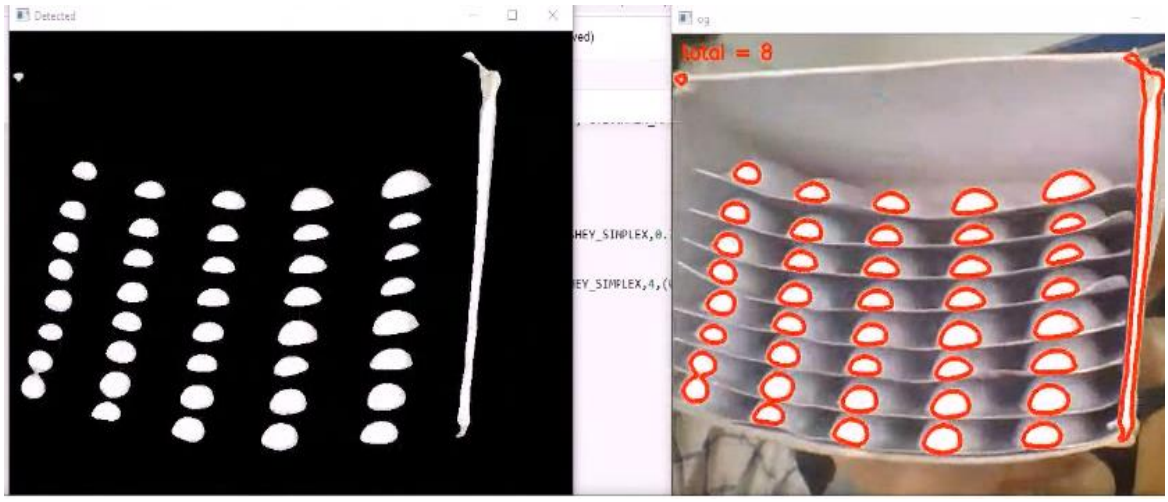

Figure 6.2: Output Showing 8 Blister Cards

6.1.3 9 Blister Card Output

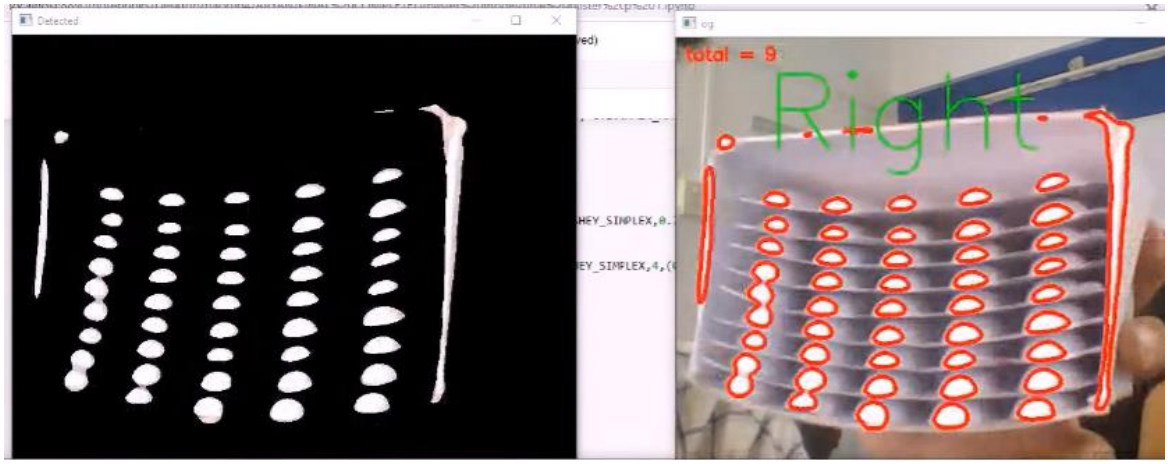

Figure 6.3: Output Showing 9 Blister Cards

Above fig 6.3 shows that when nine blister cards are placed in the frame of camera it shows the total number of blister cards as nine (total=9). The left side of the fig 6.3 is the masked image and the right one shows the edges which is in red color. As the user wants 9 blister cards in one box, the system detects the 9 blister cards and gives the output as right in Green color.

In the next Chapter we will se the conclusion and future work for the project.

CHAPTER 7

CONCLUSION AND FUTURE WORK

The inspection of different elements in packaging systems for a pharmaceutical product is aimed at ensuring that medicines will hand over safely to end users and patients. To the simplest of our knowledge, there's no similar work in the literature that fully concentrated on blister counting in product lines. Therefore, the innovative and new model for blister counting in drug production lines was presented. Our model included the object detection, feature extractions and classifications methods to solve a challenging object counting problem. Ultimately, the total accuracy of more than 90% was obtained.

In future we will be concentrating on increasing its accuracy and classify the number of blister cards as accepted and rejected.

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CHAPTER 1
INTRODUCTION
This chapter introduces the project topic, relevance, aim and objective behind choosing this topic.
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Quality control (QC) is a set of operations such as measurement or testing which is applied to a product to determine whether its specifications comply with technical standards or not. One of the main duties of a quality control system is to supervise production and in the case of any problem, it should be capable to cease production line and prevent the production of low quality or damaged products. The pharmaceutical products quality has great significance for healthcare services providers, assurance companies, standardization organizations, and patients. Hence its inspection has become more crucial and urgent with increasing attention. In addition, so as to release zero defect QC systems, machine vision systems have emerged as intelligent technologies for visual inspection of various attributes in wide selection industries. A vision-based quality control system for pharmaceutical factories is modelled in this work. To the simplest of our knowledge, there's a couple of works concentrating on counting blister cards within a drug package while occupation a conveyor belt. So we targeted designing and developing such a system based on computer vision techniques. In this paper, drug packages are detected using some object detection algorithms like Canny algorithms. After that features are extracted .In the end, our algorithm would be finalized with classifiers to form a choice about the amount of blisters within a package.
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1.3 PROJECT UNDERTAKEN
1.3.1 Aim of Blister Card Counting
• Our aim is to develop a three-phase Blister cards monitoring system using Machine Vision (Image Processing) kit.
• The main task is to design a quality control system that supervises production procedure to prevent any defect and damage in final goods.
• In this project a replacement model for blister counting within the pharmaceutical production line is presented. The proposed algorithm is split into three main steps- object detection, feature extraction, and classification.
1.3.2 Objective of Blister Card Counting
• Objective behind Machine Vision based counting blister cards within drug package is to replace existing monitoring systems that have inferior precision.
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In this project, a replacement model for blister counting within the pharmaceutical assembly line is presented. The main task of a quality control system is to supervise production procedure to prevent any defect and damage in final goods. For designing an efficient machine vision system, every aspect of the procedure from the dataset to the implementation phase should be considered accurate. To generate a proper dataset, in this project several important terms are taken into consideration: intensity and colour of the light source, angle of view, distance, and moving object's speed.

For the task of counting the blister cards within drug packages we need following steps:
2.1 Object Detection
2.2 Feature Extraction
2.3 Classification
2.1 OBJECT DETECTION
The main step of our model is the Object Detection. Object detection algorithms has lot of applications. Generally, Template Matching Algorithm and Haar Cascade Algorithms are used in order to compare detection accuracy but we will be building our own algorithm according to the lead of the project. In this project we are using gausian filter and edge detection library for detecting the object.
2.2 FEATURE EXTRACTION
Obtain the foremost relevant information from the first data and represent that information during a lower dimensionality space is the goal Feature Extraction. Suppose data to an algorithm is too large to be processed and it is suspected to be redundant (much data, but not much information) then the data is transformed. Feature Extraction is conversion of input data into the set of features. The objective of both Feature Extraction methods is to avoid overfitting of data. In image processing and pattern recognition, feature extraction is a special form of dimensionality reduction. It is expected that the features set will extract the relevant information from the input data, if feature are carefully chosen in order to perform the expected task using Pattern recognition is an emerging field of research within the area of image processing.
2.3 CLASSIFICATION
The purpose of Classification and decision making is to classify features extracted through blister counting algorithm. Through Decision making we will ensure number of blister cards present in package. Objective of classification and decision making is to obtain extracted features into proper classifier and to obtain results. It will also count the number of accepted and rejected Blister cards.
In the next chapter we will see the specifications of the proposed project.

Sources	Similarity

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CHAPTER 3
SPECIFICATION
This Chapter tells us about the specifications of the project.
3.1 PROBLEM STATEMENT
An approach for counting of blister cards within drug packages.
3.2 INTRODUCTION
3.2.1 Purpose
The purpose behind the implementation of this system is to replace existing monitoring systems that have inferior precision. Replace low sensitivity and require laboratory analysis. Design a quality control system that supervises production procedure to prevent any defect and damage in final goods.
3.2.2 Intended Audience and Reading Suggestions
This project is a prototype for the counting blister cards within drug packages.Implemented under the guidance of college professors. This project is useful for the Pharmaceutical Industries. It reduces the total number of defected products and maximizes the performance. System helps Pharmaceutical Industries to monitor and control the proper packaging of drugs in pharmaceutical product lines.
3.2.3 Product Scope
Future research will focus on improving the current system, for example by differentiating the number of accepted blister cards and number of rejected blister cards.
3.3 OVERALL DESCRIPTION
3.3.1 Product Perspective
The Blister Card Counting System has the following information.
• Libraries:
The Blister Card Counting needs following Libraries that need to me installed in order to take the input:
1 skimage for image preprocessing.
2 cv2 for impage processing, video capture and analysis including object detection.
3 numpy for counting the number of edges in blister card.
4 matplotlib for creating plotting area in the figure.
• Loaded Template:
The Blister Cards are placed in front of the Camera with steady background and the video is captured, been processed and then the result is generated.
• Masking and Contour Generation:
Masking is done and contours are been find using the OpenCV libraries.
3.3.2 Product Function
• User Module
User has to keep the blister card on a particular platform with a steady background.
• System Module
The System then captures the video, masks the image taken from the video, creates contours for edge detection and then given the result.
3.3.3 User Classes and Characteristics

The person using system has to just place the blister card box on a particular place given and have basic knowledge about the system and its use. This system is specially developed for Pharmaceutical Industries. Other application like counting of products within a package can also use this system.
3.3.4 Operating Environment
Operating Environment for the counting of Blister cards is as listed below:
• Operating System: Windows
• Platform:
• Database: Inbuilt system database is use by the software
3.3.5 User Documentation
The product is under design phase and requires a complete implemented prototype to explain the user documentation. Prototype is designed and implemented online manuals, user manuals are often provided.
3.3.6 Assumptions and Dependencies
• The libraries need to be installed in order to run the system.
• The user need to place the blister card in front of the system manually.
• The user need to take away the blister card after the result.
3.4 EXTERNAL INTERFACES REQUIREMENTS
3.4.1 Software Interface
• Operating System:
The windows operating system for its best support and user friendliness.
• Anaconda IDE:
It is used for developing the blister card application.
3.5 SYSTEM FEATURES
• The main task is to design a quality control system that supervises production procedure to prevent a[illegible]d damage in final goods.
• In this project a replacement model for blister counting within the pharmaceutical production line is
• Objective behind Machine Vision based counting blister cards within drug package is to replace exi[illegible] systems that have inferior precision.
• Replace low sensitivity, and require laboratory analysis.
In the next Chapter we will see the system design,workflow and component requirements.

CHAPTER 4
DESIGN
In this chapter we will study about the workflow, component requirements and high level diagrams of project.
4.1 WORKFLOW
First the user has to start the system and then check the frame. Then the user has to open the image for training. Then object detection will take place .Then the feature extraction will take place. Area filter will be conducted. Mask the image taken with the template image for matching the features. Hence the process of classification will take place. After classification the result would be generated showing the blister cards accepted or rejected.
4.2 COMPONENTS REQUIRED
4.2.1 Hardware
• Laptop or any other Camera for Object Detection.
4.2.2 Software
• Anaconda IDE, NumPY, Scipy Libraries, Python Imaging Library (OpenCV).
• OS: Windows 8 and above.
4.3 HIGH LEVEL DESIGN OF THE PROJECT
4.3.1 Data Flow Diagram
Figure 4.1 and 4.2 shows DFD level 0 and DFD level 1. DFD diagram shows the flow of data through an application system. Level 0 contains only one process node that is Blister Card Counting System while level 1 shows how the system is divided into subsystems.

Figure 4.1: DFD Level 0
Diagram 4.5 shows DFD 0 flow of Smart Waste Management System. The features would be extracted and classified and expected output would be displayed.

Figure 4.2: DFD Level 1
Diagram 4.2 shows DFD 1 flow of Counting Blister Card System. The user will adjust the frame. Then the features from the image would be extracted and classified and the output would be produced.
4.3.2 Use Case Diagram
The figure 4.3 shows use case diagram of Counting Blister Card System. In the above use case diagram, user and application are identified as actors. The respective functionalities are also identified. User loads the template and adjusts the frame in to the application after which the process of feature extraction and classification takes place.

Figure 4.3: Use Case Diagram
4.3.3 Activity Diagram

Figure 4.4: Activity Diagram
The fig. 4.4 shows the flow control of Counting Blister Card System. The activity diagram represents the flow of various activities in the system. After the user has load the template in to the system he/she will adjust the frame. Then the gaussian filter will be applied to detect the contours and the edges. Then features would be extracted. Then the image

would be compared to check the number of blister cards in the drug package.
4.3.4 Sequence Diagram

Figure 4.5: Sequence Diagram
Sequence diagram of Counting Blister Card System shows how objects are interacting with each other as shown in fig 4.5. In the above sequence diagram the objects are represented in rectangles that are User, GUI and System. The messages are shown on the horizontal rows. The vertical line represents the lifeline of each object.
Next Chapter is about how the system will be implemented and the technologies involved.

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CHAPTER 5
SYSTEM IMPLEMENTATION
In this chapter we will study about the actual code and flow of the system.
5.1 FLOWCHART
Figure 5.1: Flow Chart
Figure 5.1 shows a flowchart of Counting Blister Card System. First the user has to start the system and then check the frame. Then the user has to adjust the image at a certain angle. Then edge detection will take place. Then the feature extraction will take place. Gaussian filter will be applied. Mask the image taken with the template image for matching the features. Hence the process of classification will take place. After classification the result would be generated showing the blister cards accepted or rejected.
5.3 CODE
5.3.1 Below code is to count blister cards within drug package

```
import skimage.io as sk
import cv2
import imutils
import numpy as np
import matplotlib.pyplot as plt
cv2.namedWindow('Tbar')
def no(x):
pass
cv2.createTrackbar('l_h','Tbar',0,179,no)
cv2.createTrackbar('l_s','Tbar',0,255,no)
cv2.createTrackbar('l_v','Tbar',0,255,no)
cv2.createTrackbar('u_h','Tbar',179,179,no)
cv2.createTrackbar('u_s','Tbar',255,255,no)
cv2.createTrackbar('u_v','Tbar',255,255,no)
cap=cv2.VideoCapture(0)
while(1):
ret,img=cap.read()
blur = cv2.GaussianBlur(img,(15,15),5)

hsv=cv2.cvtColor(blur,cv2.COLOR_BGR2HSV)
lh=cv2.getTrackbarPos('l_h','Tbar')
ls=cv2.getTrackbarPos('l_s','Tbar')
lv=cv2.getTrackbarPos('l_v','Tbar')
uh=cv2.getTrackbarPos('u_h','Tbar')
us=cv2.getTrackbarPos('u_v','Tbar')
uv=cv2.getTrackbarPos('u_s','Tbar')
```



```
lower=np.array([lh,ls,lv])
upper=np.array([uh,us,uv])
mask=cv2.inRange(hsv,upper,lower)
result=cv2.bitwise_and(img,img,mask=mask)


edge=cv2.Canny(mask,75,200)
cnts,hierarchy = cv2.findContours(edge, cv2.RETR_LIST, cv2.CHAIN
_APPROX_SIMPLE)
nums=int(len(cnts))
n=nums/10
n=int(n)
num=str(n)
cv2.drawContours(img,cnts,-1,(0,0,255),3)
cv2.putText(img,"total = "+ num,(10,25),cv2.FONT_HERSHEY_SIMP
LEX,0.7,(0,0,255),2)
if num=='3':
cv2.putText(img,"RIGHT ",(100,125),cv2.FONT_HERSHEY_SIMP
LEX,4,(0,255,0),2)


cv2.imshow('og',img)
cv2.imshow('Detected',result)
cv2.imshow('Detected1',mask)
k=cv2.waitKey(30) & 0xff
if k== 27:
break

cap.release()
cv2.destroyAllWindows()
```

In the next chapter we will study about the evaluation and results.

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CHAPTER 6
EVALUATION AND RESULTS
This chapter gives the brief about the modules of the system and the results.
6.1 WORKING MODULES
6.1.1 2 Blister Card Output

Figure 6.1: Output Showing 2 Blister Cards
Above fig 6.1 shows that when two blister cards are placed in the frame of camera it shows the total number of blister cards as two (total=2). The left side of the fig 6.1 is the masked image and the right one shows the edges which is in red color.
6.1.2 8 Blister Card Output
Below fig 6.2 shows that when eight blister cards are placed in the frame of camera it shows the total number of blister cards as eight (total=8). The left side of the fig 6.2 is the masked image and the right one shows the edges which is in red color.

Figure 6.2: Output Showing 8 Blister Cards
6.1.3 9 Blister Card Output

Figure 6.3: Output Showing 9 Blister Cards
Above fig 6.3 shows that when nine blister cards are placed in the frame of camera it shows the total number of blister cards as nine (total=9). The left side of the fig 6.3 is the masked image and the right one shows the edges which is in red color. As the user wants 9 blister cards in one box, the system detects the 9 blister cards and gives the output as right in Green color.
In the next Chapter we will se the conclusion and future work for the project.

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CHAPTER 7
CONCLUSION AND FUTURE WORK
The inspection of different elements in packaging systems for a pharmaceutical product is aimed at ensuring that medicines will hand over safely to end users and patients. To the simplest of our knowledge, there's no similar work in the literature that fully concentrated on blister counting in product lines. Therefore, the innovative and new model for blister counting in drug production lines was presented. Our model included the object detection, feature extractions and classifications methods to solve a challenging object counting problem. Ultimately, the total accuracy of more than 90% was obtained.
In future we will be concentrating on increasing its accuracy and classify the number of blister cards as accepted and rejected.