SIDDAGANGA INSTITUTE OF TECHNOLOGY, TUMAKURU-572103
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Booklet Lifting Machine For Scanning Internal Assessment Marks

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Contents

Introduction

- Need of automation
- Converting Physical books into digital form by scanning
- Challenge of storing documents
- Automated lifting and sliding process
- Applications.

Motivation

- Traditional method of scanning by manual flipping.
- Different techniques development in design, specifications, speed and quality.
- Auto Document Feeding (ADF) scanner.
- Designing automatic lifting and scanning machine as the solution to the present problem.

Objectives

- To design a model which can automatically lift, scan and place the answer booklets with less human effort.
- To scan the front sheet of the answer booklet and store the image in the system for future use and send processed images as pdf through mail.
- To send " No Booklet" signal to the controller through the Last Page Detector once the process is completed.

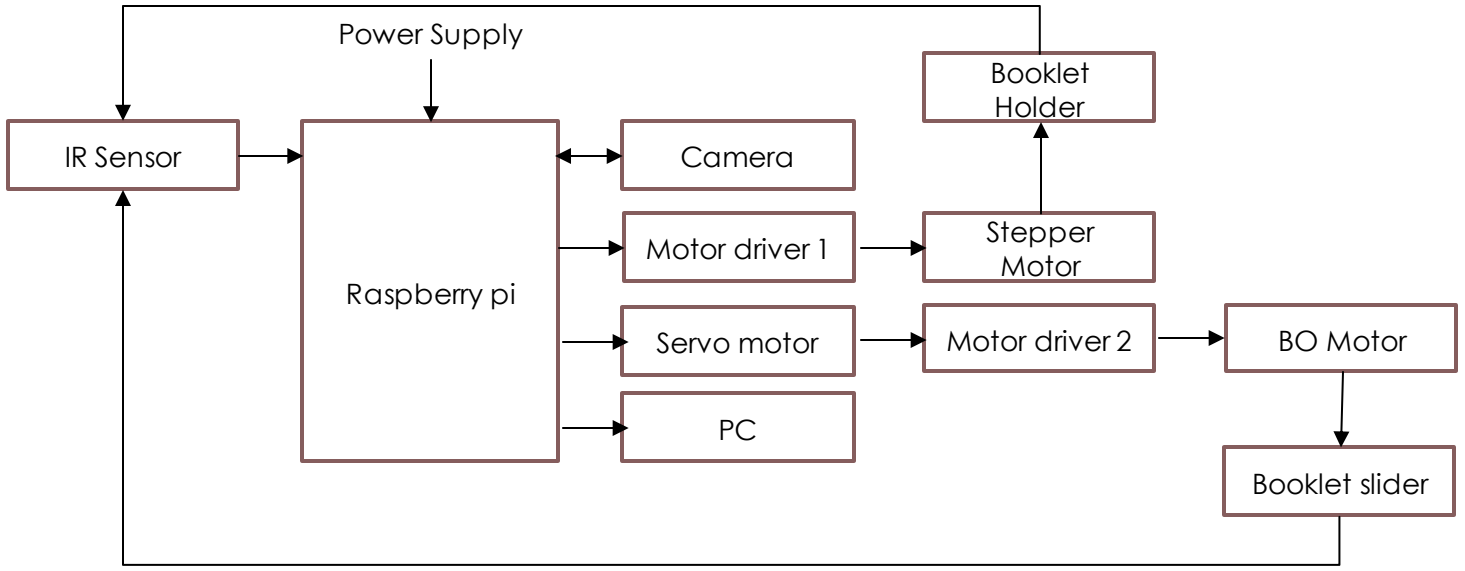
Literature Review

Author	Title of the paper	Key Points
1. Shraddha Ghogare 2. Chetan Mahajan 3. Preeti Mulay	Automation Related to Professor Evaluation	Automation in evaluation
1. Gabor Takacs	Lifting Mechanism	Scissor lifting, Pneumatic lifting, lifting using linear actuator
1. Priyanka Bhanudas Deshmukh	Book Flipping and Scanning Machine Review	Book scanning and flipping, Kirtas APT book scan, Low overhead manipulation of book bound pages, Automatic page turner machine

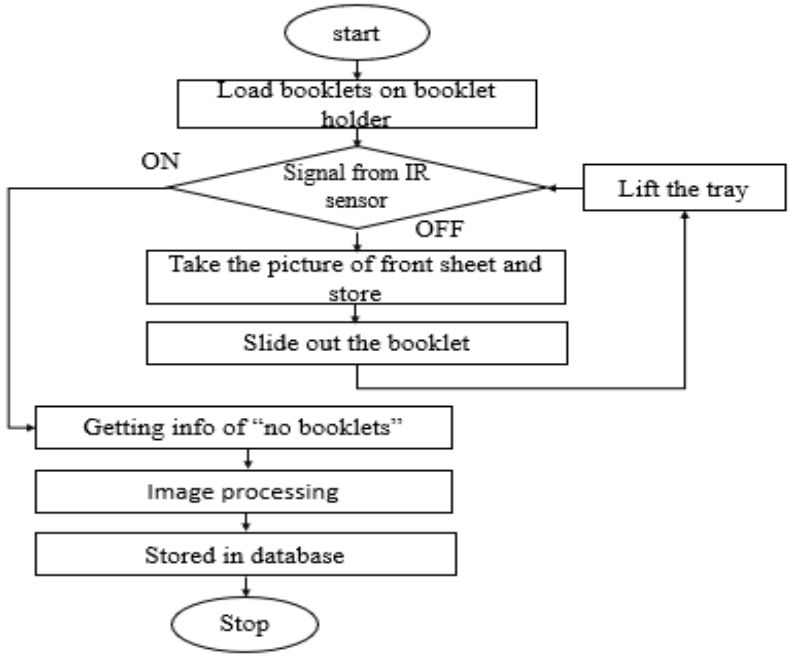
Literature Review (continued …)

Author	Title of the paper	Key points
1. Junseok Lee 2. Wonseok Jeon 3. Youngsu Cha 4. Hyunseok Yang	Automatic Page-Turning Mechanism with Near-Field Electro-adhesive Force for Linearly Correctable Imaging	Destructive type of scanners, non-destructive type of scanners.
1. Moh. Aquib Ansari 2. Diksha Kurchaniya 3. Manish Dixit	A comprehensive analysis of image edge detection technique	Edge detection algorithm

Methodology



Block diagram

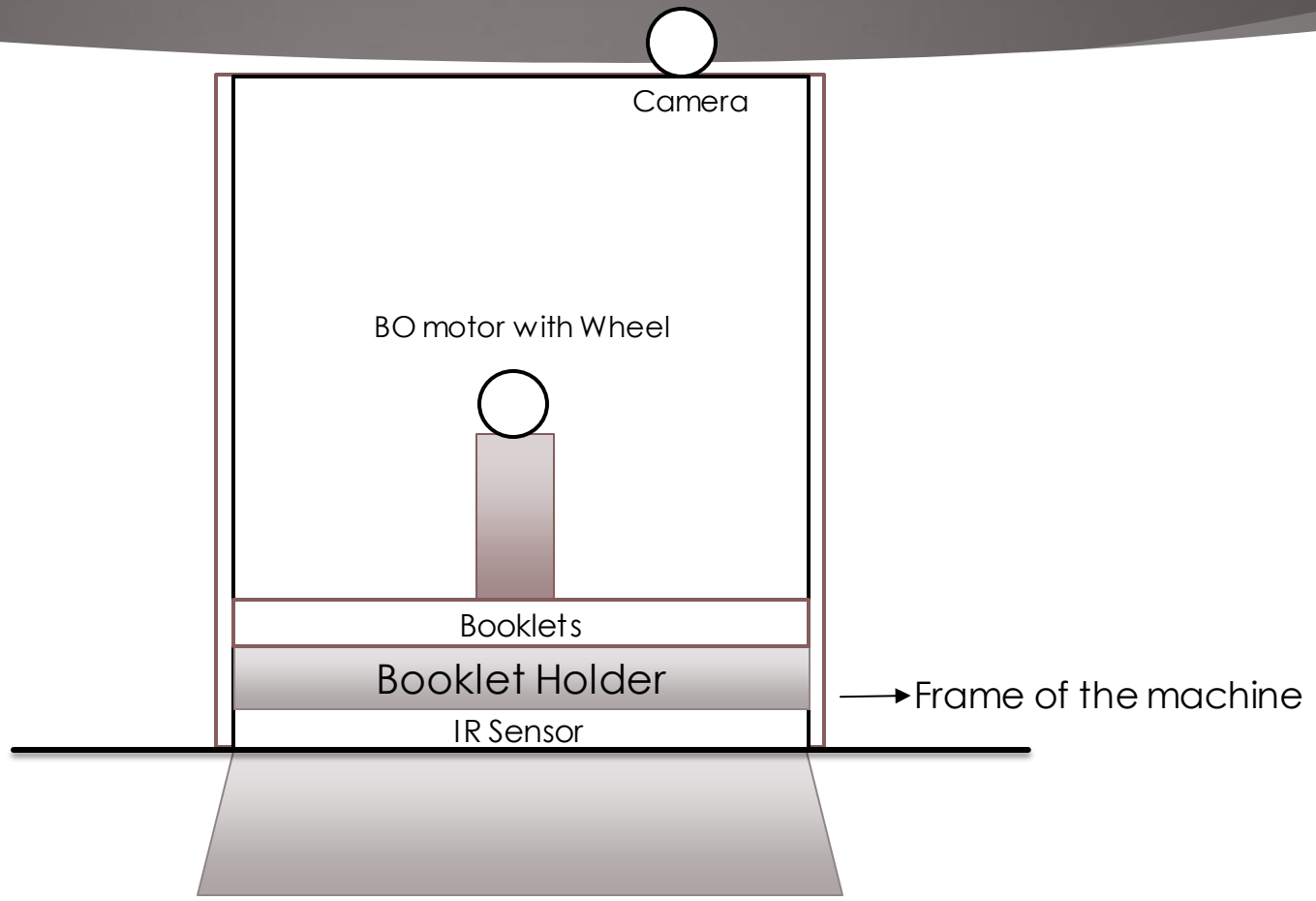


Flowchart

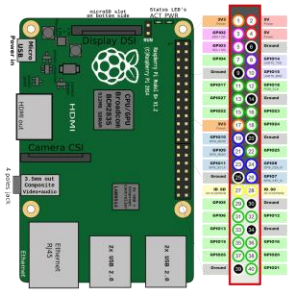
Hardware

Hardware

- Model



Hardware (Continued …)



a

b

c

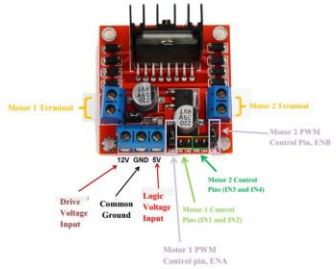
a. Raspberry pi module b. IR Sensor c. Pi camera

Hardware (Continued …)

d

e

f



g

d. MG995 Servo Motor e. BO Motor with wheel f. Stepper Motor g. L298N motor driver

Software

Software

- Raspbian OS
  - Interfacing of the hardware components.
- Python
- Python libraries
  1. Open CV
  2. NumPy
  3. SciPy
- SMTP
- MIME

Software (Continued …)

- Interfacing of all the components

- Modules imported:
  - Picamera – for pi camera
  - Gpiozero - for servo motor
  - Fpdf - for converting into pdf
  - Stmp.lib – for sending mails

Software (Continued …)

- **Image Processing**

- The **Canny edge** detector is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images.

- The pre-requisite for this algorithm is to convert the image to grayscale.

The Canny edge detection algorithm is composed of 5 steps:

- Noise reduction
- Gradient calculation
- Non-maximum suppression
- Double threshold
- Edge Tracking by Hysteresis

- **Pillow library**
- Used to process the edged detected image.
- Filtering of image.
- Supports image resizing and rotation.
- Automatic contrast enhancement.

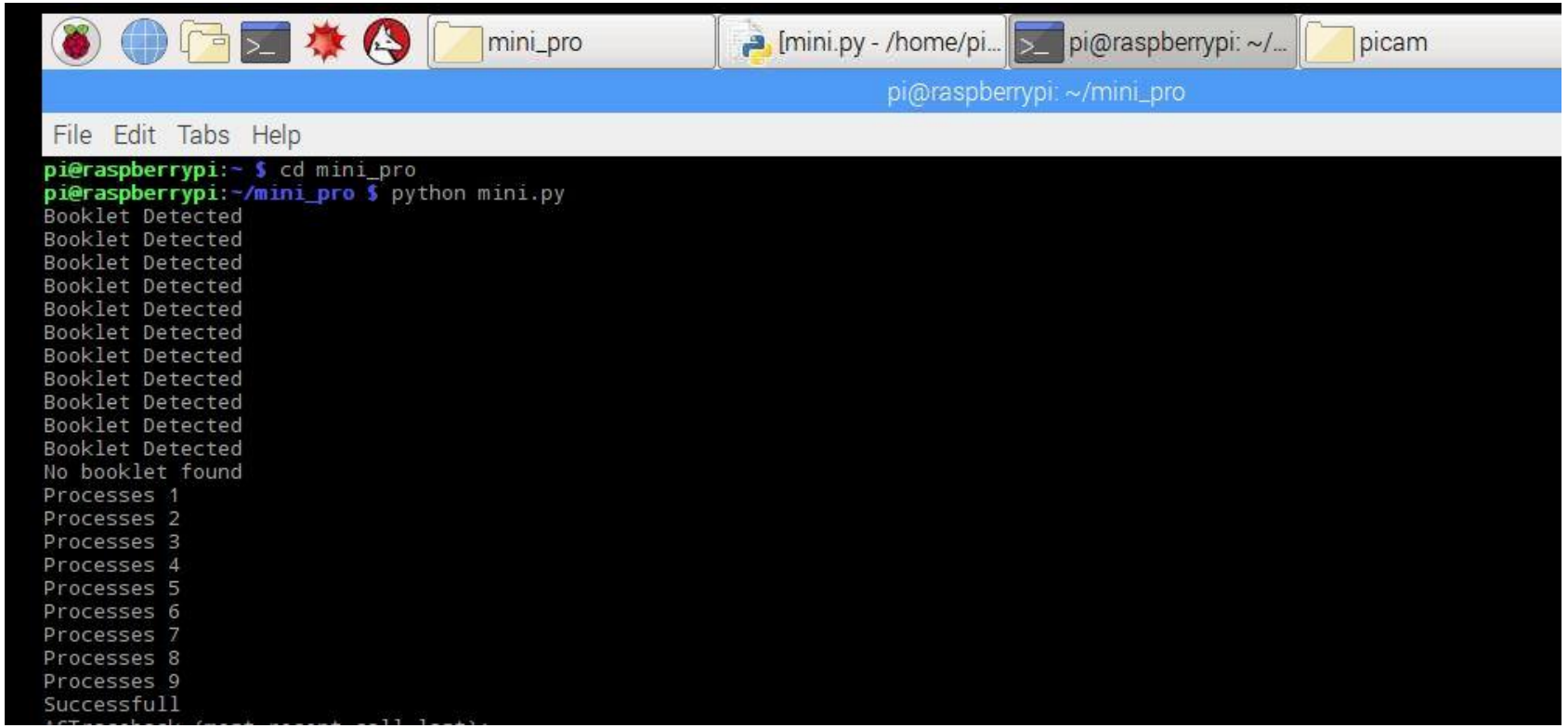
Software (Continued …)

- **SMTP**
  - It is an application layer protocol.
  - This server is always on listening mode.
  - It initiates connection through Port 587.
- **MIME**
  - Used to send binary files or video or audio data.
  - Able to send multiple attachments with a single message.

Experimental Process and Results

DEMO VIDEO

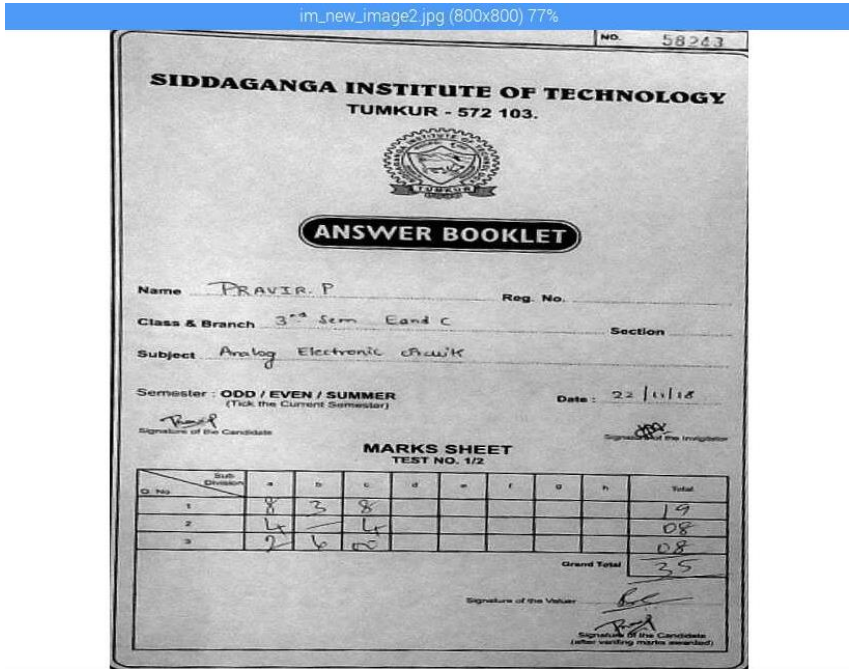
Results



Output of the process

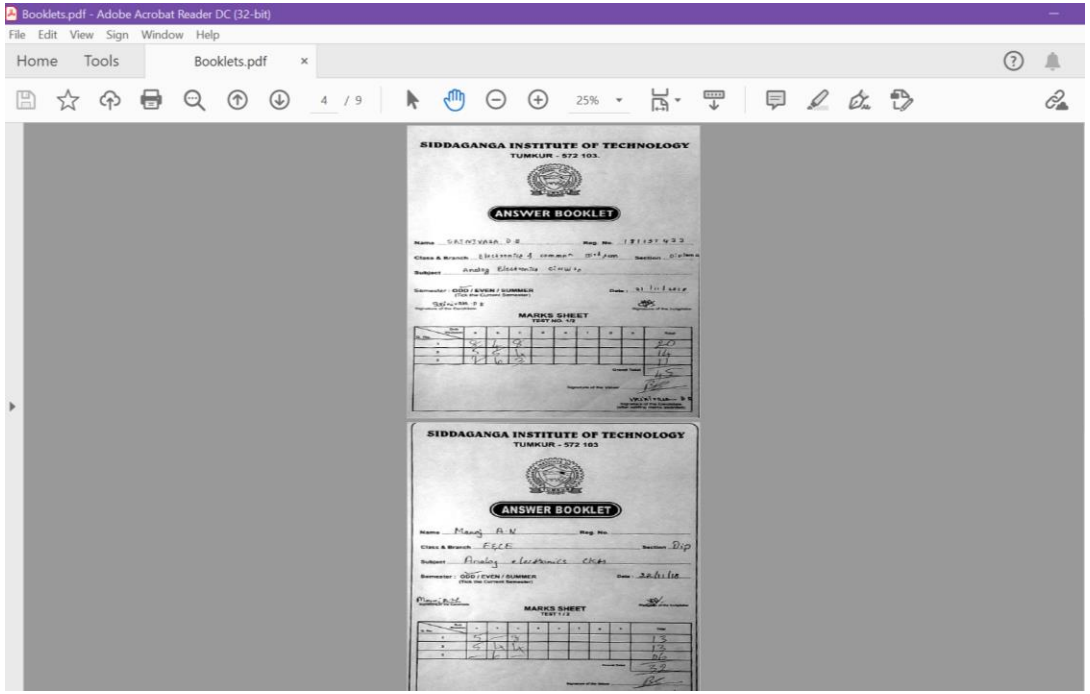
Results (continued ....)

Captured image before image processing

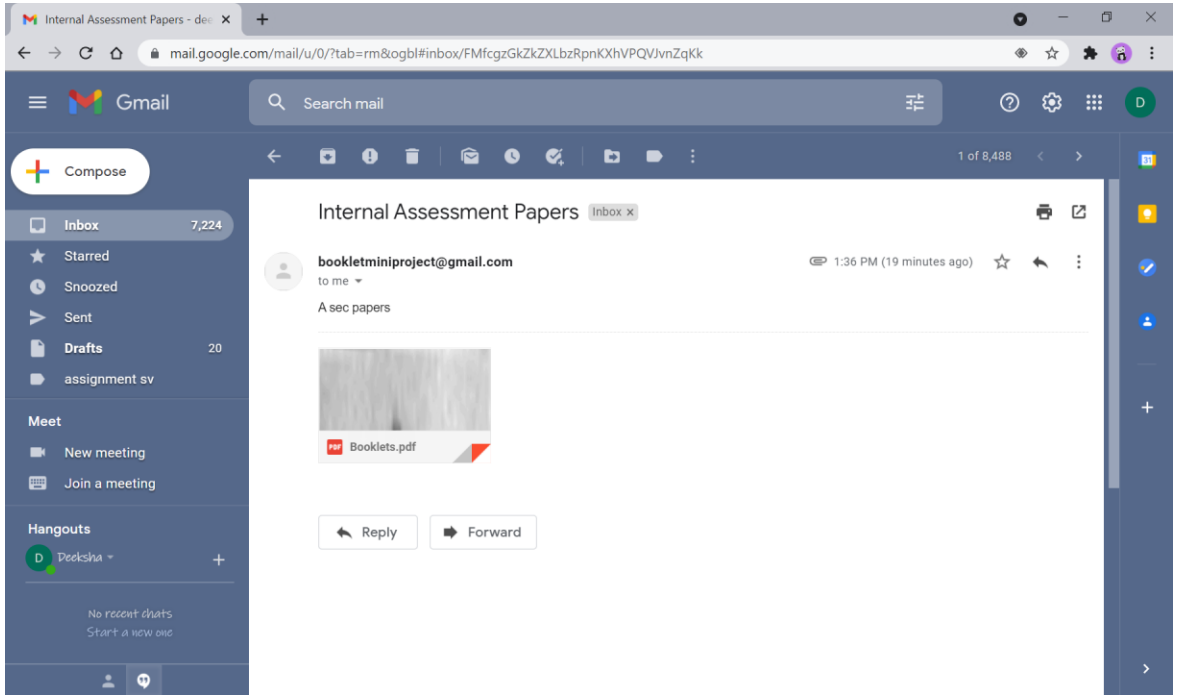


Captured image after image processing

Results (continued ...)



Converting all processed image to pdf



Sending mail

Future Scope

- Extracting characters and digits for automatic evaluation.
- Storing in database.

- To have a completely automatic book lifting machine for scanning and storing the marks obtained in database.

Conclusion

- Booklet lifting machine is thus able to:
  - Scan the front sheet of the internal papers.
  - Automatically slide out the booklets without human effort.
  - Save the processed images in jpg and pdf form.
  - Send the pdf to the mail ids.

References

- [1] S. Ghogare, C. Mahajan and P. Mulay, "Automation related to professor evaluation," *2015 International Conference on Applied and Theoretical Computing and Communication Technology (iCATccT)*, Davangere, India, 2015, pp. 579-582.
- [2] Gabor Takacs, "Lifting Mechanism", ScienceDirect, 2015. <https://www.sciencedirect.com/>
- [3] Priyanka Bhanudas Deshmukh, "Book Flipping and Scanning Machine Review", *International Journal of Latest Trends in Engineering and Technology (IJLTET)*, ISSN: 2278-621X, 2016.
- [4] Junseok Lee, Wonseok Jeon, Youngsu Cha and Hyunseok Yang, "Automatic page-turning mechanism with near-field electroadhesive force for linearly correctable imaging," *2017 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Vancouver, BC, Canada, 2017, pp. 279-285.
- [5] Moh. Aquib Ansari, Diksha Kurchaniya and Manish Dixit "A comprehensive analysis of image edge detection technique", *International Journal of Multimedia and Ubiquitous Engineering Vol.12*, 2017.

Thank You !!!