

# Raspberry Pi Based Image Enhancement in Java Programming

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**Abstract:** Image capturing system with embedded capturing can extract the information from image by using the various techniques. Here the implementation of image processing operation is based on the Raspberry Pi. The choosing embedded base platform of the Raspberry pi is very unique, low cost and easy to implement. The Raspberry Pi board is single, powerful computer having 85.6X56mm Dimension of business card, and it is used to reducing the complexity of system in real time application. This is based on "JAVA" programming. It contains many minor improvement based on user suggestion without increasing price.

**Keyword:** Raspberry pi board, Image capturing, Java, Camera module, Image enhancement algorithm.

## 1. INTRODUCTION

Image processing system is composed finite number of element each of which having particular location .The element are that pixel and it is form of single processing. In image processing, Image acquisition technique is used for transferring an optical image(real world image which is in three dimension) into an array of numerical data which manipulated on computer and usually suffered from undesirable camera shakes. Hence image enhancement algorithms are requiring to remove the camera shake and it improve the quality of image. This concept is implemented on Raspberry Pi .Raspberry Pi board developed in UK by the Raspberry Pi Foundation.

Raspberry Pi board having video core 4GPU support up to 1920X1200 resolution , GPIO header containing 40 pins, Micro USB power port providing 2A current supply ,512MB RAM,. It consist camera slot interfacing, Micro SD card, 10/100 Mbps Ethernet port, 4XUSB 2.0 port,. It secure Micro SD card reader (Model B+) sockets for boot media. This system provides Linux-kernel operating system having Java platform.

## 2. IMAGE PROCESSING MODEL

Basically the Digital Image Processing model is represented in the three stage of Algorithm,

- 1) Input Image (Original Image).
- 2) Processed Image.
- 3) Better image (Output Image).

The Output Image (Better Image) is capture by camera; it sent particular system to focus on Pixel of image that's gives its output as a processed Image.

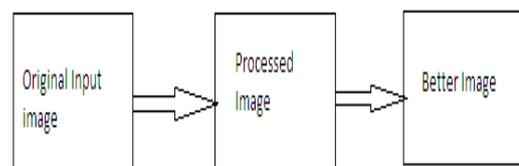


Fig.1 IMAGE PROCESSING MODEL  
Steps for image processing

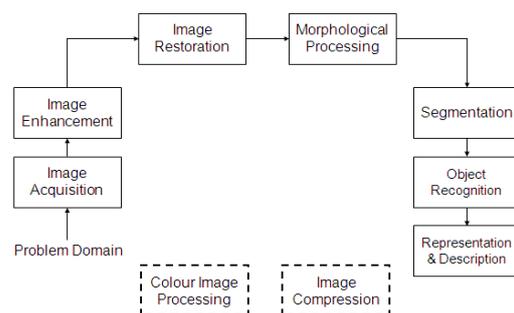


Fig.2 STEPS FOR IMAGE PROCESSING

## 3. HARDWARE DESIGN MODEL

Its main parts include: main processing chip unit, memory, power supply HDMI Out i.e.VGA display, Ethernet port, and USB ports.

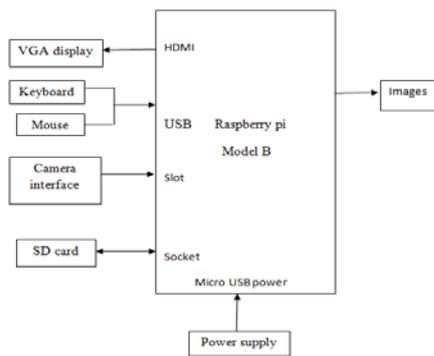


Fig.3 BLOCK DIAGRAM

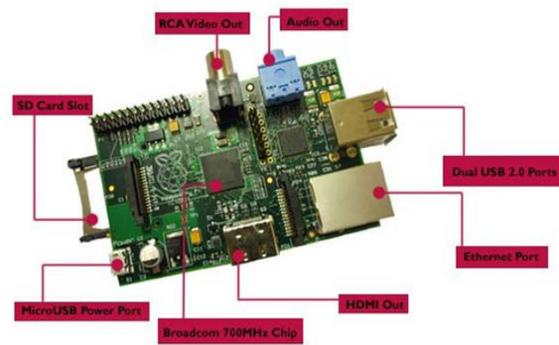


Fig.4 RASPBERRY PI B+ MODEL

### Setting Up of Raspberry Pi equipment

1. Raspberry Pi
2. USB keyboard
3. USB mouse
4. SD card
5. VGA display
6. Power supply
7. Camera module
8. And image processing model.

It is possible to do everything . The real advantage of a model B as far as programming is concerned is the network port. This port will make it easier to connect to the Internet.

### 4. RASPBERRY PI MODEL

Raspberry Pi model is based on Broadcom BCM 2835 system. Its inception began in 2006 and it was finally released on 19 Feb.2012 as 2 model A&B. The latest model B+ was announced in July 2014. In early Feb.2015 next generation Raspberry Pi, Raspberry Pi 2 was released having 1GB RAM and power is 4.0 W. This is very small credit card sized computer. It is basically small PC which provides all the basic function that is provided desktop PC. This board is the central module of the whole embedded image capturing and processing system as given in following figure. Its main parts include: main processing chip, memory, power supply HDMI Out, Ethernet port, USB ports and abundant global interfaces The main signal processing chip used in our system is a Broadcom 700MHz Chip in which CPU core is a 32 bit ARM1176JZF-S RISC processor designed by Advanced RISC Machines.

### 5. CAMERA INTERFACING

In this project we use camera module is RPI NOIR-CAMERA BOARD which is shown in the fig. The camera board attached to the raspberry pi board via a 15 way ribbon cable. This ribbon cable need to be attached to the camera PCB and Raspberry pi itself. On the camera PCB ,the blue packing on the cable should be facing away from the PCB .and on Raspberry pi it should be facing towards the Ethernet net connection. The camera plugs directly into the CSI connector on the Raspberry Pi. It's able to deliver clear 5MP resolution image . The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data to the BCM2835 processor. This camera board which has no infrared filter making it perfect for taking infrared photographs or photographing objects in low light (twilight) conditions. Other features of this camera board are Automatic image control functions ,Programmable controls for frame rate 32 bytes of embedded one time programmable (OTP) memory and Digital video port(DVP) parallel output interface Excellent.



Fig.5 CAMERA INTERFACING ON RASPBERRY PI MODUL

The following commands are used in this operation:

- 1) pwd
- 2) cd Desktop/
- 3) sudo java -jar RaspberryPiImageProcessing.jar

## 6. HARDWARE INTERFACING

This system was composed by following parts:

- 1) An image capturing camera
- 2) Raspberry Pi board to run image recognition programs on it.

This system includes Main processing chip, unit memory, power supply, Ethernet port, USB port. After installing the Operating system to the board, it connect all the hardware component and switch on the power supply. Then it start booting up the board and login the Raspberry Pi .It operate on the LINUX operating system but it mainly work on the PYTHON.

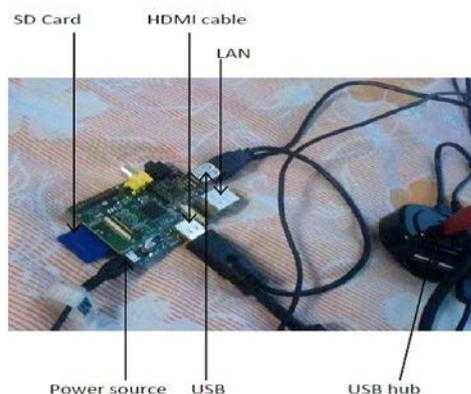


Fig.5 HARDWARE INTERFACING MODE

The following commands are used in hardware starting operation:

- 1) nano image.c
- 2) ls
- 3) gcc image.c -o image
- 4) ./image

## 7. SOFTWARE DESIGN

In this system we use java programming base Linux operating system.

### LINUX OPERATING SYSTEM

It is "Kernel" manage operating system.

- 1) Touch: create a file touch text ".c "
- 2) Is: list the content of the file.  
 Is-1: long format for file listing
- 3) Cp: copy  
 EX. Cp files 1.c, file 2.c.
- 4) rm: delete the file.  
 Ex. rams text.
- 5) mKdir: create new directory.
- 6) sudo/su: change to super user mode.

The directories are present in slash (/).

Example:-cd/home.

Cd/: home directory.

Ls/: what directory present.

Pwd/: current position.

Cdhome/: go to home.

Ls-l: every file indicated.

Ls-la. Called current directory.

Ls-l.. Called parent directory.

cd.. back position.

Compile the file by using the command,

Gcc.c

Vi hollow's: saving the file.

Check output: (. /a. Out)

## 8. RESULTING IMAGE



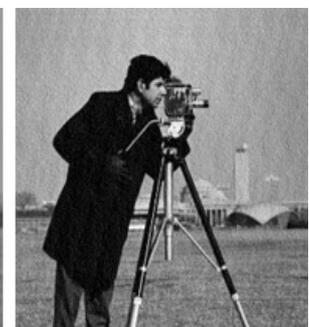
ORIGINAL IMAGE



NOISY IMAGE



NOISE FREE IMAGE



GAUSSIAN FILTERING IMAGE

## 9. CONCLUSION

It's a very unique process for realizing the image capturing system. We describe interesting image capturing process by using Raspberry pi. This is low power consuming process, Resulting that, it find smoother version of image while preserving the edge and structure.

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