Television Based on Smart Box with Gesture Detection

Darpan Patel[1], Arjav Bavarva[2]

PG Student [ES], Dept. of ECE, R.K. University, Rajkot, Gujarat, India[1]

Assistant Professor, Dept. of ECE, R.K. University, Rajkot, Gujarat, India[2]

ABSTRACT: This paper presents algorithms on Smart Box which Is to convert our normal television in to smart television by adding the latest features of the smart television like USB port, Ethernet port, GPIOs, Gesture detection etc. It would also include the camera for capturing the live video and image, and voice recognition like siri. The best acclaimed feature of the smart television is the High Definition, and Also the user can be controlled the video by a gesture detection through camera depending on image processing using python languages. With the help of Smart Box any one can convert a monitor (PC or Laptop screen) in to a normal television screen, with provided operating systems like android, XBMS, RISC, raspbian etc.

KEYWORDS: smart box, gesture detection, siri, image processing, raspbian, python.

I.INTRODUCTION

In the present, technology has become a special choice of the people with the hike of development. In market, Television has become a major industry, especially in the industrialized nations, and a major medium of communication and source of home entertainment. Television is put to varied use in industry, e.g. in surveillance in place inaccessible to or dangerous for human being; in science, in tissue microscopy and in education.Television in India is a huge industry which has thousands of programs in many languages. The small screen has produced numerous celebrities, of whom, some even attaining national fame. More than half of all Indian households own a television.

In the present, smart television has become a most popular for entertainment filed.The price of the smart TVcan afford by high class people but medium class people can't be afford with the price of smart television. They can afford with low cost television as CRT (cathode ray tube) television. After then, I think about that how to make a normal television convert into a smart television and I started searching about television box or smart box.

SMART BOX

Smart Box as raspberry pi modules which is to convert our normal television in to smart television by adding the latest features of the smart television like USB port, Ethernet port, GPIOs, gesture detection etc. It would also include the camera for capturing the live video and image, and voice recognition like siri. The best acclaimed feature of the smart television is the High Definition and to makes as normal television to smart television with its own operating system. Also to adds that all features of smart television which is used into a normal television. Using this Smart Box we would be able to work in our normal television as a desktop PC and include required operating systems like android, XBMS, RISC, raspbian etc.

According to the set up diagram below, you can easily set up your Raspberry pi:

  a. Insert the written-image on SD card from http://www.raspberrypi.org that to the SD card spot on the left side edge of the underside of the board.

  b. On the bottom "edge" in the middle of the board is the HDMI Type A (Full sized) port. Just connect any HDMI to VGA/AV cable from the board to your TV or Monitor and the 3.5 mm stereo headphone jack to the right of it.

  c. Plug a USB keyboard , mouse, camera into the USB slots located on the right edge.

  d. Just under the USB ports on the right edge is the Ethernet connector for anyone who wants to plug the raspberry pi into a wired network.

  e. Finally, at the very left of the bottom edge is the micro-USB power connector. Plug in a regulated power

supply that is rated at 5V ±5% and at least 700mA (or 0.7A). Any number bigger than 700 mA (like 1000mA) will also work up to 1.5 A. Avoid using the smaller chargers used for small GSM phones, as these are often unregulated, even if they claim "5V 1A", they may do "5V" and may do "1A", but not at the same time!
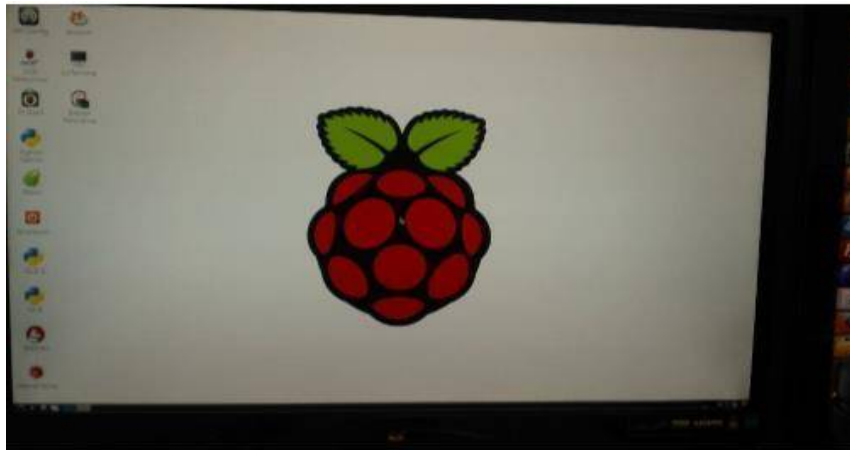

Fig.1 screen of raspberry pi after all completed

f.   If all goes well, the raspberry Pi will boot in a few minutes. The screen will display with the raspbian OS GUI as shown in (fig. 1).

II. CONVERT THE VIDEOS

The videos conversion can be divided into two parts
1. Format conversion
2. Resolution conversion

FORMAT CONVERSION
Simple FFMPEG command tools should take care of most of your media conversionlike as converts an mp4 to flv.
Commands for convert the videos:
"ffmpeg –i input_file_name.mp4 –sameq –strict experimental output_file_name.flv"

Or

"ffmpeg –i input file.mp4 output_file.flv"
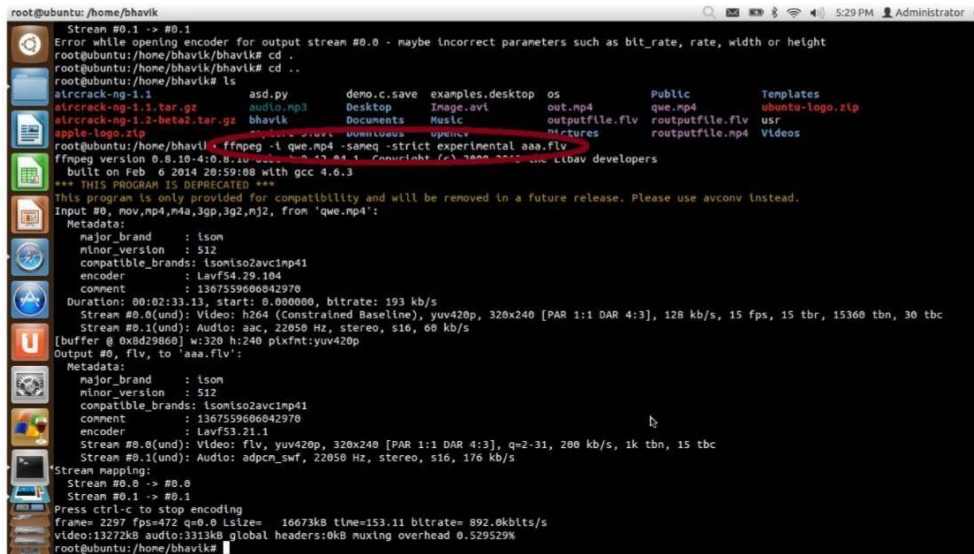
Fig. 2 format conversion

As shown in figure, the format conversion of videos from .mp4 to .flv format instruction and after then how much change in video parameters but using "-sameq" which indicated to no change in videos parameter.
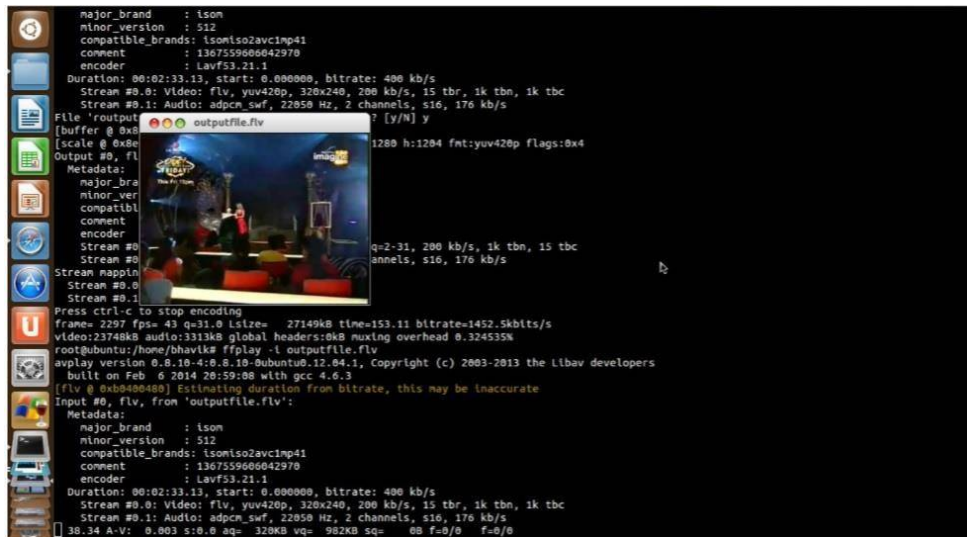
Fig. 3 mp4 to flv. Conversion

As shown in figure 3, the extension file of video is converted from mp4 to flv without change of any parameters.

RESOLUTION CONVERSION
The resolution of output video file we can change the setting of frame size using FFMPEG command tools.

For increase the resolution of video use the command of:
"ffmpeg –t output_file.flv –s 1280x1204 –strict experimental routput_file.flv"
Or
"ffmpeg -i input.avi -vf scale=320:240 output.avi"

Fig.4 resolution conversion

As shown in figure 4, Before this conversion the outputfile.flv file's parameters and size of input video file is 17.1 MB, resolution is 320x240, bitrate is 400kb/s, audio bitrate is 22050 Hz and the fps of video file is 15.

Fig.5 increasing video resolution [4]

As shown in figure 5, after conversion the routputfile.flv's parameter and size of this file is 27.8 MB, resolution is 1280x1204 frames per second are 43 and bitrate is 1452.8 kb/s. Here note that the audio parameter is not change during the conversion.

III. VIDEOS CONTROLS BY GESTURE DETECTION

Gesture detection as possible as through camera interfacing with raspberry pi module with the help of image processing by which I can control the videos as forward, backward, volume increase and decrease and also I moves the image next and previous as swap detection.

The programming of GESTURE DETECTION should be possible by python languages with the help of open CV tools that is used for image processing [5]as shown in figure 6.
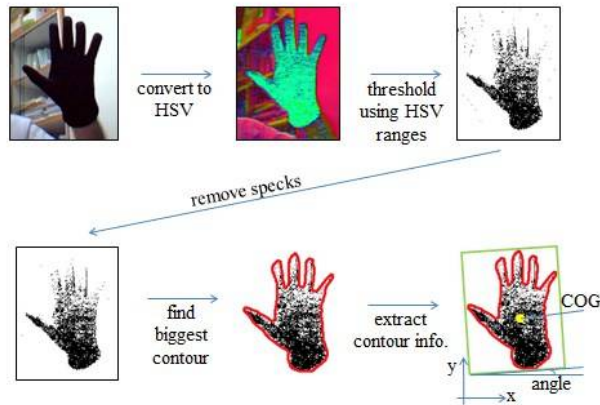
Fig. 6 process of gesture detection [8]

As shown in this figure, The process of gesture detection in which the original RGB figure converts into HSV (hue saturation value) after then converts into thresolding using HSV range and in last find the contour with extract information.
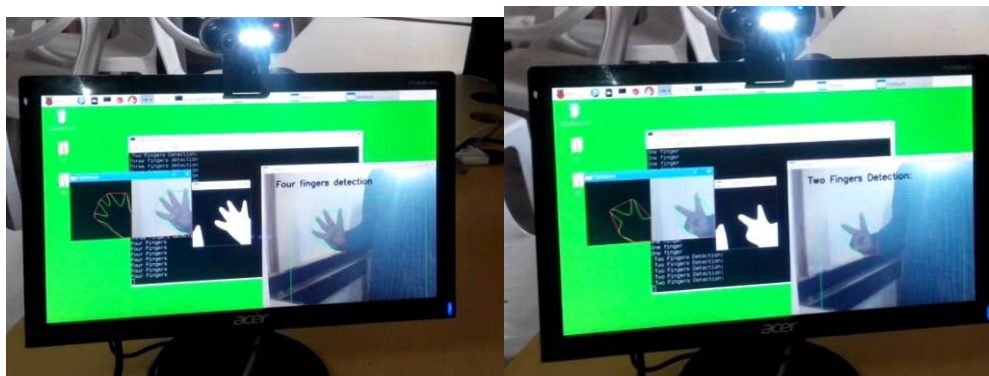
IV. RESULT AND DISCUSSION

Fig. 7 gesture detection (as finger detection)

In this figure, Gesture detection is possible through camera interfacing with raspberry pi module with the help of image processing and how to detect the contour of our hand by RGB to gray-scale, image blurring, thresolding, define the contour of hand and find convex hull and convexity detect as shown in this figure.

The videos controls by gesture detection in which detect for two finger forwards the video, for three finger backward the videos, for four fingers increase the volume and for five fingers decrease the volume. This fingers detection which depends on the contour of two fingers and detects the point between two fingers.In the last all the process are covered by argument parsing which is controlling by arg-parse tools of python languages. By the arg-parse tools, all the videos controls by gesture detection.

V. CONCLUSION

The features of smart television that we are adding in a CRT television to make it a smart TV, requires a special hardware and a dedicated operating system like Linux or Raspbian which in turn requires various packages and plug-ins for the interfacing of different hardware adds such as camera, microphone, etc. The management of these hardware modules and their foreground and background processes puts a considerable load on the OS. The timely output of every processed signal, especially the real-time HD video and audio signal for voice-recognition, will prove crucial for the overall efficiency of the resultant smart TV.

ACKNOWLEDGEMENT

I would like to thank my adviser, Mr Ankit Pitroda, without whose guides this document would have never seen the light. His technical advice was of huge value to me, and, probably just as importantly, his kind encouragement helped me get through many difficult times.

I would also like to special thanks toclem martins from England for help me on element14 community about raspberry pi module audio- video jack connection.

REFERENCES

[1]"Introducing-the-raspberry-pi-model-b-plus-plus-differences-vs-model-b" [online] Available: https://cdn-learn.adafruit.com/downloads/pdf/introducing-the-raspberry-pi-model-b-plus-plus-differences-vs-model-b.pdf

[2] "TV BOX MANUAL" [online] Available: http://www.satechi.net/media/blfa_files/**tv_box_manual**.pdf

[3] "FFMPEG tools" available on: https://ffmpeg.org/ffmpeg.html

[4] "Increase the video resolution by FFMPEG tools" available on: https://trac.ffmpeg.org/wiki/Scaling%20(resizing)%20with%20ffmpeg

[5] "OPEN CV PYTHON TUTORIAL" [online] Available: docs.opencv.org/3.0-beta/doc/py_tutorials/py_tutorials.html

[6] Rafiqul Zaman Khan and Noor Adnan Ibraheem, "HAND GESTURE RECOGNITION: A LITERATURE REVIEW International Journal of Artificial Intelligence & Applications (IJAIA), Vol.3, No.4, July 2012

[7] Siddharth S. Rautaray and Anupam Agrawal, "REAL TIME HAND GESTURE RECOGNITION SYSTEM FOR DYNAMIC APPLICATIONS" International Journal of UbiComp (IJU), Vol.3, No.1, January 2012

[8] "Gesture detection" available on: http://fivedots.coe.psu.ac.th/~ad/jg/nui055/