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Embedded Image Capturing & Digital Converting Process using Raspberry pi System interfacing and Comparision of Generation 2 verses Generation 1 models in Raspberry pi

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Abstract **: The captured image can be digitally processed and give several conclusions. The device interfacing make the process mobile and of utility grade with optimum results. The embedded platform here is unique and easy to implement. The methodology here is capturing an image through a camera module via interfaced with second generation Raspberry pi model named as Raspberry pi 2 Model B and with a defined digital image processing algorithm it get converted to a gray image and to compare result through performance with Raspberry pi 1 Model B+. The device interfacing shows with a definite Raspberry pi model, camera and display screen. Result shows the efficiency and rationality of the developed interfacing of devices with recognized algorithm using the new model of Raspberry pi.**

Keywords : **Raspberry pi 2 Model B, Intex night vision camera, SOC**

1. INTRODUCTION

In today era of digital world there are number of practical implementations and research work are being performed to get rationalism for humanity. There are traditional ways and archaic being utilized even today but with vast resources one wanted to be more meager and secured. Technically, the applications are being performed so that it can be affable both publically and individually. Taking reference of individual security and systems the past is working more on Biometrics and its applications[1]. Since the archaic is of keys, passwords, etc. concentrating more on analog designs. Now efficiency and optimum results are showing better results on digital designs and development, exemplar are digital signatures, image identifications, digital authentications, etc. experimentally. So, today more conveying is on embedded system design and development which is a podium for automations and its versatility. Since embedded system always defined with hardware interfacing with recognized software combinations. Like Arduino boards, Polulu, TI Launchpad etc. are standard embedded platforms which are being used both by beginners and experts. Then single board computers popularly known as SBC came into existence and Raspberry pi models and Intel Galileo are the SBCs which more precise the area of embedded software. Since they are having there own operating systems and based on RISC architectures, profound the area of automation and their core applications. They are being used vastly because of their light weight, compability and portability. They have their wide area of applications because of above specifications i.e. human & animal detection, spying, body detector, etc. through camera module and wi-fi module, home-automation, robotics, & other automated series which shows its real-time analysis working. Since a lot of projects are done with previous Raspberry pi models and in this new incremented model is taken. Here the camera module is interfaced with Raspberry pi 2 model B module with a display monitor through HDMI cable which shows its optimum proof on its specified properties like light-weight, portability & low power consumption with the help of an easy and rationalized algorithm used.

Tools used are normal and widely applied for current applications and python as the main programming language & Linux based operating system, one can use C, JAVA or Perl also.

2. LITERATURE SURVEY

Since there are number of works have been done using raspberry pi models in digital image processing field. Like image capturing technique in an embedded system with Raspberry Pi 1 Model B. Especially the biometric access systems like voice based access, speaker recognition, password key systems, stand alone face recognition system[2], etc. all using Raspberry pi 1 model B or B+. Moreover the face recognition system are worked deeply for the security purpose and surveillance and calculation of different parameters like false rejection rate and false acceptance rate are done as an aspect as non-living things such as smart-cards, plastic cards, PINS, tokens, keys are used for authentication[3]. Hence the performance, random-speed, etc. other parameters are based with respect to the hardware design of Raspberry pi 1 Model B and Raspberry Pi model B+. Also Raspberry pi is known for its versatility and inexpensiveness with respect to display modules[4]. As time passes public utilizes the Raspberry Pi 1 Model B+ as the central module and extract the results.

3. SYSTEM HARDWARE DEVICES AND DESIGNS

The interfaced group is of a SBC i.e. Raspberry pi 2 Model B type for dynamic image recognition process and digital image conversion program. This includes a night vision camera interfaced via USB 2.0 port and a display monitor got interfaced via HDMI output of SBC and also a wi-fi keyboard-mouse as input devices. Now as per the programmer command the whole embedded platform initiates.

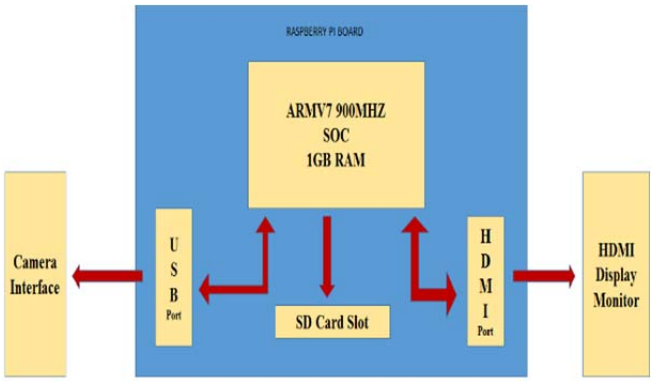

FIGURE 1 : Hardware Design

3.1 RASPBERRY PI BOARD

Here Raspberry pi 2 model B is used which is the second generation of the Raspberry pi replaced by raspberry pi 1 model B+. Model 2 is more technically incremented. The most exited part for this is its interfacing with Microsoft version i.e. this particular model can run Microsoft Windows 10 operating system.

Compared to Model 1 it has a Broadcom BCM2836 900 MHz quad-core ARM Cortex-A7 (~6x performance) including 1 GB LPDDR2 SDRAM (2X memory) combined to form a SOC. Since it has ARMv7 processor, it can run the full range of ARM GNU/Linux distributions like snappy Ubuntu & Windows 10 as stated above. 40 pin GPIO pins, 4 x USB 2.0 ports, HDMI port, Camera display connector, MicroSD port for operating system, MicroUSb power source, VideoCore IV 3D graphics core, etc[5].

For the operating system, here class 10 Sandisk 8 GB card is used with pre-installed NOOBS (New out of Box Software) for Raspberry pi.

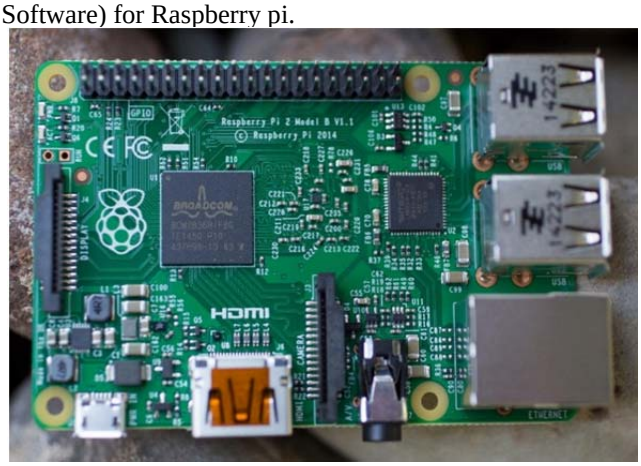

FIGURE 2: Raspberry pi 2 Model B board

3.2 INTERFACES

The SBC used is a mass interfaced module. But here only an Intex – IT 305 WC night vision camera is used (16 Megapixels/30fps/1080 HD recording) which is connected with USB port. A display monitor for recognition is used via HDMI output. A wi-fi communicated keyboard-mouse setup interfaced and finally for power enabling MicroUSB power cable is used. Ethernet port is used for networking for the whole module, though it is optional for this setup.

Figure 3 : Intex Night Vision Camera

4. METHODOLOGY FOR PROCESSING

The system algorithm designed here works in two phase for implementation, one is to capture the real image and creating a database into the memory and second phase is digitally converting it into a gray image and it can be used further data applications. It's depend upon the user. As can be seen Algorithm for digital image conversion is applied by changing the value for red, blue & green values i.e. RGB processing.

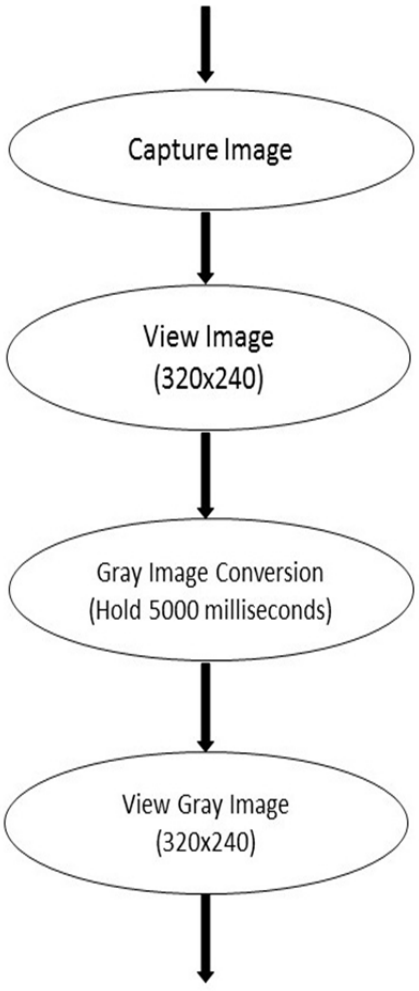

FIGURE 4 : Algorithm for Module Processing

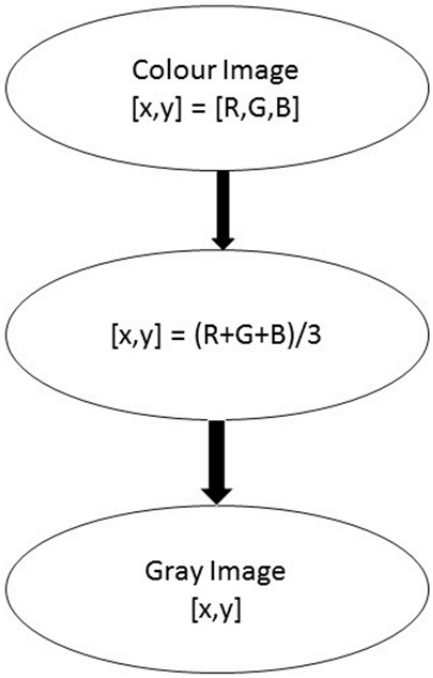

FIGURE 5 : Algorithm for Digital Image Conversion

5. RESULTS

After applying the algorithm in the embedded module the results are optimum as theoretically concluded.

FIGURE 6 : Real Captured Image

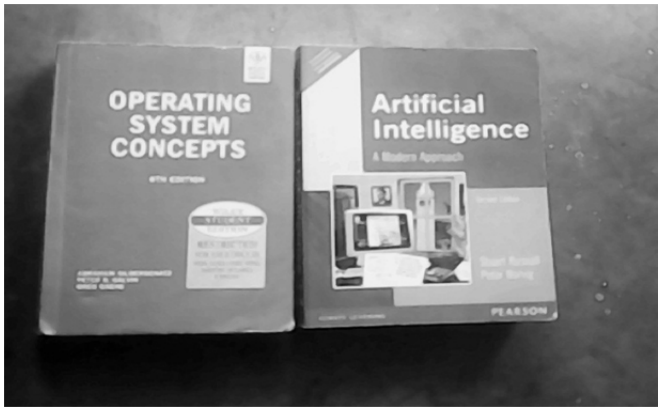

FIGURE 7 : Gray Image Formed

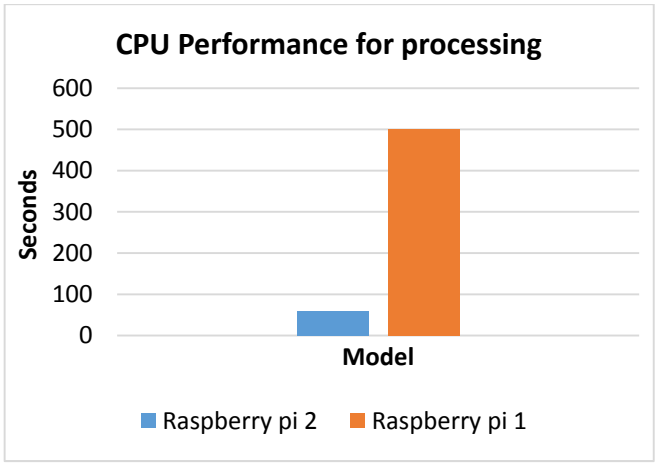

FIGURE 8 : Result 1 Comparison for the Data extracted

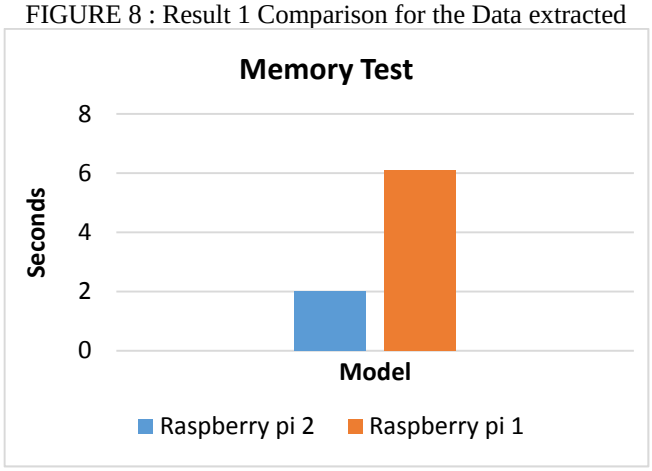

FIGURE 9 : Result 2 Comparison from the Data extracted

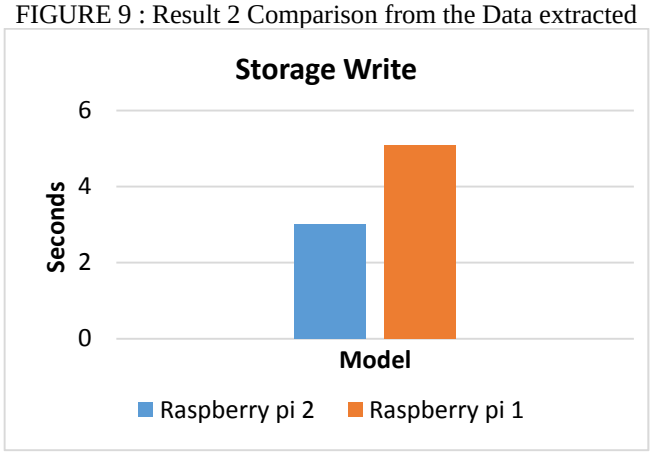

FIGURE 10 : Result 3 Comparison from the Data extracted

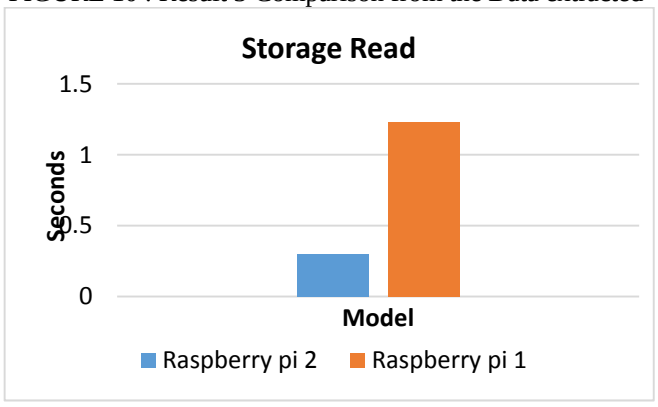

FIGURE 11 : Result 4 Comparison from the Data extracted

The graph shows the comparisons between the Raspberry pi 1 model B+ and Raspberry pi 2 Model B. In each and every case the Model B generation 2 is much faster than Model B+ generation 1[6]. As by the hardware design generation 2 has 4 chips on the SOC with 1 GB of RAM whereas generation 1 has 1 chip on its SOC with only 512 MB of RAM. Hence by the above graph increase rate for the parameters given can be concluded[7].

6. FUTURE WORK

As technology is incrementing the working is precisely on its dimensions and versatility. In the case of embedded systems this is also true. Using SBC like raspberry pi the current project can be modified by a wi-fi module of camera interfacing and it can be used in Home security or any type of public security using Living body detection or spying. Also it can be used in home automation or Advanced robotics like UAV machines or Swarm Robotics. If we talk for the robotics using automaton, technology prolific on Artificial Intelligence and the research projects are being worked on this. The authors are working on GPS, anti-car lock system, Instant car breaking system, Arducopters using SBCs. Also some profound applications can be implemented using interfacing of Raspberry pi and Arduino UNO board like sensor application of smartcard swapping, finger detection, alcohol detection, agriculture humidity sensing, Temperature sensing using web server, and many more.

7. CONCLUSION

This paper gets a rational result while on practical applied. This is economical and technically more smart than while performing the image interfacing system on a Personal Computer. Since the contents are light weighted, lower power consumption and efficient. Also use of open source software like Linux make it more efficient and software can download freely. Experimentally, in the case of embedded image system it is easy to perform and is effective in the case of using Raspberry pi as the central module for getting optimum results. Also it shows why generation 2 model is more effective than generation 1 and its being a smart to buy a model with more specifications if the economic cost have very less amount of difference.

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