Digital Electronic Portrait Archive and Display System

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Abstract

Photos either portrait or full pictures serve different functions which include but not limited to hark back to events; remember personalities, etc. The collection of photos is popularly referring to as photo album. The creation of photo albums is mainly to keep record of event and attached to photos. Portrait photos collections are currently been used as indication of occupants of offices within a particular period of time and in such case the number increases as the number of occupants of the office increases. This work is focused on design of an electronic digital portrait in the form of a slideshow whereby multiple images can be displayed in a single frame we use a Raspberry Pi 3 motherboard technology with some of it features related to the design connected to an LCD monitor via a HDMI interface. The components were interfaced using phase testing approach and the output was packaged hanging and displaying of stored portrait.

Keywords: Raspberry Pi3, Digital Portrait, electronic portrait, photo frame, photo album.

Introduction

Among function of the picture are means of identification and memory [1]. A photo archive or a picture frame is an enhancing border for photo, to mark it easier for put on show or safeguard over a lengthy time, people have been printing physical photo for display at homes/offices using these frames which they arrange in various shapes and sizes. Photos being taken with digital camera are usually stored in a photo archive it is to be noted that these photo frames have their setbacks as they can only accommodate a photo or two per frame [2-4]. Digital picture edge is basically a small LCD monitor designed to stare as unoriginal picture edge. Majority of digital photo edges can be in portrait or landscape and showcase as slide of its content [5].

This work is focused on designing a digital electronic portrait frames which will conveniently display multiple at interval of time, it will demonstrates two systems for which digital photo edge will promote social interaction; rapidly display of frame contents at homes/offices for increase social interaction, easy bring up-to-date of the recent and distant past and to inspire recollecting current and reserved past events. This work will achieve the following objectives among others: Using a digital photo frame to display images, slideshows and short clip videos electronically. Using an LCD display screen to achieve this i.e. the display, using a WAV/MP4 player as to controller, and using a flash drive to store data (photos, slide shows, etc.) temporarily of which can be updated at convenience.

Literature Review

Evolution of Photo Display

The use of camera obscures has been in place long before photography was invented and the technology keep changing to meet modern day life [6].Main story of digital photography began in 50s, but the major foundation for digital photography came in 1981 when camera was produced for consumer by Sony Incorporation [7-13]. First and second generation of digital photo frames came in 1990 and 1999 respectively around 2010 digital photo has been revolutionized with Wi-Fi connections to upload and generate photo frame with the use of ICT technologies [14, 15].

Working of a Digital Photo Frame

Majority of digital photo frames comprise inner storage device and universal serial bus port, the edge is connected to the computer through the USB, one can then drop and drag photo into the frame until the memory is full. This implied that the memory capacity will determine the number of photos to be stored in the digital photo frames [5].

Manual Photo Frame versus Digital Photo Frame

Manual picture edges are usually made of wooden which is still the predominant material in this modern day even though plastics, bronze, aluminum and silvers have also been in use. A picture frame comes in various variant of colors and texture. They are designed to accommodate a single printed photograph

and by choice changed to another desired photograph or painting. Its major disadvantage is that it can only accommodate a single photograph. While in a digital photo frame, we can see an advanced way to view pictures in a more exciting ways as in Digitalized viewing mechanism, multiple image viewing, using an actual monitor [5].

Review of Related Works

Jeong K et al. [2], Zimmerman J et al. [4] demonstrated three approaches that supports uses of digital photo edges as tool for social interactions, showcase photos of people at homes and offices, and to arouse hark back to recent and the past event. Boll S et al. presented a research that aimed at using metadata to get and put information at right spot in one personal album [16]. D'sa F designed a digital photo frame that uses LCD monitor, a DVD player which can handle DivX movie files, an external TV tuner box with VGA output, a small speaker, a USB pen drive to store and play photos and videos, a power connector and a USB connector [17]. A digital photo frame with 5inch LCD display that displays quality BMP images is also designed.

Design Methods

Major gaps identified in the existing manual and digital portrait based on our reviewed works is the foundation for our research design consideration. The gaps are display of a singular image, manual changing and updating of the images, and image quality and uniformity.

Hardware Consideration

Major hardware considered for this work is Motherboard – Raspberry PI 3, Monitor - Liquid Crystal Display (LCD), and Power Supply. The Raspberry PI 3 is an electronic board similar to normal computer motherboard, it comes with many features but features to be considered useful for his work are: Broadcom BCM2837, 1.2 GHz Quad-core 64-bit ARM cortex A53 processor, USB 2.0 with 480Mbps data transfer, MicroSD card or via USB-attached storage, 400MHz Video Core IV multimedia, 1GB LPDDR2-900 SDRAM, Full HDMI port, and Combined 3.5mm audio out jack and composite video. A monitor that uses LCD technology to show clear images was considered for this work. A suitable was choosing based on power rating of the components. **Figure 1** is a block diagram of the proposed design layout and **Figure 2** is the diagram of the Raspberry Pi 3 motherboard that serves as the brain of the proposed system.
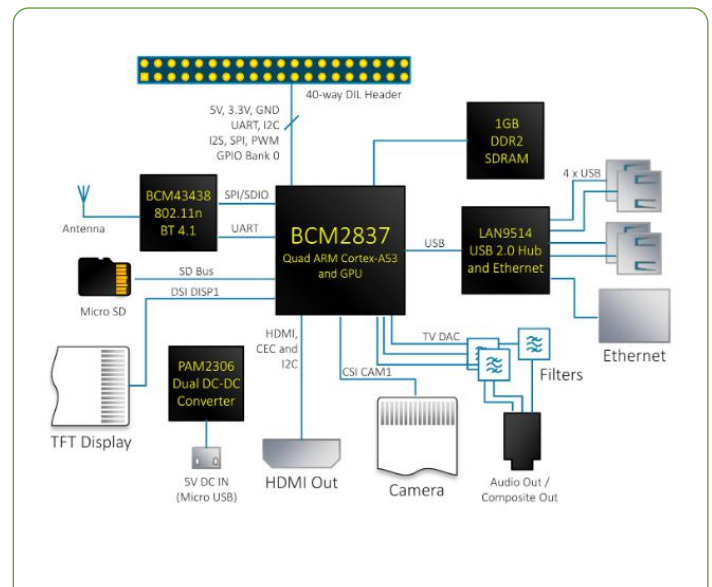

Figure 1: Proposed design layout

Figure 2: Image of a Raspberry Pi 3 motherboard

The circuit diagram for various functionality of the proposed system is given in **Figure 3, 4, and 5** respectively.
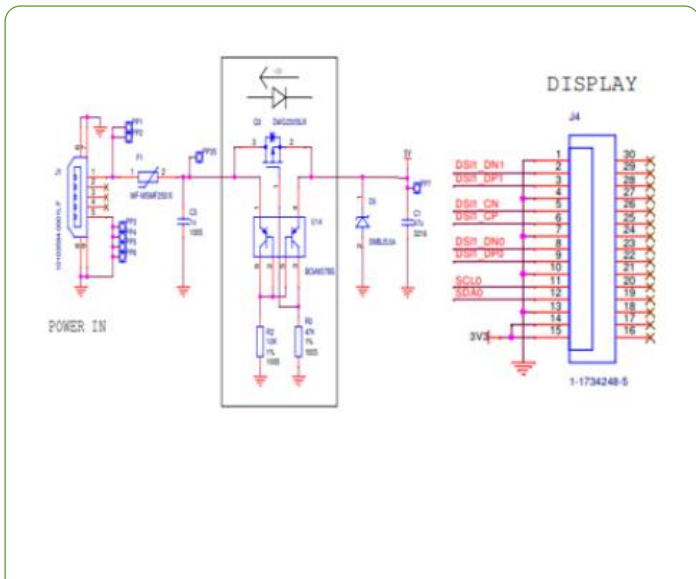
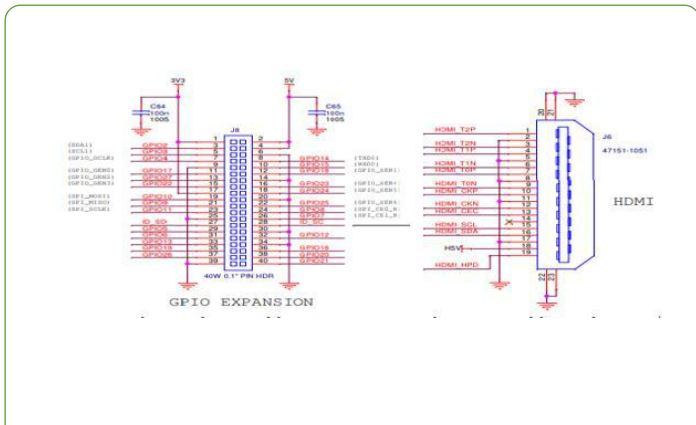**Figure 3:** Circuit diagram of the Power and display of the Raspberry Pi 3

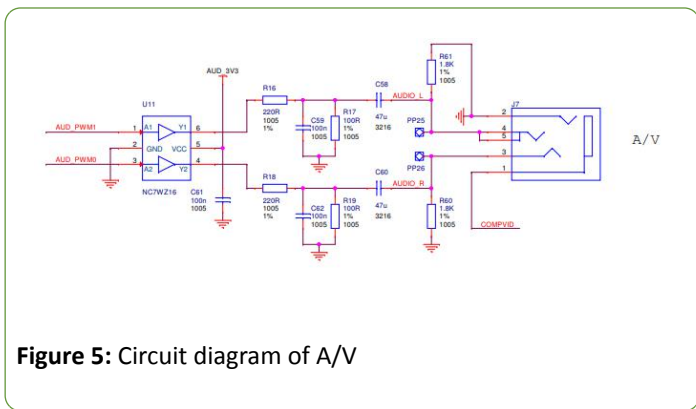**Figure 4:** Circuit diagram of the GPIO Expansion and HDMI pins of the Raspberry Pi 3

Figure 5: Circuit diagram of A/V

Software Design

Software design consideration is based on programming of the proposed system to input, formatting and display photos. The software design consideration which based on some features of the Raspberry Pi 3 motherboard is represented with flowchart **Figure 6 and 7** respectively. Details of the hardware and software design implementation are given in the next section of this report.

Packaging Design Consideration

Uniformity in frame size, reduction of frame number (n) to 1 irrespective of numbers of photos are parts of aim and objectives of this work and it was taken into consideration during the design processes.

We made the following assumptions: No of photos (N)=25, frame should be of square shape (L=B) where L=0.6m.

Hence

Frame area A (m^2) =L x B

0.6 × 0.6

0.36m^2

The actual is of the frame will depends on the size of monitor chosen for this work. Space required with singular frame is 0.36m^2 if we use a frame for a photo and N=25 space required S will be given as.

Space required S=A × N

0.36 × 25

9m^2

With the little calculations and assumption made it implied that S–A space will be saved by implantation of this project work in offices and home i.e. (9–0.3) m^2=8.7m^2
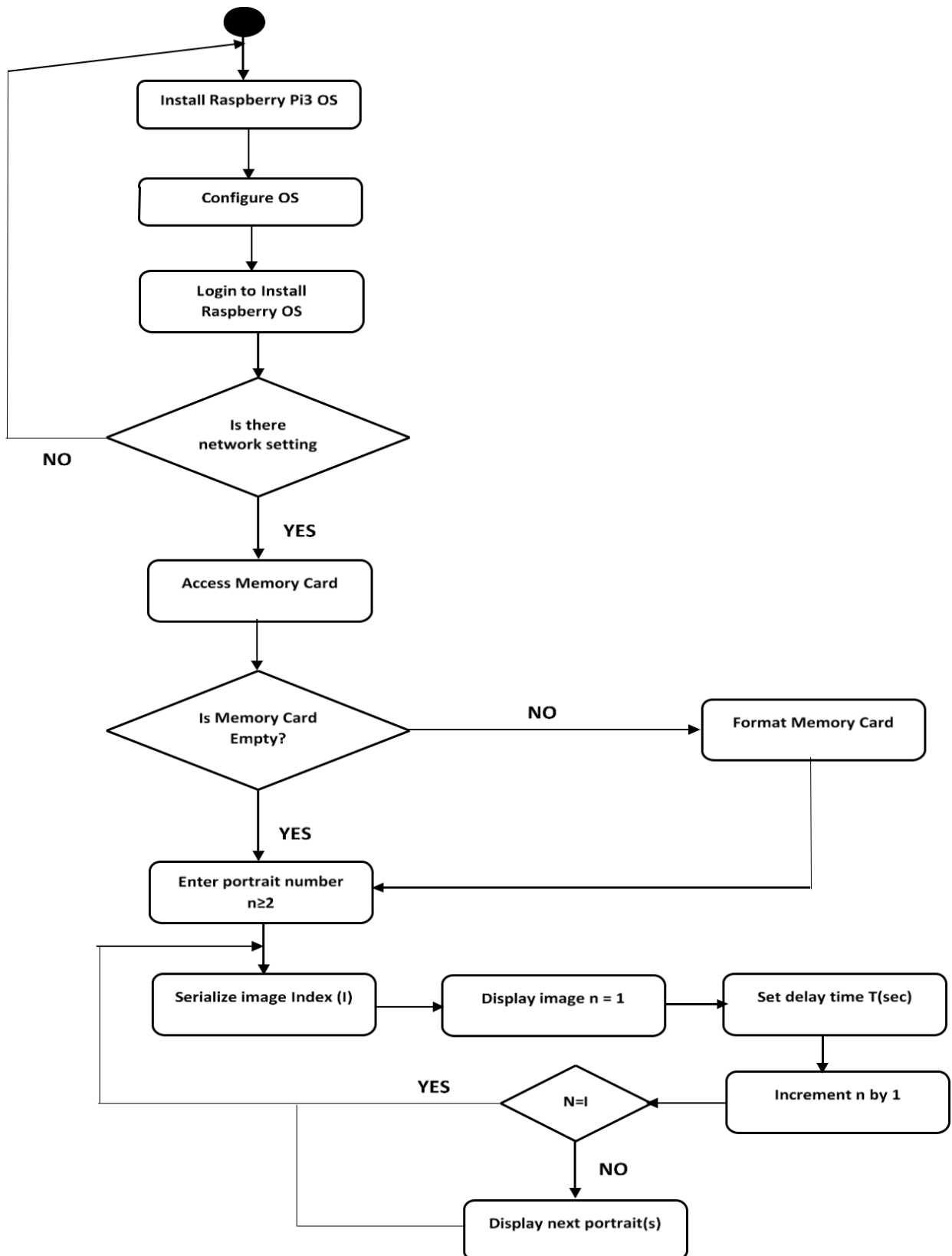
Figure 6: Flowchart of proposed System

Implementation and Testing

Interfacing the Components

The hardware (major components and peripherals) **Figure 8** selected for this project work were carefully interface. We did test at each phase of implementation while final test was carried out to confirm reliability and workability with reference to the aim and the objective of the system. The outer architecture is a wooden frame with a metal hanger.
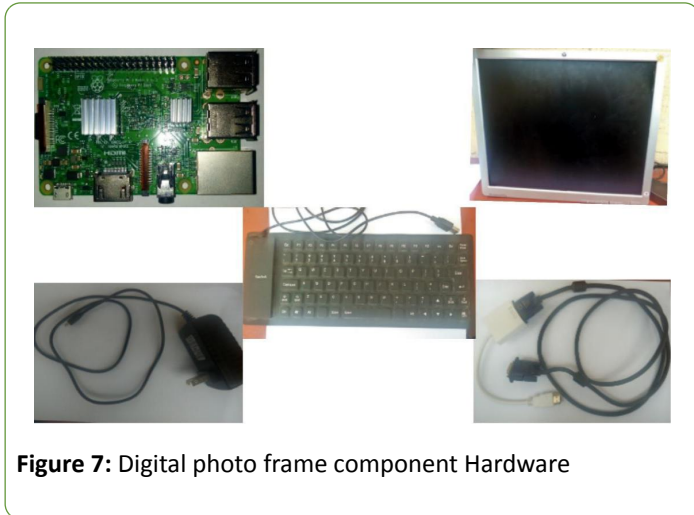

Figure 7: Digital photo frame component Hardware

Programming Testing and Packaging

The hardware system was configured and the system was programmed to perform the function it meant to perform. At the stage a case was chosen for the display which is displaying of past and present Rectors of Yaba College of Technology. The steps towards the setting-up of the systems with reference to the flowchart in **Figure 6** are as follow. The system was powered ON, OS installed, the system was 'Boot to Desktop', we setup the wireless internet connection by clicking on the Wi-Fi icon at the top right section of the screen, and then connected to Hotspot, LX Terminal was then open to write and run all configurations, and then program the portrait number N where N≥1, **Figure 8** gives the laboratory set-up and display of first picture of rector that served between 1960-1961.

Figure 8: Laboratory set-up of proposed system

Packaging

After successfully setting up the slideshow programs for the digital photo frame, we then constructed a wooden frame by using the width and height dimensions of the monitor to create a frame and carefully placed the raspberry pi 3 inside the frame by partitioning a segment of the frame for it and placed it firmly. We also partitioned all the connecting cables as well. We created a small hole at the bottom of the frame of which the cable will come out through and finally used a plywood as back cover for the frame and clipped a hanger to it for hanging on the wall Figure 9 shows the output at every stages of the packaging while Figure 10 shown the final product with display of the current rector.
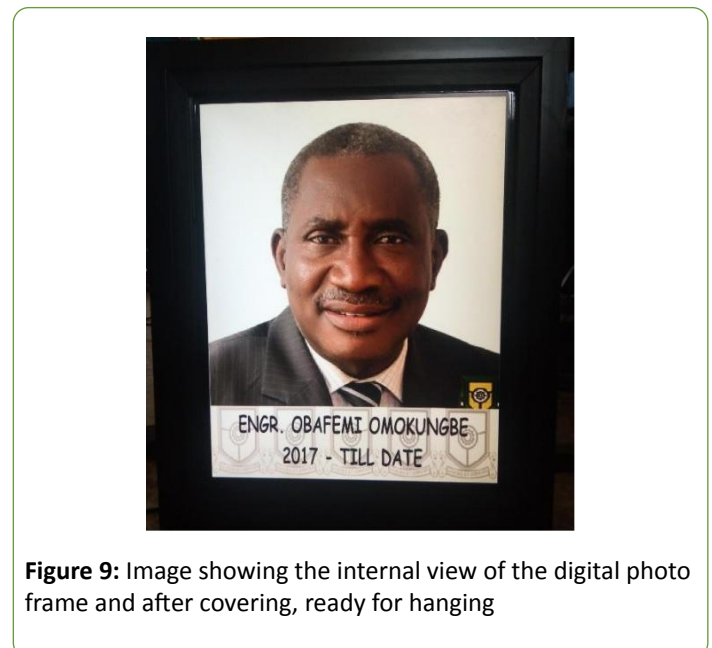

Figure 9: Image showing the internal view of the digital photo frame and after covering, ready for hanging

Figure 10: Final Product Displaying Portrait of Present rector of Yaba tech

Conclusion

Based on the aim and objective of this research work which is to create a digital way of viewing portrait and saving space on walls for hanging multiple frames for occupants of an office through the use of a single frame with digitalized slides. This design made use to the raspberry motherboard with multiple functionalities. It is to be noted that raspberry multiple functionalities were not explored to its maximum as it possesses an audio jack for sounds (if slideshow was to have music playing at the background). Also, it possesses a camera port if there is need to automate a camera, it will serve as its microcontroller. These are just a few of the much functionality that the raspberry pi possesses. Therefore, it is safe to say that even with future scope based on the digital photo frame, the raspberry pi is still capable of delivering to maximum efficiency. This design is compact, cost efficient/effective, unlimited to the number of photos that can be displayed, and attractive.

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