

Smart Home Theater System on Odroid-C2

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Abstract—An electronic device which is usually connected to another device or a network with different protocols like Bluetooth, BLE, NFC, Wi-Fi, Li-Fi, 2G, 3G, 4G, 5G etc., which works to some extent of interactively and autonomously is well known as Smart device. In today's world everything around us is turning to a smart device, like the normal cell phone has been completely replaced by smart phones, wrist watch is being replaced with smart watch and smart bands, normal switch board is replaced by smart switches, and also normal Television is replaced by Smart Televisions in this work I am going to illustrate how one can save thousands of rupees, and also reduce electronic waste produced in spite after enjoying the same feature and comforts within a fingertip instead of upgrading our yet new Televisions. One can use his yet new television with one small electronic gadget or a device, to convert his existing television or any display device to a smart television.

Key Words: *Bluetooth Low Energy (BLE), Near Field Communication (NFC), Wireless Fidelity, Li-Fi, 5 Generation*

I. INTRODUCTION

The growing market in smart television and online video streaming is being increasing drastically in India and around the world. The technology is driving everyone to use them and implement them in their daily life. A smart television has an inbuilt Operating system, which is required to install the various third-party apps for browsing, video streaming, music, movies, sports, gaming, multimedia photo viewing experience, and various contents. All these experiences are important for a user to enjoy the content over a internet, but recent boom in smart television industry is driving all the user to upgrade their television set on a whole to enjoy these experience. Even though a user has got his television set very recently with a better display quality and sound quality, since because his television set is not capable of taking the smart television features and the latest apps and application, a user needs to change his whole television set by paying a relatively higher price in the market.

II. LITERATURE SURVEY

Working of smart television system in [1] defines the main working of the smart TVs. This defines the various application which can be used for the smart TV and its platform for developers to be used on the smart television system. The limitations and its cost effect on various classes of users is discussed. Also the security and safety of these smart television system has been discussed in brief.

The various alternatives of Television system which works like a smart television system, its audio and video effects and efficiency of various players etc..

Including live streaming is discussed in [1]

In [2] various versions of Odroid's Android along with its different updates starting from V 0.2 of Android 5.1.1 to v2.8, Marshmallow v1.0 to V5.2 is provided with all the required image and installation files which is most important for the project. [2] Gives all the required information for the installation of Google play which is a sort of unofficial method to use Android market by installation. Various A D B and Fast Boot drivers which could be necessary for windows is also listed in [2]. Androids Background of its history, and early development cycles and introduction is being explained in the [3]. The ecosystem on which all the android versions runs on, and its preinstalled android application is listed in [3]. Detailed [3] information of Android SDK and its different development cycles for phone and other android devices is also listed. Java SDK's and its library list is clearly explained with its Java Virtual machine JVMs is given in [4].

Open source java packages and about Open source programs is given in [4].

Android version history, IDE for android development and Android Studio is gathered from the [5].

Detailed Architecture and history of Odroid is given in [6]. Guidelines for hardware setup and using the Odroid is given in detail.

Using the libraries from the external to save much efforts and also time. Playing and also Capturing the different types of video and playback devices which is mainly required for media items is explained in [6].

1.1. DESIGN AND PROPOSED WORK

An Odroid is product of Hardkernel Co. Ltd, this company is originated from South Korea. Odroid is another single-board computer like Raspberry Pi, Banana Pi, UDOO, or Beagle Board which are built with a single PCB, memory, microprocessor, input and out pins, and few other hardware components required for an embedded system controller. Odroid C2 is one of the 64 Bit four-core on a single board which is known as quad-core Computer. It is the most cheapest 64 bit development board available till date which works on the most popular ARM processors. It has 40pin GPIOs required for embedded applications and 7

pin I2S which is used for communication. Amlogic's ARM Cortex-A53(ARMv8) is a 1.5Ghz four core CPUs It has one USB OTG which can be used for either power supply or for data transfer, and four number of USB.

1.1 Storage Interface of Amlogic S905:

Available to use SLC or TLC NAND flash memory with upto 60-bit of ECC or even MLC. It has 16bit or 32-bit SDRAM interface dedicated for memory. Data which is of the size of one, or four or eight bit, MMC card and eMMC card interface can use HS 400 of v5.0. For the reason to storage the key which should be of HDCPP or DRM, these keys are programmed where the 4k bits are built in this.

1.2 Audio Decoder and input output:

Dual-channel audio DAC with amplifier which are built in. Can decode file formats like MP3, WMA, RM, AAC, and FLAC all of these are programmable with 5.1 or 7.1 by the process known as down-mixing. With combination of I2S+PCM, supports concurrent dual audio stereo channel output.

1.3 Core and Fabric of Amlogic S905:

With Crypto and Nano extensions, of which 1.5Ghz, Sub-system of CPU which is four cores in ARM Cortex A 5 3.

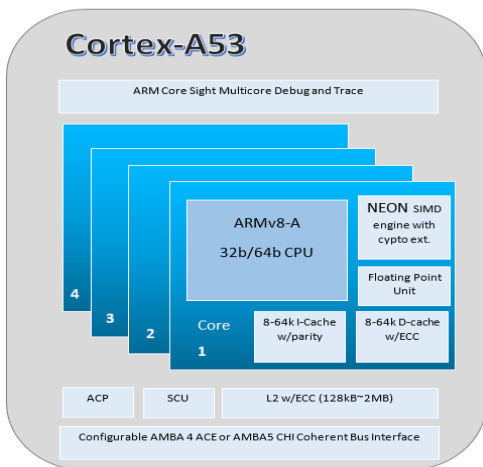


Fig1: Block diagram of Arm Cortex A53

1.4: Installing Android on to the Odroid C2

Android on Odroid-C2 can be installed in two different ways. The first method is by using pre-installed eMMC or microSD card, and the other one is done by downloading from the Hardkernel website which can be installed manually onto the eMMC or microSD card.

1.5 :Loading Android image on to the eMMC card

Open the location downloaded ISO image file from the Hardkernel website. Plug in your eMMC card or SD card on to your PC using eMMC card connector and memory card reader, and make sure that the SD card is

detected in your PC. Format the eMMC card or standard SD card using SD Card formatter.

Launch the rufus software in your PC and select the Drive in which you have the memory card. Click on Device in rufus window and select the proper drive label where your memory card is present. Click on Select tab in rufus window and select the image location which is downloaded from the Hardkernel website. Select the partition Scheme as MBR. Select the target system as BIOS or UEF-CSM You can give any name for volume label if required or you can just leave it as per the default label. Select the File system as FAT32 which would be the default file system. Select the cluster size as 4096 byte which would also be the default cluster size, this can be varied based on your application or requirement. After selecting the proper image file to be written on to the memory, click on Start and give the required permission when prompted for. Once after starting, you can view the status bar at the bottom of the rufus window which indicates what percentage of file is completed writing.

ODROID C2 REPRESENTATION AND CONNECTION



Fig2: Odroid-C2 after making all the respective connection

Once after making all the connection properly and powering on, Odroid-C2 boots up for the first time. The first boot will slightly take a couple of moment more as it need to expand the file system and other operating file in the memory. The Red LED on the Odroid-C2 indicates that the power supply is good. And the Heart beat blue light indicates that the Odroid-C2 is powered on and the processes .Kodi is one of the open-source and free software of media player. This application was developed by the XBMC (Xbox Media Centre) foundation, which is also a non-profit technology organization. This is one of the powerful media applications with which a user can play and view most streaming media such as videos, music,

radio, podcasts along with digital media files which can be assessed form local storage files and network storage media.

Kodi is a cross platform software which can be used widely over various platforms like windows, android, Linux, mac OS, etc. The core of this application is written in C++. This application uses Open GL which is an open graphic library where graphics are rendering under Kodi. Many of the Kodi's Libraries along with third-party libraries on which a Kodi is dependent are all written in C programming language instead of C++ as a Kodi's core, but still they are mostly wrapper of C++. Kodi partially uses the SDL (Simple Direct Media Layer.)

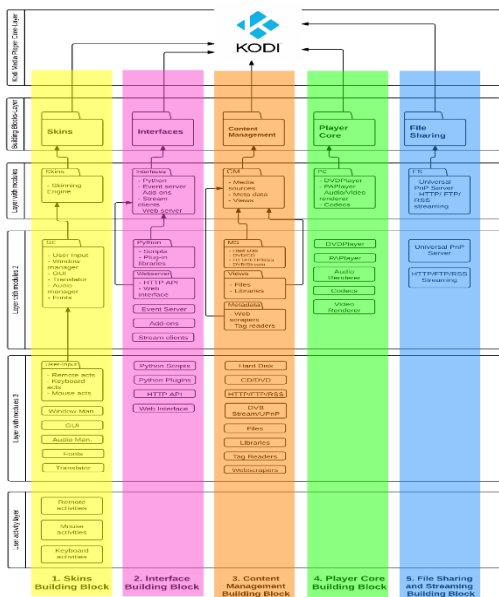


Fig3: Building Block of Kodi

The standard or unmodified version of Kodi can be easily downloaded and installed even from google play store.



Fig4: Kodi menu displayed on Television

The application like Netflix, Amazon Prime video etc are working good with both remote-control interface and also mouse interface. Also this works good on the touch interface which is there on the vu7 display while testing. Hence all the apps can be very easy to access through various display and input devices like Touch, mouse and keyboard, and also through IR remote.



Fig5: Kodi starting up on vu7 display

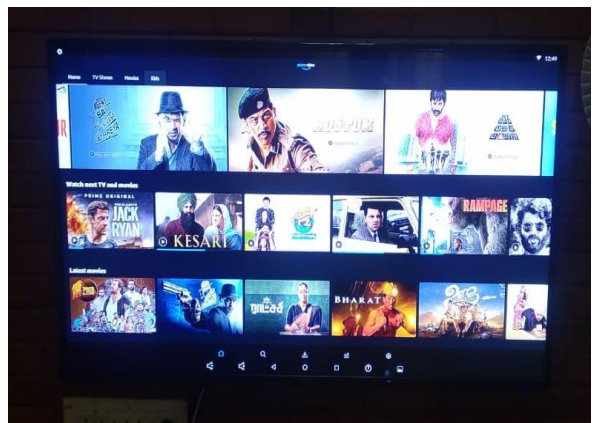


Fig6: Amazon Prime Video running on Television

CONCLUSION

As an advantage of all the above-mentioned system, we can expand this project as to interface the Odroid-C2 for home automation, room ambient control like lighting in a house according to the video and screen's theme, controlling the AC fan or heater to give extra ambient like 4D video experience at home .By interfacing the various wireless embedded module to any relay board or electrical control board one can control the various device in a home environment. Like an ESP32 and WiFi and BLE enabled controller can be interfaced directly with Odroid-C2 through wireless connection via WiFi, Bluetooth or BLE interface An ambient light system can be created in the edges of any video playing on the Odroid-C2. This Ambient light uses an RGB Led lights behind or at the edge of the Display system, and adopts the RGB colour to the frame colour at the edge of the video.

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