Data Streaming via Wi-Fi Technology Using Android Mobile Device

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Abstract **— World's software and hardware logistics have grown tremendously providing affordable to many person to have it and ANDROID OS is been working thoroughly to make it more pleasingly ingenious and simple. Today, Android operating system, the bestselling Smartphone platform has about many millions of applications which strive towards making interaction with digital world faster and easier. Consider about Android's goal to get the digital place at our finger, gives rise to many new ideas. Presentation is an important mode for sharing knowledge now-a-days. What if Smart mobile phone could be used for presentations instead of desktops or laptop? Moreover, what if all your presentations are done without the use of cables? This paper gives an idea of data/image display on a projector via Wi-Fi using android smart mobile device. Use of android smart mobile device will eliminates the use of desktops and laptops while Wi-Fi gives freedom from tangles of wires and cables. Using Wireless Fidelity methods for transferring data through the wireless medium, the basic question of connecting a projector to the android smart mobile device has been put an end. This paper first present the different technologies which are used and then continues to give an overview of the system.**

Index Terms **— Android, Raspberry Pi, Video Projector, Wi-Fi**

I. INTRODUCTION

Since the formal presentation of the open source platform android for mobile phones by Google, there is been significant interest in the Original Equipment Manufacturer (i.e. OEM) is a community which also customize android for many embedded devices such as net books , car dashboards, set-top boxes and others. The benefit of making android available to multiple other device platforms it means that an application developed for one device could are made available easily for another platform with very less porting needs (consider for example, a Ditto TV recording client that is made available both on your digital settop box and another on your phone – similar application's, similar code but available on two devices to suit your mobility needs)

Tremendous progress in mobile computing should start with effortless local convergence of Smart phone's and computer infrastructure via simplistic mobile use model. This use model would enhance the various functions of the projector by connecting it to a mobile device through wireless (i.e. Wi-Fi) medium. The plan to setup a connection between the mobile device and a projector via Wi-Fi which eliminates use of desktops/ laptops, VGA cables and other cables and hence get rid of limitations for carrying out presentations. This model give android smart mobile device to act as a presentation device creating a best alternative for desktops or laptop.

The paper is having various sections which are as follows. Section II introduce the system architecture of Android OS. Section III introduces projector and the Wi-Fi details in fleet. The section which is IV gives details of the hardware and processor details to be used in the system. Section V actual entire working of project. Section VI shows result analysis with various combinations.

II. ANDROID OS ARCHITECTURE

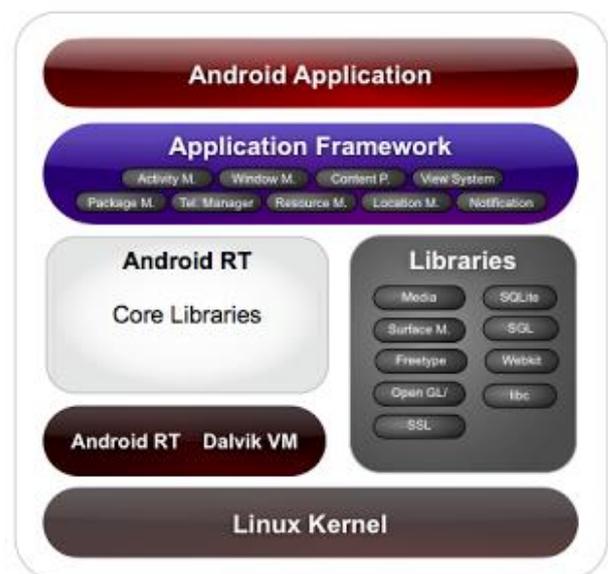The following figure shows the major basic components of the Android OS.

Figure 1.   Android OS Structure.

A. Linux Kernel

Linux provides security, management of memory, process management, network stack, and driver model. The kernel is part the OS which behave as an abstraction layer in the middle of hardware and software stack.

B. Android Runtime

Android application runs process at their own, with its own instance of the DVM (Dalvik virtual machine). Dalvik virtual machine execute so that a device can run multiple virtual machines efficiently and effectively. The DVM executes files in the executable .dex format which is optimized for memory minimal footprint. The VM (i.e. virtual machine) is register-based, and runs classes compiled by a Java compiler which have been converted into the .dex format by using dx tool. Android OS have some core set of libraries that helps to provides many of the functionality.

C. Libraries

Android have a set of C/C++ libraries which are used by various components of the Android OS.

Media Libraries
Based on Open CORE or Packet Video's; these are libraries which support recording and playback of many popular video and audio formats, as well as static image files, which include formats like MPEG4, AAC, AMR, H.264, JPG etc.
*Surface Manager m*anages display access subsystem and smoothly blend 2D and 3D graphic layers from many applications.

LibWebCore is a modern web browser engine which powers both the Android browser and an embeddable web view.

SQLite engine is powerful and lightweight relational database access available to all applications.

System C library is a BSD derived standard C system library implementation of the (libc), which is tuned for embedded Linux-based devices

D. Application Framework

Android OS provides an open source development platform, so developers can have full access to the same framework APIs used by the core applications. Developers are open to take benefits of the device hardware, access every possible information about background services, alarms, notifications to the status bar, and many more.

Elementary all applications are set of services and systems, including a rich and extensible set of views. The views that can be used to build an application, including text boxes, lists, grids, buttons, and even an new web browser.

Content Providers enable applications to access data from other applications such as contacts, alarm and other data or can share their own data.

Resource Manager provides access to many non-code resources such as localized strings, layout files and graphics.

Notification Manager enables applications to show/display custom alerts in the status bar.

Activity Manager manages applications lifecycle and provides a common navigation back stack.

E. Application Framework

Android is shipped with some core set of applications including an email client, browser, dial, calendar, maps, contacts and various others. Applications are codded with use of Java programming.

III. WI-FI AND PROJECTOR

A. Wi-Fi

Wireless Fidelity is a most popular technology that allows a device to exchange data (using radio waves) wirelessly over a computer network, having a high-speed Internet connections. The *Wireless Fidelity* Alliance defines Wi-Fi as any "WLAN (wireless local area network)"products that are deployed on the (Institute of Electrical and Electronics Engineers) IEEE 802.11 standard [3].

A device that can use Wi-Fi (such as a PC, mobile, gaming console) connect to an Internet via a wireless access point figure.2 shows how nodes are interconnected using Wi-Fi technology; an access point has a range of about 65 feet (20 meters) indoors and can have greater range outdoors. Access point range coverage can comprise an area as small as a single room with walls which block radio.

Wireless Fidelity is consider as less secure than physical wired Ethernet connections and other because an intruder does not need a direct/physical connection with device. Web pages that use SSL are secure but unencrypted internet connections can easily be detected by intruders. To avoid this, Wi-Fi has adopted various encryption methods. The encryption WEP, provided was easy to break. So the higher quality protocols (WPA, WPA2) were introduced later. Wi-Fi Protected Setup (WPS) feature added in 2007 and had a serious flaw that allowed an attacker to recover the router's password and was not helpful at all.

Figure 2. Wi-Fi connectivity among devices.

Wi-Fi provides service in homes, street chains and businesses, as well as in public spaces at Wi-Fi access point can be set up either free-of-charge or commercially use purpose. Many businesses & organizations, such as hotels, and airports often provide free-use Wi-Fi access point to attract customers. Authorities or person who wish to provide services or even they promote business in some of the selected locations sometimes provide free Wi-Fi access.

Router incorporate a digital subscriber cable modem or a line modem and a Wireless Fidelity access point, it is set up in individual homes or in buildings to provide internet access point and internetworking to all connected devices, via cable or wirelessly.

There are some battery-powered routers which have a mobile Internet radio modem and Wi-Fi access point. When we are subscribed to a particular phone carrier, they allow you to connect nearby Wi-Fi stations to access the internet over various 2G, 3G, or 4G networks. New generation smart phone have a built-in feature of this sort, Android based smart phone are good example for this.

Wi-Fi is a cheap installation option of local area networks (LANs). Area where we cannot have cables, such as outdoor areas buildings, we can host wireless LANs.

Now many Manufacturers are building wireless network adapters in almost every laptops. The price for Wi-Fi chipsets are continues to drop with adding new feature, making it an economical networking option and adding even more devices. The figure.3 shows the different ports of the projector. The important port to be used in this use process is the VGA video input port.

B. Video Projector

A projector is an image projector which receives a video signal and it projects the equivalent/same image on a projection screen using a lens system [1]. All video projectors use a very bright light to project the image, and most modern ones can correct any blurriness, curves and other unpredictability through manual settings [1]. Video projectors are widely used for many purposes such as, presentations in conference room, training in classroom, concerts and home theatre. Projectors are widely used in many educational institute and other places settings it with interactive whiteboard to interactively teach pupils.

Figure 3.   Projector Connections

IV. RASPBERRY PI

A. Raspberry Pi

The Raspberry Pi figure.4 is a small debit card sized single board which was developed in the United Kingdom by the Raspberry Pi Foundation with the motive of actively encouraging the teaching of basic computer science in schools [5].

Figure 4.   Raspberry Pi Board

The Raspberry Pi is having a Broadcom BCM2835 system on a chip (SoC), it also includes an ARM1176JZF-S 700 MHz processor (The firmware includes a number of "Turbo" modes so with it user can do the over clocking, up-to 1 GHz, without touching the warranty), Video Core IV GPU, and 1024 MB RAM. It is not having a built-in HDD (hard disk drive) or SSD (solid-state drive), but it uses an SD card for booting and storage for long term [5].

The model intended in this paper uses the ARM 11 processor as illustrated in figure.4. The processor is connected with an ASUS wireless adapter and a projector with a VGA. The basic operation of the processor is to receive the data sent by the Android smart mobile device, change it to serial data and transmit it to the VGA port which is to be displayed on the screen by the projector. Buffer is used to make the Wi-Fi and VGA data rates compatible. This combination of adapter, processor and the VGA port is coined as Wi-Fi device for the proposed model.

The Raspberry Pi Foundation will be releasing two additional codec's that can be bought separately Microsoft's VC-1 and MPEG-2 [5]. Also it was announced that the Pi will support CEC, enabling it to be managed/control with the TV remote control [5].

B. Raspberry Pi Constraints

With Raspberry Pi we can have following short comes and their solutions shown in following table. Table shows the solution for the board chosen.

Constraints for Raspberry Pi	
Constraints	Solution
To choose operating system for loading on board	Raspberry pi board suggested its own operating system (Wheezy)
Mobile OS kernel problem	Rooting of mobile device.
Board has no internal Memory to load OS	Use external memory (SD Card)
VGA port unavailable on Board	HDMI to VGA Converter
No inbuilt Wi-Fi	Use external Wi-Fi Dongle
Power supply	Min require 5V
Temperature	Maintain temperature

C. Board Comparison

As there are many boards are available in the market nowadays, so the parameter that are consider are availability of the board, cost, memory, CPU etc. on this basis following is the comparison chart. Boards are compared as the model available in Indian market

Board Comparison			
Parameter	Beagle	Panda	Raspberry
Cost	$149	$182	$35
CPU	ARM cortex A8	ARM cortex A9	ARM1176 JZF-S
Memory	128MB	1GB	1024MB
USB	2	2	2
Speed	600 MHz	1GHz	700MHz
OS	Linux(Raspberry),RISC OS, FREE BSD	RISCOS, FREE BSD	Linux, RISC OS, FREE BSD
Video Out	S-video, HDMI	DVI, HDMI	Composite RSA, HDMI

V. ACTUAL WORKING

A. Steps for project implementation:

1) *In this step we will establish connection between android phones with Wi-Fi device.*

2) *Data transfer to Wi-Fi device*
   a) Snap Shot of android Screen is taken.
   b) Snapshot data is divided into packet size creating n nos. of packets.
   c) Data of each packet is stored in IEEE802.11 standard format.
   d) Add the address of Wi-Fi device and send data.
   e) Do step 3&4 for each packet.

3) *Data display on projector*
   a) Data is extracted from packet.
   b) Wi-Fi device is connected to projector using VGA cable; so data transmitted from Wi-Fi-device onto VGA port.

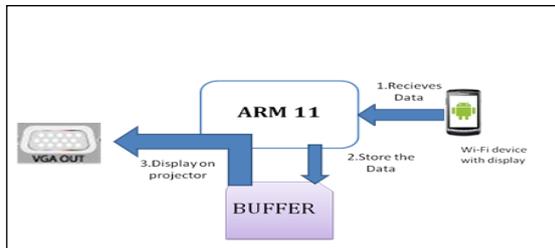### B. Schematic for the project implementation:

Figure 5.   Actual Project Schematics

VI. RESULT ANALYSIS

The result analysis shows the in which way the parameters should be consider otherwise it can affect the resultant output. While having first module the processor clock speed has great significance on seamless & Glitches/delay free data streaming to the projector. This parameter is having great impact on selection of the different kinds of boards available in the market. After having consideration of the clock speed it help a lot in selection process of the raspberry pi board with other boards; obviously all other parameters are also consider in this.

Result Analysis Based On Processor Speed
While developing first module the issues was seamless & Glitches/delay free data streaming to the projector. In this the results say that you should have processor with Greater than 1GHZ clock speed.

I.   Result for different Clock speed of processor

Processor Speed			
Parameter	Description	Variation	Result
Processor Speed	The glitches in the output increase	500 MHz	The delay is high hence there lot of glitches between

		consecutive screenshot displays.
as the processor speed becomes less. The delay in displaying the screenshot is more	1GHz	Glitches/delay between two consecutive screenshot displays is reduced
	Greater than 1GHZ	No Glitches at all

CONCLUSIONS

Android OS is in its infant stage despite of some tremendous progress. This paper focuses on major and important technologies which can be fruitful and may assist forthcoming human generations the easier way for interaction with the digital world. This system has an ample scope in academic institutions where presentations are a mode of sharing knowledge, corporate meetings and advertisement world. It subsume easy access to knowledge and information which is to be projected on the screen by eliminating use of many stationary devices. Furthermore the future work would be in research on same operations using Java-powered and other devices.

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