Modular Upgrade for mobile handset

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Abstract— Android was launched on 23rd September 2008. Since then the use of mobile phones has increased greatly, raising its popularity to unprecedented heights. Android's have seen numerous updates, adding new features and fixing bugs in the older one. However, all this features get updated on the latest android handset, causing consumers to buy new handsets for better features and better hardware upgrade. This prototype will overcome all these problems and cause the user to upgrade their hardware as well as software with a simple case. 'Modular upgrade for mobile handsets' is a case which will communicate with the handset for additional hardware and software features.

Index Terms— USB(Universal Serial Bus), Isolator, ROM(Read Only Memories), Camera, Speaker, Power Extender, Wireless Charging.

1 Introduction

Smartphone is a two way microwave device causing radiation harmful to human bodies. However the use has increased fiercely causing users to upgrade their phones for better features. Hence this increases E-waste.

This prototype includes a modular handset that can be upgraded through the attachment or replacement of discrete components. Consumers will only pay for the upgrades they need and not replace the entire handset. It includes a case which will swap in modules using electromagnet, easily attachable and detachable.

2 Technical Approach

2.1 Designing a 2 way USB Cable

USB's are designed half duplex where no data is controlled from one end of the device. The other end remains blank and acts a client. This can be considered as a server-client network. The server here is the mobile handset and the client is the device. This client accepts commands from the server and functions accordingly. The server accepts as well as recieves data simultaneously. This can be considered as a full duplex communication. Hence this means the signal travels along the wire in both ways but is controlled from only a single end. However the client does not keep track of what data transfer is taking place in the server-client network. The mobile handset is capable of communicating with 2 or more devices simultaneously. Hence a 2 way usb had to be designed where the device is also capable of controlling the data sent and received to and from it. This type of connection is now full duplex.

The 2 way usb also allows the device to draw power from the mobile equipment. The power drawn from the mobile equiplment was 3v and 500 mA. This power was enough to run small devices for communication.

The 2 way USB cable is designed as follows

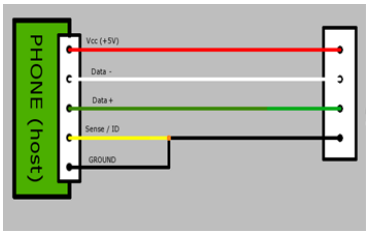

Fig 2.1 2 way usb

Fig above shows the diagram of a 2 way usb. Generally, the phone micro usb consists of 5 pins. The 5th pin is meant for experimental purpose and is never used. The pin is known as the sync or sense pin. On connecting this pin to the ground terminal of the micro usb, the usb is converted into a 2 way usb.

2.2 Desining a driver Isolator

A driver isolator not only handles the power coming from the input port but also distributes the data in its four different output ports. The isolator allows connection only from the input port to the output port. No data or power is back transferred to the input port. This helps in safeguarding our host (Mobile equipment) from any damage. The power used to drive the isolator is 2v and 100mA. The power transferred from the input port to the output port of the isolator is used to drive the external device.

There are 2 types of isolators. Powered and unpowered. The powered isolators provide power from the host (Mobile equipment) and the unpowered isolators draws its power externally. The Universal Standard Bus standard allows for devices to draw their power from their host. High power devices have their own power supply, eg Printer. These devices only accept the data information from the isolator. However the isolator does not provide data of its own but just forwards data received at its input ports. The power for theses devices is supplied externally. The power (up to 500 milliamps at 5 volts for USB 2.0 and 900 milliamps for USB 3.0) is drawn from the mobile handset. If a lot of self-powered devices (like printers), are used then the isolator doesn't need to be powered -- none of the devices connecting to the isolator needs additional power, so the Mobile handset need not power it. If a lot of unpowered devices like memory and cameras are used, a power isolator is needed. Some isolator's have their own transformers and supply power so that the devices power don't cause damage to the mobile handset.

3 Experimental Setup

The prototype consists of different modules. They are

- Camera module
- Speaker module
- Wireless Charging module
- ROM modules

- Power extender module

3.1 Camera

The camera consists of a image sensor which is a chip with a width of about 10mm. The camera has arrays of sensors, which is used to convert the light into electrical energy. Even though both CMOS and CCD are very common, CMOS chips are used. CMOS chips are much cheaper compared to the CCD. But for good camera quality and high end cameras use CCD technology.

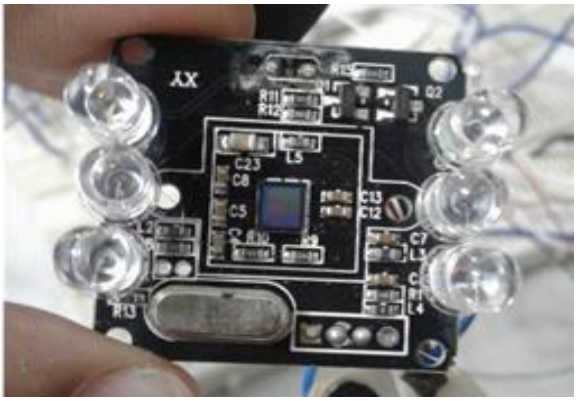

Fig 3.1 Camera Module

Lens in a digital camera is used to focus the light to be displayed, projected and captured. The light when focussed on the camera sensor, is converted to its respective electrical energy. The light is captured by the camera sensor as soon as the shutter button is pressed. The shutter opens the pixels and the light is illuminated in different intensities. Thus an electric signal is produced. This electric signal is then further broke down to digital data and stored in a computer. This digital signal is then transferred to the mobile equipment via the isolator.

3.2 Speaker Circuit

Speakers are designed the same way as musical instruments are made. Little tolerence and detailing have large difference on their performance. Large musical instruments and speakers suit low frequencies and small musical instruments and speakers suit high frequencies. One speaker works efficiently and linerarly with 3 octaves (octave is a ratio of 1:2).

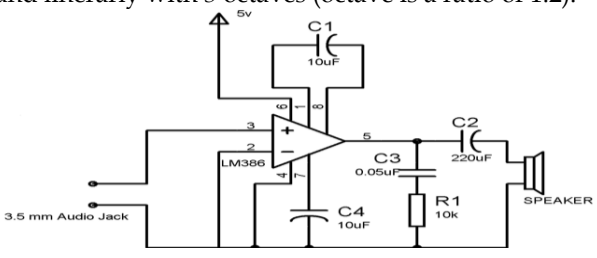

Fig 3.2 Speaker Module

3.3 External ROM (Read Only Memories)

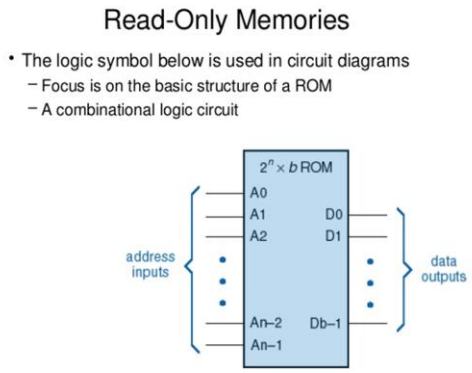

Fig 3.3 Basic ROM Logic symbol

Memory devices like ROM store information in the form of binary. ROM module in this prototype is used to extend the meomory of the mobile equipment externally. Since ROM requires less power it can be driven by the powered isolator itself. It consists of a inputs and d outputs. The inputs provide the address of the memory and the outtput ports provide the data bits at the specified address in the memory. The address and power to the ROM is given by the mobile handset. Hence the ROM acts as a client driven by the host that is the mobile equipment.

3.4 Wireless Charging

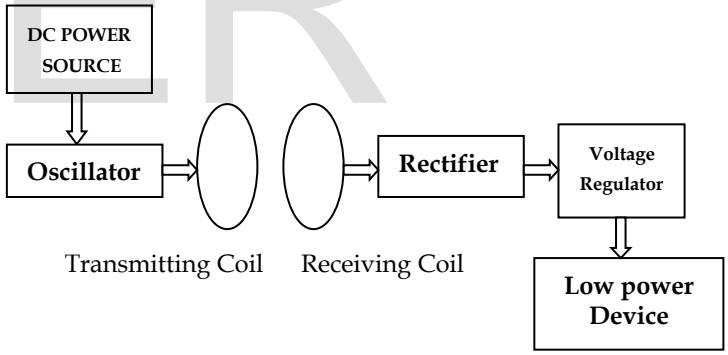

Fig 3.4 Wireless Charging

The wireless charging is considered the module without any attachment made to the battery but is expected to charge up the device. Using the basic coupling idea we charge up the low powered devices like mobile phones batteries etc.

The block diagram explains the basic wireless transmitter and reciever required for the functioning of the wireless charging. DC power is converted to a high frequency AC power in the transmitter section. This transmitter section uses a transmitter coil to perform this function. A AC magnetic field is created in the coil due to induction to transmit power and energy. This is linked to the wireless transmitting coil. Similarly in the reciever side the receiver coil gets a induced alternaating voltage from the transmitting coil due to induction. A rectifier is then used which converts the AC induced current to DC. This DC power fluctuates and hence is passed through a regulator which stabalizes the output and is used to power up the low power devices.

3.5 Power Extender

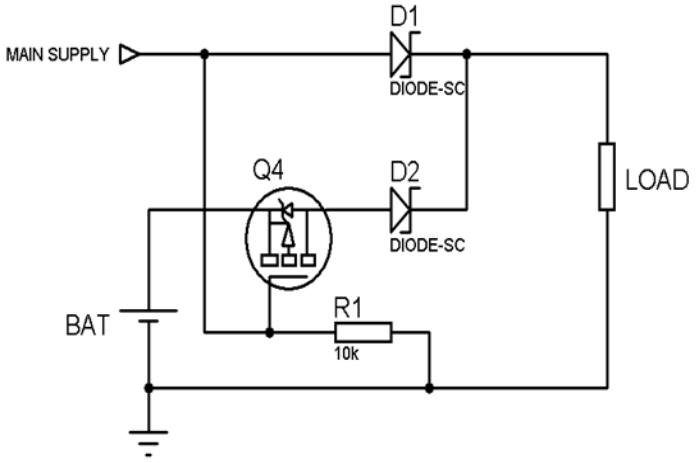

Fig 3.1.5 Power Extender Circuit

The above circuit shows the basic principle used to extend power in the device. The main supply is usually when the power is driven from the phone. The battery is the extender used in case the main supply fails to provide power to the handset. However the battery is also used in case when the main power supply is not available.

3 CONCLUSION

The prototype consists of the modules interfaced to the device. Thus enabling the user to reduce E-waste and switch between modules for better upgrades. The modular upgradable case is compatible with all type and sizes of mobile handsets. The device is built not only for the upgrades but also how innovative and attractive it would look from the users point of view.

5 REFERENCES

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