

The amazing mobile phone

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Introduction:

Almost everyone carries a mobile phone - from farmers in poor countries to Hollywood stars. It is amazing to see how this humble mobile phone has moulded itself to suit the needs of different classes and is still considered by many as a status symbol. They are no more a luxury but have become a necessity in our day to day lives.

In order to sustain growth, mobile phones nowadays pack more and more content than ever before. Someone even quoted that the mobile phones nowadays have more computing power than the first satellites sent over space. Probably the satellites were predominantly made of analogue circuits at that time - I am not sure!! But, today's mobile phones are alarm clocks, calculators, personal music systems, Television sets, digital cameras, navigational devices, gaming consoles, computers, credit cards, status symbols and of course mobile phones - just to list a few. So what components in the mobile phone help us achieve such versatile functions? Keep reading...

Antennas:

The number of antennas packed onto mobile phones is phenomenal it makes it impossible to believe that the mobile phones actually have to pass all sorts of stringent approval tests. Nowadays there is at least one GSM/WCDMA antenna for mobile phone communication, one antenna for FM Radio reception & Transmission, an antenna for DVB - Digital Television, Antennas for Near Field Communication, Bluetooth, WLAN, GPS and few more depending on what market the phone is designed for. To me, a mobile phone is a great engineering achievement. It actually proves that something so complicated can indeed be achieved by humans. What's even more fascinating is that it doesn't stop there...the research and development on next generation mobiles is a huge market by itself and millions are spent every year to push boundaries even further.

Cameras:

There are phones with a 12Mega Pixel camera in the market (with optical zoom capability, truly defining the term "Camera Phone") and I don't think it is still a rumour to see 15 Mega pixel cameras in a few months time. Considering that the resolution of the eye is about 576 Mega Pixels (with 120 degree field of view), the mobile phones actually see 2% of what our eyes see. But I see this figure going up in time and we will have lot more detail in images than we currently have. The mega pixel race may not go on forever, but definitely the cameras will get more intelligent and intuitive in doing their job. But as one would imagine, it is not just the camera that is important in a mobile phone - if it were to market itself as a self-sustainable device.

Displays:

What is captured need to be realistically displayed and the mobile phones need very high resolution displays to do the job. In some sense, the Displays are the sales guys - they lure the customers more than any other single mobile phone component does. The current popular display resolutions range from QVGA (240 pixels x 320 pixels) in low end phones to WVGA (800 pixels x 480 pixels) in high end phones. These are generally 3 to 4 inch displays, meaning they have very high PPI (Pixels per Inch) values - that is close to what our eye can resolve. The display industry is trying to align itself towards HD resolutions; probably due to the fact marketing has created a "wow" factor for HD TVs. The future high end resolutions in displays could range anywhere up to qHD (960 pixels x 540 pixels). Mobile phone displays are generally Liquid crystal Display (LCD) based while Optical Light Emitting Diode (OLED) technology is catching up with LCDs and have a potential market share in future - particularly once they become cheap and competitive. Currently the medium and high end displays add up touch input capability - while in the future this might become more of a necessity for almost all displays.

Touch Panels:

The Touch input is generally an external component but there are technologies available with companies that can integrate touch input on to the Displays - which would mean that the touch resolution will closely follow the display resolution in future. The touch has the potential to replace the number key pad that has been a default in all phones for the past decade. But the QWERTY keypads would still be something that everyone would want - as we are getting more and more used to the desktop keypad layout. The challenge for mobile phone designers is to create small footprint handsets with a bigger display and a QWERTY keypad. Actually, all other computing bits can be accommodated within the space available - It is the User Interface part that takes most of the space on a mobile phone and it poses the biggest threat and defines the minimum achievable mobile phone size.

Processors:

That said, computing is not child's play - it is indeed quite complex and the base band processor needs to handle all the modules and coordinate them accordingly - no matter what sort of user uses it. Young users generally would want to store personal media on their mobile phones and need lot more storage space for files and folders. A typical flash size of around 2-4GB can be found on many phones and these will go up to 40GB levels in the near future. With many companies showcasing 3D Displays recently, it puts even more pressure on imaging and graphics processors to keep up with the market expectation for 3D content - gaming in particular.

Audio Circuits:

Well, all mobile phones have a speaker to help us hear what the other party says. But most phones nowadays have separate audio circuits for speakerphone and headphones as well. It is this that gives the mobile phones an extra dimension of transforming themselves into personal entertainment devices. A lot of phones can play MP3 music and record high quality music and voice. The SNR (signal-to-noise ratio) of some audio circuits designed in the mobile phone are as high as 80dB (which is a surprisingly high figure for equipment with so many other digital circuits).

Miscellaneous:

Even after addressing many important functions, the mobile phone has many more up its sleeves. There are short distance wireless communication circuits like Infrared and Bluetooth and wired communication circuits like the USB. Mobile phones nowadays have USB charging enabled, which means we can plug the phone into a PC and charge its battery. An upcoming technology for charging without wires uses near fields. It is an interesting technology where the user just leaves the mobile on the table closer to a near field charger or source and the phone recharges itself! There are many more interesting circuits that put the mobile phone in a league for itself. Hearing Aid Compatibility or HAC is an upcoming feature that enables people who use a hearing aid to use a mobile phone like anyone else.

Batteries:

All covered, there is one more particular and peculiar feature of the mobile phones I have deliberately missed out - batteries. It is really inconceivable for us to think of something with such high computing capability to be run on a 3.7V battery with a typical current rating of around 1000 mA h. The amount of effort that goes into optimising power states in a mobile phone is enormous and intelligent algorithms in both hardware and software run to save every mW of power that can potentially go wasted and hence constantly pushing the standby times and talk times upwards.

Software:

The Mobile software nowadays is more of an operating system that boots up the phone and keeps track of every event and action and tries to efficiently handle them and deliver the desired result in the quickest possible time. But as phones evolved, so has the software and so has the overhead in maintaining backward compatibility thereby making the software size bigger and slower in some cases. There are a number of promising companies out there in the market who are devoted to develop high class software that can give the user the power to do everything - immediately.

Parting Words:

There is very high hope that the mobile phone organism will continue to evolve into newer devices that in future would dictate the way we live and the way we think. To me this is a very versatile organism capable of transforming itself as it moves on.

Whatever it becomes, the beautiful journey it has taken will look only more vivid.

Goodbye!