THE word ‘mobility’ signifies ease of movement. Our lives are deeply intertwined with technologies that aid our business and personal lives. Today’s mobile phones lie at the convergence of electronics, computing and consumer usability considerations. Advances in electronics and computing have aided miniaturization of the mobile device, while retaining (and possibly enhancing) the complexity of its functionality. The popularity of certain information, communication and entertainment modalities and consideration of user experience with mobiles has also influenced software and device design.

Various features of the new mobiles have made these technologies available in a single device by making the hardware compact, and offloading sophisticated functionality onto the software. Carrying one device containing all business and personal technologies gives users flexibility in their communications, even as they move around in different places.

Mobile phone applications, popularly called ‘apps’, are the nuts and bolts of the smartphones. Apps are programs routinely used in devices like smartphones, iPhones, tablets etc., to make their functions work in the desired manner. Apps can be divided into two types: Native Apps and Web Apps.

Native Apps work offline and only on one platform i.e. operating system. They work efficiently and effectively as the relevant data is present inside the device only. Examples of native apps include radio, calendar, calculator, pictures, instant messaging etc. On the other hand, web apps work online and are platform-independent. They are browser-rendered, so they are made using HTML programming language. Web Apps sometimes are slower as the data is readily not available as it fetches the data via the Internet service provider. Once data is obtained, the web app starts working i.e.

Advances in electronics and computing and their integration have turned the modern mobile phone into a mini computer. Mobile phone applications, or apps as they are called, enhance its information and communication capabilities. With features like GPS, motion sensors, cameras etc., stand-alone devices are fast becoming obsolete for non-specialized uses.

Mobile Phone 'Apps' at your Service!

To run mobile apps, an operating system (OS) or platform is required. An OS platform manages the hardware and software resources of the device and controls all its basic operations. Operating systems are like the heart of the mobile phone; without it the device is just like a piece of metal in our hand. A good interactive interface linked to the OS is important; it keeps the device functioning according to the user requirements. Some examples of operating systems are Android, Mac, Windows Mobile, RIM (for BlackBerry), MeeGo, SHR etc.

The OS platform provides the base for the application developer to develop different kinds of apps. It is very necessary to have proper knowledge of the operating system to create an application for the mobile phones.

loading the webpage, browsing websites and downloading items. Examples of web apps include Facebook, Twitter, Hi5, Friendster etc.
Another important criterion to be followed while creating new apps is that it should be user-friendly. Even if the mobile has sophisticated features, it would be useless if the user is not able to operate it. Hence, the operating system plays a vital role in mobile functionality – from making the apps to their actual performance in the hands of the user.

There are many different kinds of operating systems like iOS, Android, Windows Mobile etc. that are designed and programmed in many different languages. The simplicity and versatility of programming language is the key criteria in designing operating systems and newer apps for the phones. Some OS like Android from Google Inc. are free and open-source, whereas others like Blackberry OS from RIM are proprietary.

Let us take a look at some useful applications in today’s cutting-edge mobile phones and see how they work.

**Touch Sensitivity**

Earlier, devices like tablets and touch screen-enabled computers worked by using a resistive screen composed of a thin layer of flexible polyester film over a layer of glass or plastic. These layers were crisscrossed with near-invisible wires. When the user touches the screen, the top layer is pushed towards the lower layer and these wires intersect. This changes the flow of current, which in turn helps in determining the location of the touch on the screen.

Nowadays, the touch screens are capacitive and have uniform sensitivity. For example, in iPhone, capacitors are arranged according to a coordinate system. When the user touches the screen, it generates electrical impulses. This signal travels from the screen to the processor. The processor uses software to analyze the features of the touch i.e. the size, shape and location of the affected area on the screen. If necessary, the processor arranges ‘touches’ with similar features into groups.

For example, if you move your finger, the processor calculates the difference between the starting point and ending point of your touch. In this way, the gesture interpretation software of the processor combines the physical movement of your fingers.
finger with information about which application you were using and what the application was doing when you touched the screen. The processor then relays your instructions to the program in use. If necessary, it also sends commands to the iPhone screen and other hardware. We can see changes on the screen based on our input almost instantly. If the raw data doesn't match any applicable gestures or commands, the iPhone disregards it as an extraneous touch.

Touch screen mobiles are more user-friendly than keypad mobiles. Rather than pushing lots of buttons, it is much easier to touch and type a message. In the earlier keypad phones, users had many problems with the keypads. Buttons would not work properly due to various reasons. Sometimes a water droplet would find its way inside and the whole keypad would stop working and would need to be replaced.

Today's touch screen mobile phones are free of such issues. Custom apps are linked almost entirely through computational means, ready to be summoned at the user’s touch. In addition, these apps are popularly used means of communication, information and entertainment, which minimizes the need for the user to give a lot of instructions. Many games are now much easier to play on the mobile. New games have emerged that take advantage of the responsiveness of touch screens, like piano, guitar and Burning the Candle. With one touch we can listen to music, play videos and do a lot more things in the touch screen mobile phones.

**Voice Recognition**

For many years, we could control our mobile phone only using its keypad. Later, technology companies and audio engineers tried to perfect voice recognition software to assist the blind and physically disabled to communicate through voice. Voice recognition software used is speaker-independent, where there is no need of training to understand our voice.

The emergence of smartphones in the last decade changed the entire scenario. Speaker-independent voice control was either built into the phone or offered through apps. The processing power and speech recognition were built into the phone with limited speech commands. The majority of the applications in mobile phones that work on voice command of the user mostly rely on Automatic Speech Recognition (ASR) with the help of which the user can use dialing, phone book search and various applications of the mobile phones. Most Smartphone users who have tried Android phones are familiar with Google’s speech recognition software, which is used mostly for navigation, mapping, making calls and launching programs.
The Automatic Speech Recognition (ASR) technology converts a speech signal into a text message transcription of the spoken words. When a speaker utters a stream of words, usually interspersed with pauses and utterances like ‘uhh’ and ‘ummm’, the software produces a speech waveform representing the words of the sentence as well as the extra sounds and pauses in the spoken input. The fragments of the sentences are then measured based on their amplitude and the level of compression of air released from a person’s mouth. The software then attempts to syntactically decode the speech into the best estimate of a sentence. A microphone present in the phone uses ASR and analog-digital converter to convert the analog data into digital data.

Many users have adopted smartphones as voice recognition is an attractive feature for them. Voice recognition increases the interactivity, convenience and flexibility with the mobile compared to touch. Besides, it can also be useful to people who cannot see or are unable to operate the mobile by touch.

Global Positioning System

Global Positioning System, or GPS, is one of the most widely used technologies in the communication world. GPS navigational systems are supported by a network of 27 satellites, which orbits the Earth in a cyclic pattern every twenty-four hours. At any given time, signals from a minimum of four satellites are accessible to any one point on Earth. Whenever a receiver device is activated, radio waves are sent out. A receiver’s exact location is determined through a process called triangulation where three satellites work together to track down possible location points, while a fourth satellite compiles the data and picks out the exact location. Distance calculations are made based on how long it takes the radio signals to travel back and forth between the receiver and the satellites.

A GPS tracking system uses the Global Navigation Satellite System (GNSS) network. This network includes a range of satellites that uses microwave signals that are being transmitted to GPS devices to give information on location, vehicle speed, time and direction. So, a GPS tracking system has a potential to provide the real-time and past navigation data on any kind of journey.

Location tracking by providers in case of an emergency and giving navigation directions are other uses of this technology in mobile phones. A mobile phone also works like a two-way radio when communicating with the cell phone towers and the GPS capability of phones simply extends the radio signals to reach out to the space satellites.

The receiver device can be located inside the phone itself, or the user can use a wireless connection like a Bluetooth connection. Mobile phones work on Java-based programs and have database access to their provider’s system. The mapping capabilities are displayed on the phone’s screen via the cellular provider’s database. The accuracy of these maps depends on how frequently your provider updates the database.

Mobile Camera

While cameras in earlier mobile phones were based on Visual Graphics Array (VGA) technology, most new mobile cameras are digital. So, did you ever notice how a picture is taken by your mobile camera and stored?
Digital cameras comprise of various kinds of chips. When the light from the object falls on the camera's digital sensor's pixels, they become excited with an imprint of the object. This imprint is passed through a colour filter that creates analog electric signals from light signals. This analog signal is converted to digital signal with an analog to digital signal converter. Then these signals are saved in chips known as memory cards, a location from which the image of the object we captured is recomposed.

The main working chips – the pixilated digital sensors – are Charged-Couple Devices (CCDs) and Complementary Metal Oxide Semiconductors (CMOSs). CCD is a silicon chip used to detect light and convert light photons into electrical energy (video). CMOS is a semiconductor chip that operates on the same principle as CCD chips but differs in quality. CMOS provides much better quality images, consumes less energy and is also less expensive than CCD based cameras. Today, most cameras in mobile phones use CMOS image sensors over CCD based cameras because of the reduced power consumption and are also cheaper to manufacture.

As compared to the VGA cameras, pictures we obtain from CMOS based camera chips have much better quality. People are increasingly going for mobile phone cameras with much higher pixel quality, and even starting to prefer mobile phone cameras rather than purchasing stand-alone picture cameras. Not only do they get most of the features associated with the digital camera, mobile cameras also tend to be much lighter than stand-alone picture cameras. Having a camera built into the mobile is handy to take pictures, such as when you need to record evidence in situations like vehicle accidents and during crimes, as well as record unplanned cherished moments.

**Motion Sensors**

Motion Sensors sense the change in the position of an object relative to its surroundings or vice versa. The motion sensor used in mobiles is known as accelerometer, which measures linear acceleration. Using this measurement, it translates motion into action on the screen. Earlier the accelerometers worked on one-axis to two-axis. Today’s advanced accelerometers have moved to multi-axis (i.e. six-axes: up and down, left and right, forward and backwards) measurement capabilities by which their accuracy has increased. Modern accelerometers are often small micro electro-mechanical systems (MEMS).

Accelerometers have provided many applications on mobile phones. They allow you to monitor a fitness workout by measuring the number of steps you take, your speed and the calories burned. As it is capable of detecting rotation and motion gestures such as swinging and shaking, mobiles can also used as gaming controls instead of pressing keys. Accelerometers can also measure the force of acceleration, whether caused by gravity or by movement, and the angle at which the mobile is being held by the help of which it automatically adjusts the visual output to make it appropriate to the direction of the screen. In this way we can view lists with the screen held vertically and watch videos with the screen held sideways.

Accelerometers have enabled the mobile processor to function more efficiently than the earlier phones by preventing incorrect key depressions from being processed. Such ambiguities are avoided in the upcoming mobile phones, which helps in efficient functionality of the app.

**IMEI Number**

Although this is not an app, IMEI Number is something all mobile users should be aware of. IMEI is the acronym for International Mobile Equipment Identity. This...
and a terminal (phone) only needs to be strong enough to reach between the two, so the same channel can be used simultaneously for separate conversation in different cells.

2G: 2G signifies wireless digital technology that replaced analog 1G, and includes FDMA (Frequency Division Multiple Access), TDMA (Time Division Multiple Access) and CDMA (Code Division Multiple Access). All types have one common feature of multiple access which means that many users are able to use the same number of cells. 2G started working with GSM (Global System for Mobile) standard as a communication medium. In addition to the GSM protocol, 2G also utilizes various other digital protocols including CDMA, TDMA iDEN and PDC. GSM is based on TDMA.

GSM technology was the first to help establish international roaming, as it was based on digital signals. The second generation introduced a new variant of communication, SMS or text messaging, initially on GSM networks and eventually on all digital networks. 2G technology holds sufficient security for both the sender and the receiver due to digital encryption of messages. Digital signals consume less battery power, so it helps mobile batteries to last long. Digital coding improves the voice clarity and reduces noise in the line. Digital signals are considered environment-friendly. The use of 2G technology requires strong digital signals and good network coverage to help mobile phones work.

3G: 3G networks are built to handle the needs of today’s wireless users, with faster data-transmission speeds, greater network capacity and more advanced network services. 3G technology was also known as CDMA Wireless technology. It is the first wireless technology that provides broadband-speed Internet connection on mobile phones. The first pre-commercial 3G network was launched in May 2011 by NTT DoCoMo in Japan. The main advantage of 3G networks over 2G networks is speed. This standard of wireless networks increases the speed of Internet browsing, pictures and video messaging. Technically, the main difference that distinguishes 3G technology from 2G technology is the use of packet switching rather than circuit switching for data transmission. Later 3G technology began to be implemented, namely High-Speed Downlink Packet Access (HSDPA).

4G: The objective of 4G is to become a fully IP-based system, much like a modern computer network. The supposed speeds for 4G will be higher that 3G, and can provide Internet speeds up to 1 GBPS! One of the main ways in which 4G differs technologically from 3G is that circuit switching will be eliminated, and an all-IP network will be implemented in its place. 4G will be able to overcome the problems of weak network strength and should provide a much wider network, making sure that the users get high-speed connectivity anytime anywhere. No doubt, 4G will open new doors of revolutionary Internet technologies. 4G promises voice, data and high-quality multimedia in real-time all the time and anywhere.

Some useful apps that utilise internet-enabled infrastructure are:

1. Talking tom: This is the app that has a cat that just repeats whatever you say in the same manner and in a funny voice. This app works in the same way as the voice recognition software. This app takes the command or instructions from the user through the microphone and processes it.

2. You Tube: This app works online. It works the same as the real youtube website works. With the help if this app, the user can watch videos at any time and can play for any occasion he/she likes. Users can even upload their own videos to the Youtube app. For this the user need not open the browser and type ‘youtube’; instead the user can just touch the app and it becomes available in a jiffy.

3. MS Office: Nowadays, even the MS Office app is being provided on smartphones so that the user can make or view documents or PowerPoint files.

4. Shazam: This is another online app that works using the microphone and then checks with the online database to give the user the desired output. For instance, you hear a song and want to know who is the singer or from which album it is? The app will ‘listen’ to the song and search for its details in its database and give you the details.

5. Online Dictionaries: You want to know the meaning of a difficult word. No need to carry the entire dictionary along with you; instead this app, which has its own database of a large number of words, will fish out the meaning for you instantly. In case it does not have the meaning of a certain word, it would ask the user to go online and search for the word’s meaning.

6. Internet Radio: It is an app that helps you listen to the radio through the Internet. Just connect to the Internet radio app, it will automatically scan all the stations and let you listen to your most favourite songs.

Native Apps work offline and only on one platform i.e. operating system. They work efficiently and effectively as the relevant data is present inside the device only.

The IMEI number is a unique number associated with every mobile phone and can help us to find our stolen cell phone easily. We can find our mobile phone’s IMEI number by dialing the sequence *#06# into the phone. The unique 15-digit IMEI code of the mobile phone will be displayed instantly. Note this number down and keep it in a secure place so that you can find it in case your phone is misplaced or stolen.

You can also find the IMEI number by checking the metallic plate under the battery, after making sure that power is switched off.

In case your mobile phone gets lost or stolen, you can inform your network provider who can then put the IMEI number on a shared database. This will prevent that particular phone from being registered on any network. Thus, it will be useless for a thief even if the mobile phone’s SIM card is changed. And then, by the use of GPS, the phone could be tracked. This IMEI number is also required to unlock the mobile phone and get it working once it is found.

In case your mobile phone doesn’t have the IMEI number then you are in trouble! The Department of Telecom (DOT), Ministry of Communications and Information Technology, Government of India has directed cell phone operators to disconnect mobile phone handsets without legitimate International Mobile Equipment Identity (IMEI) number from 1 December 2009. This has been done to counter threats to national security, as many crimes have been aided by phones that cannot be easily tracked. So check your cell phone and replace it if it does not have a proper IMEI number to prevent misuse of your phone.

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