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Photos are one of a kind, yet they present to us many stories that can be told and frame our thoughts and dreams of faraway places, a foot print left on the moon, or the landing of Apollo 11 Lunar Module on the moon July 20, 1969.

Step back seven years in time from that first step on the moon to September 12, 1962 to watch a dream in the making when our president, John F. Kennedy spoke to the nation, from Rice University, Houston, with a message of challenge and accomplishment, only seven months after John Glen became the first American to orbit the Earth aboard Friendship 7. No space walks had been accomplished, no lunar modules were built and no docking procedures had been developed... *"We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too"*


John F. Kennedy

PREDECESSOR TO GPS

A satellite navigational system was tested in 1960 based on the need for accurate positioning for the submarine-launched Polaris missile being developed by the Navy. There were parallel developments for navigational systems by the Navy, Air Force and the Army called Transit, Timation, and SECOR. By 1973, it was realized that a superior navigational system could be developed by combining the best of these technologies.

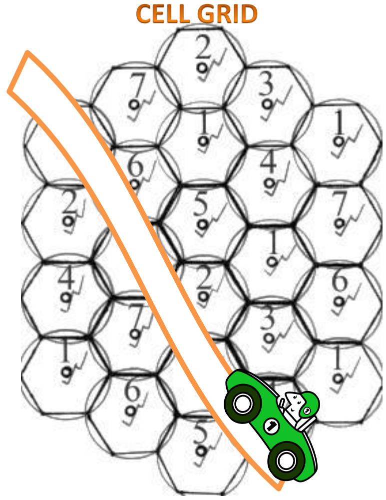
Advances in mobile telecommunications can also be traced in successive generations and by 1973 Motorola produced the first handheld mobile phone invented by Dr. Martin Cooper. Cooper stated that his vision for the hand held devise was inspired by Captain James T. Kirk using his communicator on the television show Star Trek. The wireless hand held phone would go through several more changes as technology improved in reduction of size and battery development. That first handheld device was a two way communicator. It needed long range capability and a large power source, a CB radio in a class called Simplex devices. Coopers device offered a talk time of just 30 minutes and took 10 hours to recharge.

The first analog cellular phone was commercially introduced in 1978. By the 1990's a second generation mobile phone was introduced as a digital device and steady advancements continue as it included the first smartphone in 1993 by IBM.

CELL PHONE TECHNOLOGY

A cellphone needs a cellular system to operate. A cellular system is developed by arranging base stations approximately 10 miles apart called cells. To show a typical grid of cells covering a city, the design uses hexagon shapes to show each cell with an overlapping circle to show signal range from the base station. Seven cells in a cluster will make up a working system. Each cell in the cluster needs a separate frequency and must not share the same frequency in an adjacent cell. A cell-phone carrier typically gets 832 radio frequencies for the entire city system. In order to work, each cell will have from 56 to 168 voice channels available depending on the digital technology system in use. As a cell-phone is moved from one cell to another the cell-phone will use its internal control processor to detect when the phone signal is becoming weaker as movement becomes closer to the next cell and will switch to the frequency of the next cell. The user will not notice the hand-off of the signals between cells so a driver will have un-interrupted phone service throughout the drive through the city or across the country.

CELL GRID



The Inmarsat satellite telephone system was originally developed in 1979 as an earth-orbiting satellite for safety at sea and is now in use in areas that are out of reach of landline, conventional cellular or marine VHF radio stations. In 1998 the Iridiun satellite system was in place and is in service today.

GYROSCOPE PRINCIPLES

The Earth, in its steady rotation and influences from other heavenly bodies produces a gyro effect called, "precession of the equinoxes". A bicycle stops wobbling as speed of the cycle increases. The wheel of the cycle is a rotor fixed to an axle that rests on bearings and is mounted in a fork shaped gimbal attached to the handle bars and cycle frame. As the wheel rotates at high speed it will acquire a strong will due to its gyro effect to remain pointing in the upright position even when the cycle is turned or tipped to the side.

GPS TECHNOLOGY

The Global Positioning System is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is unobstructed line of sight to four or more GPS satellites. A GPS receiver uses measurements from satellite radio signals and basic geometry to calculate an exact location. The GPS system provides critical capabilities for military, civil and commercial users around the world. The system is maintained by the United States government and is freely accessible to anyone how owns a GPS receiver. The design of GPS has its origins in applications of navigation and survey techniques. In 1962, the U.S. Army developed and launched the SECOR system similar to the radio-navigation system LORAN and Decca. The SECOR system included three ground-based transmitters from known locations that would send signals to the orbiting satellite. A fourth station could receive signals and use those signals to identify its exact location. SECOR was used for Geodetic survey and was in operation through 1970.

By 1973 it was realized that a superior system could be developed to overcome the limitations of previous navigational systems by choosing the best technologies from Transit, Timation, and SECOR systems. Technology from these systems formed the Global Positioning System (GPS) by locating 24 satellites in orbit at an altitude of approximately 20,200 km (12,600 mi.) consisting of a master control station, an alternate control station, four dedicated ground stations and six dedicated monitoring stations. The first satellite was launched in 1989 and the 24^{th} satellite was launched in 1994 completing the fully operational GPS system. There are currently 32 satellites or Space Vehicles (SV) that make up a constellation of 6 circular orbital planes each having a radius of 26,600 km (16,500 mi.). The oldest GPS satellite in operation was launched on November 26, 1990 and the most recent satellite was launched on May 15, 2013. GPS modernization has become an ongoing project to upgrade the GPS system with new capabilities to meet growing military, civil and commercial needs. The next generation GPS Operational Control System is a critical part of modernization and is on schedule to be launched in May 2014.

GPS BASICS

A GPS receiver calculates its position by precisely timing the signal sent by the GPS satellite. Each satellite in orbit continually transmits messages that include the time of the transmission, and the position of the satellite at the time of transmission. About nine satellites are visible from any point on the ground at any one time providing maximum reliability. Although four satellites are required for normal operation, fewer can function in cases where some GPS receiver can use additional clues like the last known location from a vehicle computer, altitude, or dead reckoning.

The current GPS system consists of three segments. These are the space segment, a control segment, and a user segment. The U.S. Air Force develops, maintains and operates the space and control segment. GPS receivers use these signals to calculate its three-dimensional location of latitude, longitude, altitude and current time. The user segment is composed of U.S. and allied military users of a secure GPS Precise Positioning Service and civil, commercial and scientific users in the Standard Positioning Service.

GPS receivers have an antenna tuned to the frequency transmitted by the satellite. An internal receiver-processor computes the flow of information and handles the function of the keyboard and display, deals with command and control signals with the satellite and coordinates the rest of the functions of the circuit board. A receiver is identified by the number of channels available signifying the number of satellites it can monitor simultaneously. All satellite signals are carried on a single frequency of 1.57542 GHz and must be separated using a sequence known as the Gold code that corresponds to each of the satellites being monitored by the receiver. A receiver has a stable clock set to the satellite clock providing continues and accurate interval timing so processing of the navigation message will establish the time of the transmission and the satellite position in its orbit. When more than four satellites are available the receiver-processor can use the best four signals. for calculations. GPS is widely deployed for scientific use, tracking, surveillance, navigation, astronomy, cellular communications, emergency service, recreation and much more. The GPS receiver guesses the actual speed of the signal by using complex mathematical models of a wide range of atmospheric conditions. The satellite transmission will include relevant weather information as part of the signal. Some GPS receivers are programed with a speed limit into the device so if the device is moving above a certain speed it will not work properly. A GPS device designed to be used in a car may not work in an airplane due to its lack of ability to lock on to a signal at higher speeds. GPS devices with an LCD screen may not work well in certain weather conditions so a check of manufacture instructions should be noted before using in some extreme weather conditions.

The United States owns and operates the worldwide network of Global Positioning System (GPS). There are other systems in various stages of development by other nations.

Russia's global navigation system GLONASS is fully operational worldwide. The European Union and other countries are planning to have a global system (Galileo) operational by 2014 and fully deployed by 2019. The People's Republic of China plan to have COMPASS operational by 2020 and have a regional system currently limited to Asia and the West Pacific. A regional navigation system is planned by India named IRNSS and is planned for 2014 to cover India and Northern India Ocean. Japan is covering Asia and Oceania with QZSS.