Metal detector search coils

Online resources have abundant material about metal detectors. I approach on PDF file published by Minelabs. In the paper, I learned that metal detectors use one or more coils (vire wrapped in lops for a number of turns). If a metal detector uses one coil, then the coil serves as a receiving and transmitting coil. If more than one, the transmitting coil creates a variable magnetic field. The second RX coil acts as radio and picks up the signal from the TX coil. Electronic circuitry demodulates signals and analyses.

Changing the magnetic field created by transmitting coil causes currents to flow in metal objects (called eddy currents). Thous currents create week magnetic fields and RX coil can pick up that signal. But Signal created by TX coil is much grated than the signal from the object and has to be filtered by electronics and amplified for use. The received signal can have 2 components reactive (X) other Los components or resistive (R). Thous signal is dependant on the size and depth of an object.

Search coils happen to exist in different shapes and sizes. All difference comes from different applications of metal detectors. The most popular type is concentric/coplanar. This coil uses two transmit and one receive coil. Pinpointing is easy to achieve because the greatest signal is at the center of the coil and is compatible with the discriminate function and works well. The disadvantage comes when sweeping the search site, sweeping has to be controlled otherwise many objects can be lost and in heavy mineralized soil, the detector loses sensitivity on smaller objects buried deeply.

DD or 2D wide scan coils uses two coils shapes like later D and aligned back to back. This coil setup creates a narrow elliptical shape detection zone. Thous types of the coil are not affected by heavy mineralized soil and sweeping can be not controlled. But coils have pore pinpointing due shape their detection zone.