Capacitive and Inductive

yulung tang

From the very basics, it is all about Force and Energy.

Foce is exercised to build up Energy. The existence of Force comes from that of Field. Field is the interaction among the same physical objects. For example, G Field created by certain mass interacts with another mass; E Field created by certain charge interacts with another charge.

Energy generally exist in two general forms, which are Potential and Kinetic. When there is a Field, Energy can be built up on displacement and movement. This corresponds to Newton's 1st law of motion, saying that resting object always rests and moving object always moves until there is an external force being applied to it.

In the electromagnetic world, Potential is capacitive, while Kinetic is inductive. In the analogy of a spring, the Potential and Kinetic engegies exchange with each other, so SHM (single harmonic motion) happens, thus the spring oscillates. Similarly, the Capacitive and Inductive energies exchange with each other, EM wave then radiates.

As mentioned, when the field exists, the Energy can be built by field displacement and movement. Electrically, the field displacement is gauged by Voltage (V); while the field movement is gauged by Current (I).

Capacitive energy can be built in displacement field (V) by moving in some quantity of electrical flux Q. In the same way, inductive energy can be built in movement field (I) by moving in some quantity of magnetic flux Ø. Thus,

Capacitive energy = Q V	Inductive energy = Ø I
Q: electrical flux in Coulomb (J/V)	Ø: magnetic flux in Weber (J/A)
V: voltage in Voltage	I: current in Ampere

To also discuss

$Q = C V$	$Ø = L I$
$\epsilon E = D$	$\mu H = B$
$Y = j\omega C$	$Z = j\omega L$