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http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=119564 , http://, Constantine A. Balantis

Wireless antennas are a critical piece to modern communication. They are designed to radiate or receive electromagnetic waves. It acts to transduce guided waves into free space waves or change free spaces waves into guided waves. The advent of antennas was allowed by the formulation of maxwells equations in 1873, the first signal sent over a large distance did not occur until 1901. Modern advancements such as waveguides did not occur until WW2 and beyond.

Radiation is a critical component in a wire. Consider a wire connected to some driving source. The electrons in the wire are initially accelerated by the source, this is done by an external field. The electrons move through the wire and begin to decelerate at the other end. This deceleration is caused by internal forces due to charge buildup at the end of the wire. This new induced field along with the external field allow for electromagnetic radiation.

Antenna problems can be modeled and solved via Maxwell's equations, and like most E&M problems, different geometries lend themselves to different solutions. The use and growth of modern antennas has led to many important electronic advancements. The use of supercomputers will lead to the design of more powerful antennas.

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This paper discussed mathematical techniques involved in antenna theory. It begins by considering a dipole configuration, which is solved used maxwells time dependent equations. These give rise to the electric and magnetic field which have static, induced and radiated field contributions. The use of computers allows visualization of these solutions for various distances from the point of interest. It was discovered that for large distances the shape of the electric and magnetic field looks just like the shape of the current.

I think this paper will be of great use to me because it takes something I am familiar with, the dipole field, and expands upon it. It assumes a higher level of mathematical sophistication, but I plan to supplement that with lecture notes and other textbooks. The major take away for me was that time dependent problems give rise to multiple terms when solving for the fields. The fields all contributed, the most familiar is the static field. The most unfamiliar is the radiated field contribution, which I am going to have to spend some time learning about.