OpCoast

Modeling Radio Jammer Effectiveness

Background
Improvised explosive devices (IEDs) or 'boobytraps' are one of a soldier's greatest enemies. According to the Joint IED Defeat Organization (JIEDDO), IED's are "a 'homemade' device designed to cause death or injury by using explosives in combination with toxic chemicals, biological toxins, or radiological material."

An IED can be made of almost anything with combustible material and an initiator. And, as our wars move into more urban environments, IEDs can be set off by remote control devices, such as cell phones or garage door openers.

Challenge
Jamming radio spectrum is a highly effective way to suppress IED trigger transmissions and create a secure military zone. The science of radio propagation (the analysis of radio waves and how they are transmitted) is essential to defining the paths of frequencies, but this is a highly challenging task.

Jamming transmissions are fairly easily defined when you are working over wide flat areas, like a frozen ice field or flat desert, but electronic warfare is shifting to more urban environments. Large buildings and narrow streets create elaborate mazes of unique and complex transmission paths as the radio waves bounce off buildings and terrain, while exhibiting diffraction around building edges.

Solution
OpCoast's SNEAK (Sensor/Network Electronic Attack Kit) provides physically-realistic analysis and optimization of radio frequency sensing and jamming for missions in complex urban terrains. Using the parallel processing capabilities of NVIDIA® Tesla® GPUs, SNEAK enables real-time analysis of threats so military units can direct jammer energy in a faster, more effective manner. Mobile units can pinpoint areas to be jammed, avoiding interference with friendly communications and ensuring that danger zones containing IEDs are well covered.

Impact
SNEAK was originally intended to be a mission planning tool, so that military units could model jammer effectiveness in advance, a process that used large clusters of computers. GPUs have allowed this capability to be placed into the field. Now, a mobile unit can direct the placement of jammer energy while giving the solder an accurate image of the coverage while the mission is en route. The product is now being developed for army intelligence sensors and radar in electronic warfare environments.

"Jamming is just the start," said Ben Epstein, VP of Special Projects at OpCoast. "SNEAK was originally based on workstations and a High Performance Computing Linux cluster, but the power of GPUs transformed the program from an offline exercise to a real-time deployable tool. The computational capabilities of GPUs took us from hours to seconds, allowing analysis on the fly and giving us the ability to make "what if" changes to the jammer operating parameters accordingly. Thanks to the speed of GPUs, we can continue to develop our technology and help any application requiring the real-time analysis of wave propagation in electronic warfare, radar or even sonar systems. GPUs make it all possible."