

Periodic Spatio-Temporal Improvised Explosive Device Attack Pattern Analysis

Matthew Benigni
Major, Armor
Dept. of Mathematical Sciences, USMA
West Point, NY

Dr. Reinhard Furrer
Department of Statistics
Colorado School of Mines
Golden, CO

Abstract

Improvised Explosive Devices (IEDs) are the number one killer of coalition combat forces in the Iraq Theater of Operations (ITO). A unique characteristic of this terrain is that attacks happen almost exclusively on roads. This allows us to reduce location to one dimension and consider historical attacks to quantify periodic, spatio-temporal clusters. The end result for a set of specified routes, is a set of inhomogeneous, bi-variate rate functions that aid the patrol leader in his or her route selection and/or intelligence preparation of the battlefield.

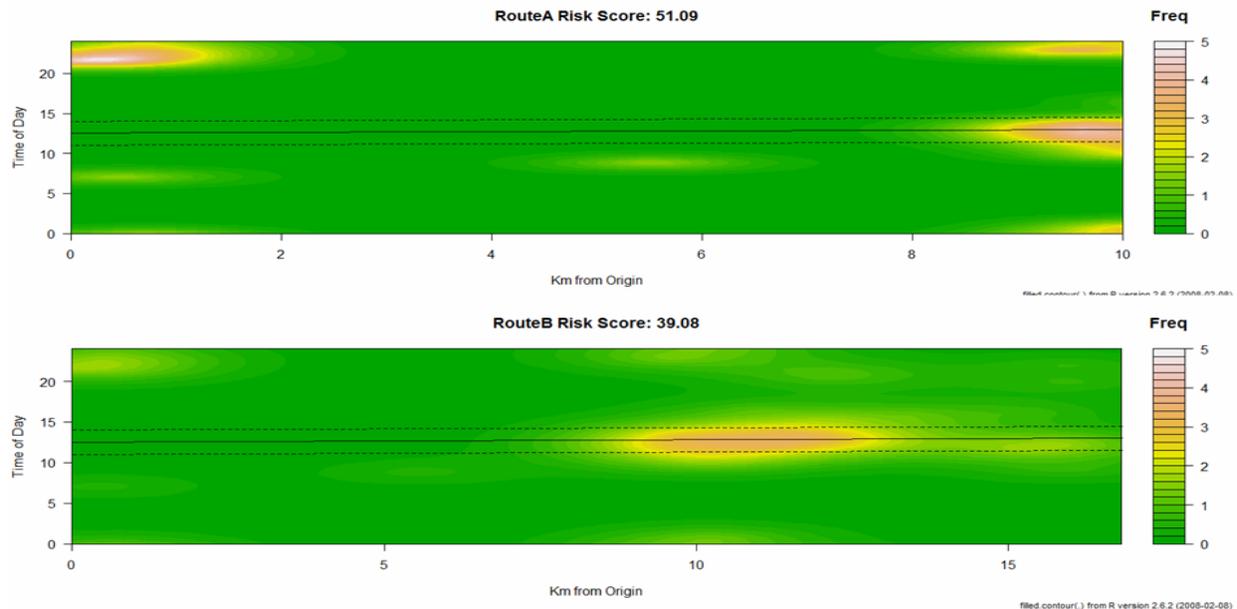


Figure 1: Shaded contour plots of our estimated attack rate functions for two potential routes to a specific objective. The x-axis depicts road distance from the route origin, and the y-axis depicts time of day in hours. The solid lines depict the predicted routes in time and space and the dashed lines represent the area of interest used to generate risk scores. The risk scores are the integrated attack rates between the two dashed lines.