RUTGERS Center on Public Security

BRIEF

Introduction to Risk Terrain Modeling (RTM) for Strategic Decision-Making and Tactical Action

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Assessed risk shapes strategic decision making for short- and long-term planning and prevention efforts. While the crime event occurs at a finite place, risk is a continuous dynamic value that increases or decreases intensity and clusters or dissipates in different areas over time (i.e. even areas remote from a crime event). Risk values are tied to geography, and, regarding crime, risk values are the measure of a geography's potential for a crime event to occur. The risk is determined by a nexus of certain factors and it changes only as the characteristics and interactions of those factors vary. In other words, risk changes with geography at all scales—i.e., feet, blocks, neighborhoods, cities, or states. Public safety resources are also often deployed to certain geographies. Assessing criminogenic risk at the geographic level, therefore, allows for a more strategic allocation of resources.

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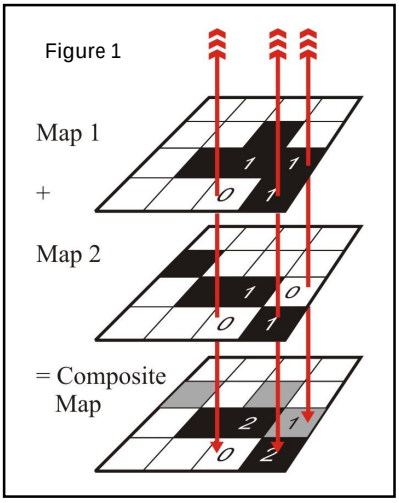
Because the concept of risk has a spatial component, proper risk assessment requires Geographic Information System (GIS) tools to describe, explore and explain the environment within which risks exist. Considering the spatial context of risk is important because people operate in space. This is a simple idea, but it is often overlooked. Our activities, legal and illegal, happen at some location on Earth. Police officers know that some locations are riskier for crimes to occur than others; at least, they may not be surprised when certain crimes tend to cluster in one particular area but not other areas. Perhaps they can articulate why, perhaps they cannot. The point is that because all people operate in space, risks to these people or their properties must also exist in space as well.

The risk of a crime event occurring at a specific location is determined by many factors. Sometimes all of those factors must interact at the same place and time for the event to occur. For example, individual meteorological factors that are incorporated into weather forecasting do not necessarily produce rain, thunder storms or hurricanes by themselves. It is only when they intersect in space and time that they have the greatest potential to yield a particular outcome. Other times, only one or a few factors may be required to interact about the same geography and at certain times for a particular event to occur. Understanding the spatial-temporal interaction effects of certain factors of crime is key to assessing and valuing risk.

The Risk Terrain Modeling (RTM) method of risk assessment aids in crime forecasting and prevention efforts by incorporating underlying causes of crimes and other threats to public safety. Risk terrains are a valuable product of the RTM method. The conceptual framework of the method is straightforward: identify, through meta-analysis or other empirical methods (i.e. factor analysis), literature review, professional experience, and practitioner knowledge, all factors that are related to a



particular outcome for which risk is being assessed. Then, operationalize—standardize—each factor to a common geography. Essentially, the RTM assigns a (weighted or un-weighted) value signifying the presence, absence or intensity of each factor at every location throughout the coverage (study area) of a given geography. Each factor is represented by a separate coverage (raster map layer) of the same geography. When all map layers are combined in a GIS (see Figure 1, above), they produce a composite map—a risk terrain map—where every location throughout the geography is assigned a composite risk value that accounts for all factors associated with the hazardous outcome. The higher the risk value the greater likelihood of the hazard occurring at that location.

When RTM is applied to crimes, risk terrain maps are produced that show areas with the greatest risk or likelihood of becoming spots for crime to occur in the future. Not just because police statistics show that reported crimes occurred there yesterday, but because the environmental conditions are ripe for crime to occur there tomorrow.

Meaningful techniques and approaches to risk assessment should be able to more-often-than-not forecast future hazardous events. RTM assumes a step that is basic to the development of geographic information systems in that certain spatial locations can acquire attributes that, when combined in prescribed ways, create contexts in which certain outcomes are made more likely. So, as an example, the combined attributes of open space, presence of children and proximity to schools may indicate a playground. These attributes combined can be used to anticipate the types of behavior that we would expect in a playground–reducing the uncertainty that our forecasts about what would transpire here are wrong. In this way, then, we use attributes as a way of assigning risk (or likelihood) that certain events will happen in a particular geography. Now, these outcomes may be benign (e.g. children playing) or they may take on a more sinister character where a combination of certain types of factors creates a context in which the risk of hazardous outcomes (including crime) can occur. The advantage of RTM is that it provides a landscape that can be considered in terms of factors that contribute to crimes or other negative outcomes that are more enduring than just the characteristics of the people who frequent these locations.

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