

# Applying Geographic Information System to Locate the Residential burglary Hotspots in Penang Island, Malaysia

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## Abstract

Identifying the geographic areas with a high concentration of house break-in incidents is crucial in policing and prevention initiatives. Despite the popularity of geographic information system in mapping residential burglary, not many studies have explored the significance level of the areas comprising crime to understand the severity of the hot spots. Hence, this study sought to identify the geographic location of the residential burglary hotspots in Penang Island and explores their spatial configuration. The latest available (2011 to 2013) police-recorded incidents of house break-in for day and night were collected from Penang Islands Headquarters, Georgetown. Geocoding technique was used to map the exact postal address of the houses in GIS. This study applied two spatial analysis tools, namely 'Getis-Ord or Gi\*' and 'Average Nearest Neighbor' to detect the locations of the hotspots of residential burglary hotspots. The results demonstrated a high clustering value for the residential burglary hotspots in the year 2013. The study concludes that even though most of the subdistricts of Penang Island have low or average-value clusters, but the increasing claustration value of the hotspot from 2011 to 2013 proofs that there is a persistent underlying physical or socioeconomic issue in these areas. Therefore, detection of the relatively in more vulnerable areas in this study makes the decision of resource allocation for further exploration and immediate treatment by the authorities easier. Overlapping of the hotspot maps generated in this study with other maps such as various crime types, land use, and socio-demographic maps will help in deeper scrutinization of the reasons behind the occurrence of house break-in of the hotspots..

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## I. INTRODUCTION

Knowing the location of a burglarized house is the first crucial step in combating the manifestation of residential burglary. Several crime theories such as crime pattern theory, rational Choice theory, routine activity theory which meticulously scrutinize the information about the geographical location of burglary incidents to explain their occurrence. Hence, identifying the location and pattern of the houses with residential burglary contributes to understanding the reasons for these incidents

When the incidents of a residential burglary in a specific geographic location is clustered with a high level of concentration as compared to its distribution across the whole area then a hotspot is formed (Chaniny&Ratcliffe, 2013). The spatial characteristic of the hotspots with high intensity of burglarized houses clustered in a certain location makes their identification and exploration critically important (Eck et al., 2005; Chainey&Raftcliffe, 2013; Sherman, 1995).

Geographical information systems (GIS) has revolutionised the mapping of the spatial location of