



### 论文摘要

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## 基于结构特征的矢量地图数字水印算法研究

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**摘要:** 提出一种基于地图图层结构特征的数字水印算法。根据矢量地图所含结点、线路和区域3种图层的拓扑特点, 定义不同的度量规则并引入模糊聚类分析方法, 对矢量地图进行综合优化, 获得地图内可供水印嵌入的矢量目标集合; 同时, 选用比特位复合的方式, 将水印信息嵌入地图属性文件描述目标对象的坐标块中。研究表明: 采用该算法达到了地图精度的零损伤要求; 在不同矢量数据压缩比率下, 该算法比其他方法的误码率低10%~20%; 在抗几何攻击方面, 该算法与同领域水印算法相比, 所产生的平均误码率可降低50%。

**关键字:** 矢量地图; 数字水印; 结构特征; 拓扑

## Digital watermarking of vector maps based on structure features

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**Abstract:** A watermarking algorithm based on the characteristics of the structure of map layers was proposed. According to the topological characteristics of three basic layers such as nodes, segment, region in a vector map, with fuzzy clustering analysis methods, an optimized embedded target set was achieved by different appraisalment rules. Using the bit-compound, watermark was embedded into the corresponding coordinate blocks of vector objects in an attribute file. The results show that the requirement of lossless accuracy can be achieved; false negative rates (FNR) can be reduced by 10%-20% at different compression ratios and compared with other algorithms mentioned, the average FNR will be reduced by 50%.

**Key words:** vector map; digital watermarking; structure feature; topology

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