应用 WS/GPS 技术的粪渣收运监控系统的开发

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摘 要：通过安装于粪渣收运车辆上的车载称重系统（WS）和全球卫星定位系统（GPS），经由通用无线分组业务（GPRS）将粪渣收运车载重变化及其位置信息，实时传回监控中心的数据库中[1]，并通过集成地理信息系统（GIS）的粪渣收运监控系统浏览、查询、管理粪渣收运情况。主要以车载重量变化信息作为收运监控参考的重要依据，并配合车辆定位信息，以核查粪渣收集、运输、卸载的时间、地点、重量，保证粪渣收运的合理安排和正常排放。

关键词：监控系统；车载称重系统；全球卫星定位系统；通用无线分组业务；地理信息系统

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对于大多数城市而言，现有的粪渣污泥处理方式是收运到垃圾处理厂和污水处理厂进行处理。然而每天产生的粪渣污泥只有极少部分收运到了垃圾处理厂和污水处理厂，绝大部分粪渣污泥直接排入了地下管网或河道。所以通过粪渣收运管理：建立一个实时的监管系统，对粪渣收运企业的粪渣收运过程进行实时监管来彻底改变粪渣污泥处理现状，保证数量巨大、分布分散的公厕和小区化粪池中的粪渣污泥正常进入处理厂进行处理。本研究从实际出发，通过无线移动服务与空间信息服务的有机结合[4]，采用成熟的车辆称重技术、3G（GPS、GIS、GPRS）技术对粪渣清疏收运进行监控，保证车辆现场数据与监控中心的决策、控制保持双向实时无线通信[3]，从而建立起科学的粪渣污泥清疏收运的综合管理系统，为粪渣清疏收运管理模式的建立提供有力的技术保障和应用平台保障。

1 总体方案

粪渣收运监控系统（如图 1 所示）由称重传感器、车身水平补偿器、仪表和 GPS/GPRS 模块、监控中心组成。通过安装在车辆上的传感器，将载重量转化为多路电信号，多路信号汇总到车身水平补偿器进行信号汇总与补偿，再传输到车载仪表，最终由 GPS/GPRS 模块将数据（重量、车号、GPS 定位等）传输到监控中心进行分析处理和管理。

1.1 粪渣收运车

本研究与深圳某清洁公司合作，利用现有的一台粪渣收运车作为本试验的研究对象（如图 2 所示）。

1.2 称重传感器

通过安装在车辆上的传感器，将车辆的实际装载

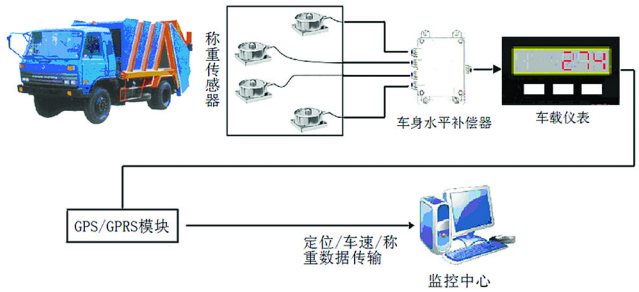
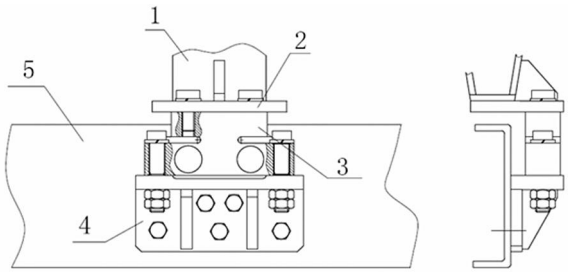


图 1 粪渣收运监控系统总体结构

图 2 粪渣清运车

重量转化为电信号。经过测算，称重传感器采用四点支承方式进行安装，安装方式见图 3。



1－罐体支撑架，2－上连接板，3－传感器，4－下连接件，5－汽车大梁架

图 3 传感器安装方式

安装后效果见图 4。

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图 4 传感器安装效果图

1.3 车身水平补偿器

补偿由于车辆倾斜（如车辆上下坡）而导致称重数据误差，提高车辆行驶动载称重精度。该设备安装在车罐下面，接入 4 个称重传感器信号，经过补偿计算后再连接车载仪表。安装效果见图 5。

图 5 车身补偿器安装效果图

1.4 车载仪表

为车主提供车辆装载货物重量显示报警，提供简单运输计重管理功能，并与 GPS/GPRS 模块集成封装，安装在驾驶室中。车载仪表中的 GPS 模块接收 3 颗或 3 颗以上不同 GPS 卫星每秒钟发送的位置、时间等信息[2]，再与接收的车载重量信息一起，通过 GPRS（采用 TCP/IP 协议[5]）实现无线数据传输。

图 6 车载仪表配置界面

1.5 监控中心

通过专门的应用软件，从上行数据中提取相应数据、重构信息数据包，并进行数据解析，将解析成果存入数据库[6]。从 GPRS 模块传输的数据，包括车牌号、车辆载重量、GPS 定位数据，由此可对车辆进行载重实时监控，并通过管理系统进行管理。

2 系统运行测试

监控中心将接收到的车辆 GPS 定位数据保存在数据库中，通过 GIS 将该定位数据转换到深圳市电子地图上，可准确显示车辆运行轨迹，如图 7 所示。

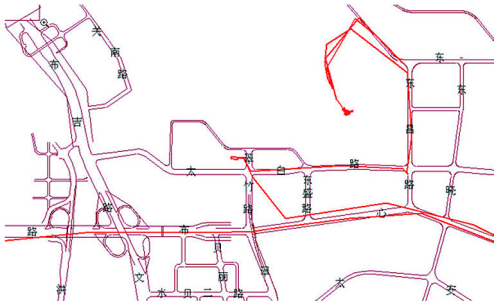

图 7 监控中心接收到的车辆运行轨迹

同时，监控中心亦将接收到的称重数据保存在数据库中，通过管理系统将该称重数据用折线图反映出来，可准确显示车辆的载重情况，如图 8 所示。

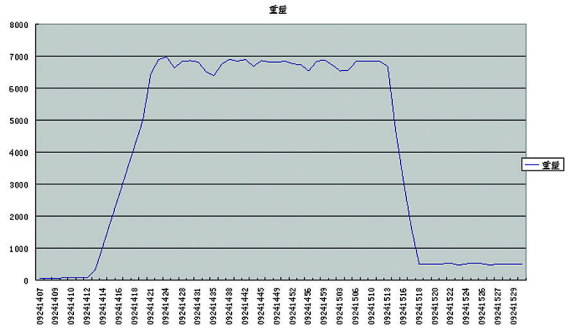

图 8 监控中心接收到的车辆载重数据

3 结 语

本研究达到了 3 个预定的目标：

1）车载监控系统的硬件安装，也就是车辆改装是可行和安全的；通过车辆改装的安全计算、方式和过程，可以保证不同型号的车辆只需对改装方案稍做调整即可。

2）车载监控系统的数据采集、处理、传输等技术手段是可行的、成熟的、安全的、稳定的。在对多辆车进行监控时，有可能会出现数据接收不及时而丢失部分数据的情况，解决的方法：一是要选择处理性能较高的服务器；二是监控中心的数据接收程序能够多线程处理数据。

3）车载监控系统能准确地监控粪渣车的排放时间、地点和重量；今后在监控中心的软件 （下转第 54 页）

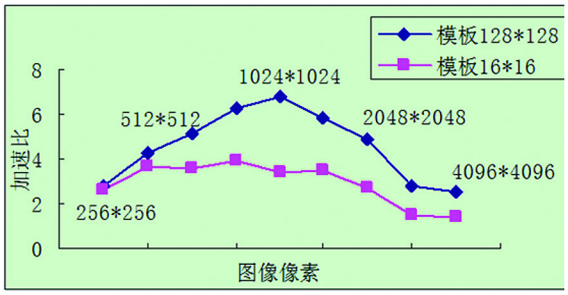

图 11 基于 CUDA 和 OpenCV 的模板匹配性能比较图

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(上接第 46 页)设计中,对传回的重量数据做进一步地分析,可更加直观及时地反映粪渣车的实际运行状况。

随着城市交通和无线通讯技术的迅速发展,对车辆的实时监控就显得越来越重要[7]。本研究对城市管理和物流行业等其他载重运输的管理也非常有借鉴意义,现在的载重运输管理主要还是采用 GPS 监控,而没有加入重量监控。采用本研究中的监控方式,可以将营运路线监控和车载重量监控有机结合起来,既可以保障运输的安全,又可以为营运管理模式的提升和深化提供更多的数据支持。

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Key words basis of geographic information , aerial exploration , process modification ,Continuous Operational Reference System (Page:27)

Construction of FJCORS and Its Application in Control Survey

by WANG Yanchun

Abstract Continuous Operational Reference System (CORS),which can provide real time positioning service, is one of hot spots about contemporary GPS development. Fujian Continuous Operational Reference System is illustrated in detail from the system composition and the technical indexes. A new control survey method based on FJCORS and Local Geoid is provided.

Key words FJCORS; Control survey; Local Geoid (Page:29)

Optimal Scale Selection of Rasterizing Vector Data in Guizhou Karst Mountainous Area by ZHOU Xu

Abstract After a series of quantitative experiments, this paper proposed that complexities of study area, requirements of accuracy, and computing efficiency were the most important factors which affect the optimal scale of rasterizing vector data; it also concluded that the 25 m-30 m raster unit is the optimal scale for Geo-spatial analysis in Guizhou karst mountainous area.

Key words rasterizing vector data, optimal scale selection,Guizhou karst mountainous area (Page:31)

Design and Realization of City Flood Prevention Command System Based on Flex and ArcGIS Server by ZHANG Hongwei

Abstract Aiming at and associating with the currently work conditions and problems of the flood control and disaster alleviation in Huai'an, We designed and exploited the WebGIS City Flood Prevention Command System, introduced the functions achieved in the system and the key technology used in the system development process and so on, which is based on related technologies such as ArcGIS Server, RIA/Flex and .NET, as well as analyzed and studied the whole design structure, database management and design and so on. Through the research and application of this system, the researchers can effectively enhance the work efficiency of flood control of city management and scheduling, and which has significant guide meanings to flood prevention and disaster alleviation, thereby minimizing the loss caused by flood damage to the city.

Key words city flood prevention and disaster reducing ; ArcGIS Server ; .NET ; RIA/Flex ; WebGIS (Page:34)

Feasibility Analysis of Anhui Meteorological GPS Data for Deformation Research by ZHENG Haigang

Abstract To demonstrate Anhui meteorological GPS data for crustal deformation research of feasibility. This paper discusses the quality of Anhui meteorological GPS data with TEQC, gives out the quality report according to IGS data quality status, and selects the available data for GPS solution. On this basis, we process solutes available data with GAMIT/GLBOK (Release 10.34) .The results showed that the change trend of sites horizontal components time series is consistent with the research results by associate researcher WANG Mei. Therefore, we consider that Anhui meteorological GPS data applied to crustal deformation research is feasible.

Key words GPS ;TEQC ;GAMIT/GLBOK ;feasibility analysis (Page:37)

GPS Deformation Data Processing Method Based on Wavelet Transform by XIA Qiu

Abstract Described GPS deformation data processing method based on wavelet transform. the data of deformation monitoring sequence as consisting of different frequency components of the digital signal is processed, with wavelet analysis of MATLAB programming, to achieve the gross errors of monitoring data, eliminate noise, trends extraction, examples show that the wavelet analysis theory applied to data processing of the dam deformation monitoring is practical and operational.

Key words wavelet transform; GPS; deformation monitoring; data processing (Page:40)

Idealogy, Method and Tools of GeoDesign by LI Li

Abstract GeoDesign is the most popular topic in GIS industry. It is not means that GeoDesign is designing nature and conquest nature as human beings' subject ideas, but that reasonable and scientific planning and deciding based on comprehensive analysis, and that promote harmonious develop between human beings and nature. GeoDesign Ideology is different in different age. In information age, GeoDesign is more and more tend to be people-oriented and pay attention to the relationship between people and environment. GeoDesign Method requires every link in design be based on geographic analysis. GeoDesign tools are not as perfect as possible in recent years. At the present stage, there are tools such as ArcCAD, ArcGis for AutoCAD, ArcSketch. We believe that GeoDesign will bring GIS far-reaching change.

Key words GeoDesign, GeoAnalysis, GeoDesign Ideology, GeoDesign Method, GeoDesign Tools (Page:42)

Development of Monitoring and Control system of Excremental Residue Collecting and Transporting Based on WS/GPS

by ZHONG Bo

Abstract The study aimed at establishing a monitoring and control system than can efficiently monitor and control the vehicles for excremental residue collecting and transporting.We also created a module for each vihicle that consisted of a weight sensing system.This module sends integrated real-time positions and loadings data for excremental residue collecting and transporting during the daily operating period for each vehicle via the global positiong system(GPS) and the general packet radio service(GPRS).We also created a control center that integrated geographic information system(GIS),enabling the monitoring of possible improper usage conducted by the vehicles.Consequently, the system closely interconnects the delivery information between the vehicles,control center,and supervisor of local government.

Key words monitoring and control system,Weighing System,Global Positioning System,General Packet Radio Service,Geographic Information System (Page:45)

High Performance Parallel Remote Sensing Image Processing Based on CUDA by XU Xuegui

Abstract As the development of space remote sensing technology in recent years witnessed a geometric growth in the data size of remote sensing images. Consequently, the process of remote sensing images is faced with such challenges as large data size, high intensity, high computational complexity and large computational quantity, and so on. Based on the analysis of the parallel architecture of the latest GPU and the flexible programmability of CUDA (Computer Unified Device Architecture), this paper presents an efficient method for processing remote sensing images on the basis of CUDA. This paper takes FFT, edge detection and template matching, three common methods in remote sensing image processing, as examples, and details the efficient parallel processing procedures of them. The experiments on different images with different data size proved that GPU is 10 to 40 times faster than CPU, which is a dramatic progress in remote sensing image processing.

Key words GPU; CUDA; remote sensing image; parallel processing (Page:47)