GPS와 HSDPA를 이용한 Windows CE 보드 기반의 교통량 수집 장치 및 경로 서비스에 관한 연구

Traffic Information and Path Guidance System is based on Windows CE Board using GPS and HSDPA

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Abstract - This paper present the Traffic information system that based on embedded WinCE board which has GPS and HSDPA. This system is able to overcome the limit of area using the Internet service other system can't provide. When the embedded board receives the data which has geometric and vehicle speed information, it transmits the data to server via HSDPA/the Internet. The server receives and processes the data for the path services. By an algorithm the data that road information is applied is provided to user. The users will be able to arrive there destination faster.

Key Word : Telematics, Traffic Information System, GPS, Windows CE, HSDPA

1. Introduction

Traffic information service system which is used of the present time has lots of problems and limitation. The existing traffic information which is gathered by manpower, that means currently system does not serve real time. This one is hard to grasps traffic density analysis and time series analysis in the downtown, so it has limitation that authenticity secure of suitable road capacity analyzes, and it can't provide traffic jam control information. These reasons make hard to apply to establish the policy of road.

Accordingly, we need to policy that is based on correct traffic jam information from a reliable real time traffic research making and traffic analysis information is based on post process statistics study.

Especially, preparing the age of 'Ubiquitous', we require to build traffic jam information that is able to update traffic jam information research, analysis, feedback in real time..

This paper differ from the currently multiple channel collecting, but the simplification 'GPS-wireless-web server' traffic quantity collecting system that is for efficiency of manpower and resource. Also, it can overcome beacon system which has local limitation as using HSDPA network that can cove the whole country.

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Moreover, the car embedded system of this system uses Windows CE operating system for optimizing car embedded board that enhanced module that is only for receiving GPS data and transmitting geographical data, time, and speed of car.

2. The Present Traffic Volume System Situation

The beginning, Korea got the traffic data by manpower. Time goes by; we introduced ITS (Intelligent Transportation System) in 1990s. ITS is expected to improve traffic operation efficiency in short time by maximizing effectiveness of existing road and controlling traffic demand to using traffic state information, optimize path information, automatic passage fee charging, distributing among freight car and public transportation, and real time traffic control. Among of ITS fields for the commencement Highway management system of The Korea Highway Corporation, ATS (Advanced Traveler Information System) project is driven promptly.

ATIS has traffic information and optimize path information service. In order to this system is realized, real time traffic information collecting is essential. Recently, the way of real time traffic data congregating are loop-sensing, image-sensing, ultrasonic-sensing and branch-sensing. And also way of using probe car and communicating between beacon and device in car.

Even though these systems have used a lot, they can't conquer the limitation of location. For that reason, gathering data is limited like passing traffic number, node speed. This is the data that is not considered many variables. And also the data using probe car had weak

point that does not deliberated among nodes and real time problem, too.

So, we suggest this system that overcome providing real time traffic information system. Moreover this one is able to service high speed Web service.

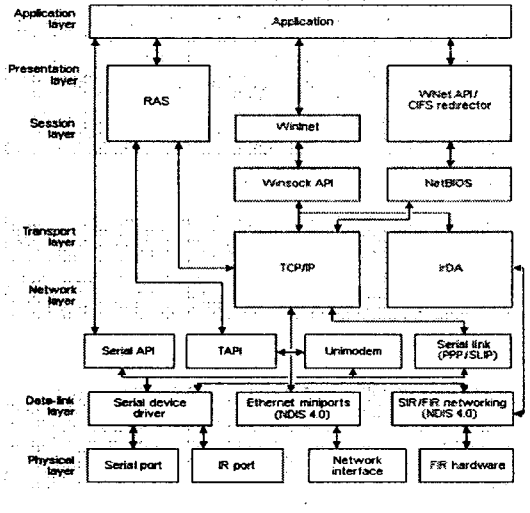
3. System structure

3-1 Windows CE

Windows CE is one of the software made by Microsoft. It feels as if others Microsoft operating system Windows 985/98/XP and Widows NT/2000. Actually, a Windows CE feature resembles others. But, Widows CE operating system structure is so different from others. It is reasonable as this operating system is for limited hardware and resources.

But, Widows CE can get market more than Linux, Palm, and Symbian as similar other Microsoft operation system and is flexible communication function. Especially Windows CE is useful for making new area communication product that can the Internet communication and data sharing/exchanging between PC based on Windows.

This is why we used Windows CE in this system. And also, extension of the system use web the other way, addition device; Bluetooth, USB, Card Reader is easy. Figure1. shows OSI model of Widows CE. This paper deals with Data-link layer for GPS receiving and Network layer, Transport layer for TCP/IP communication.



[Figure 1] Windows CE OSI Model

3-2 HSDPA (High Speed Downlink Packet Access)

High-Speed Downlink Packet Access (HSDPA) (Sometimes known as High-Speed Down link Protocol Access) is a 3G mobile telephony protocol in the HSPA family, which provides a road map for UMTS-based networks to increase their data transfer speeds and capacity. Current HSDPA deployments now support 1.8 Mbit/s, 3.6 Mbit/s, 7.2 Mbit/s and 14.4 Mbit/s in downlink. Further speed grades are planned for the near future. The networks are then to be upgraded to HSPA Evolved, which provides speeds of 42Mbit downlink in its first release. In addition to supporting high data speeds, HSDPA greatly increases the capacity of the network. Current HSDPA networks have the capacity to provide each customer with 30 gigabytes of data per month in addition to 1000 minutes of voice and 300 minutes of mobile TV.

This paper used this one for communicating between embedded board and web server. HSDPA is five times faster than 1xEV-DO (2.54Mbps), so we can serve the map which has specific geographical data and even the car doesn't have the map through high speed HSDPA.

3-3 GPS (Global Positioning System)

A GPS receiver calculates its position by measuring the distance between itself and three or more GPS satellites. Measuring the time delay between transmission and reception of each GPS radio signal gives the distance to each satellite, since the signal travels at a known speed. The signals also carry information about the satellites' location. By determining the position of, and distance to, at least three satellites, the receiver can compute its position using trilateration. Receivers typically do not have perfectly accurate clocks and therefore track one or more additional satellites to correct the receiver's clock error.

This paper used one of the data format NMEA 0183, specifically 'GPRMC (Global Positioning Recommended Minimum Specific GPS/TRANSIT data)'. An abbreviation shows the hint; this data provides speed and date. So, we took GPRMC data form GPS NMEA 0183 and transmitted to server through HSDPA network. [Table1] demonstrates GPRMC packet information.

	Field	Example	Comments
1	Sentence ID	$GPRMC	Recommended Minimum Specific GNSS Data
2	UTC Time	92204.999	hhmmss.sss
3	Status	A	A = Valid, V = invalid
4	Latitude	4250.5589	ddmm.mmmm
5	N/S Indicator	S	N = North, S = South
6	Longitude	14718.5084	dddmm.mmmm
7	E/W Indicator	E	E = East, W = West
8	Speed over ground	0	Knots
9	Course over ground	0	Degrees
10	UTC Date	211200	DDMMYY
11	Magnetic variation		Degrees
12	Checksum	*25	
13	Terminator	CR/LF	

[Table 1] $GPRMC Packet Information

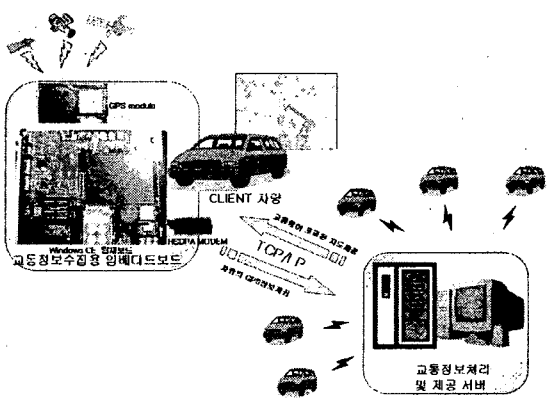
3-4 System structure and composition

[Table2] displays traffic information system structure. It shows resources of embedded board and property of server. The part of server uses MySQL for handling received the GPS data from embedded board and providing necessary information for end-user. [Figure2]

shows the composition of the entire system.

Index	Server	Embedded board
Machine	Pentium 4	PXA255 (Intel Xscale core)
OS	Window XP	Windows CE
Protocol	TCP/IP	TCP/IP
Feature	MySQL APACHE server	TFT LCD GPS/HSDPA module

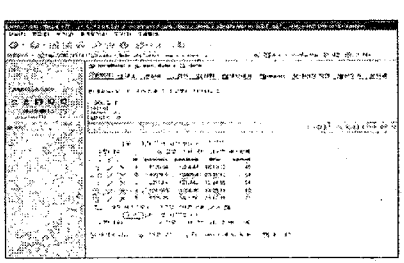
[Table 2] Traffic information System Environment



[Figure 2] System Architecture

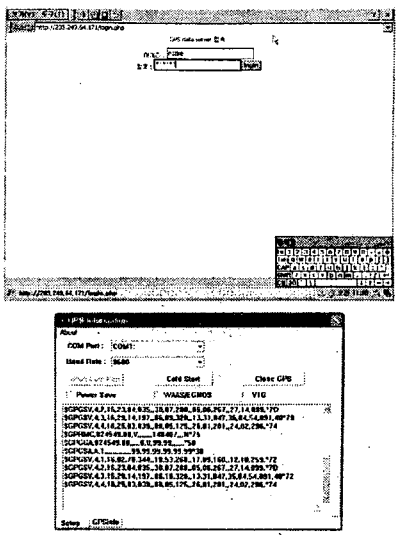
4. Experiment

[Figure3] is feature of web server that is simulated by MySQL. The server stores information that parsing data is given ID for classification of embedded board. This database is processed by main algorithm and rearrange local map, so client; include web client; can get traffic information service,



[Figure 3] Build Server using MySQL

[Figure4] shows connecting server and receiving GPS data. This system can overcome lost signal in tunnel check in-out time and tunnel length.



[Figure 4] Connect to Server and receive GPS data on board

5. Conclusion

In this paper, we simulate traffic information system based on Windows CE board using GPS and HSDPA. Both ways communication dynamically serves traffic quantity of user wanted place. This system has advantage can cover not downtown area but the whole country.

Hereafter project enhance graphic user interface for providing end user. And this system's data is not just geographical one but also added traffic condition, so we need to develop path plan algorithm that is considered traffic information.

Finally, as we use HSDPA network which can communicate high speed, client can take a film and provide real time traffic condition the other client.

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