

TOSHIBA REVIEW

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Special Reports

ITS and Road Infrastructure Systems

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Special Reports

ITS and Road Infrastructure Systems

*Growth of ITS and Road Infrastructure Systems

HONDO Kojiro

*Overview of and Trends in ITS and Road Infrastructure Systems

SHIMADA Shigehito SUZUKI Katsuyoshi ADACHI Toshiro

The preparation of roadside equipment is necessary for safe, comfortable, and smooth driving. Not only the road itself, but various types of equipment are also important including those for the detection of fire disasters and accidents, for the provision of traffic information, for toll collection on highways, and so on. The development of road infrastructure systems using computers to control and provide information to and from such equipment began in the 1970s. Since the 1990s, Intelligent Transport Systems (ITS) using the latest information technologies have been studied and put into practical use.

These developments are producing a "ubiquitous environment" that will enable full communication with moving vehicles. We believe that this environment represents the future style of the system leading to greater safety and the provision of various services.

*Toshiba's Work Related to Toll Collection System and Future Prospects

SUZUKI Katsuyoshi AOYAMA Nobuhiro SUZUKI Katsumi

The toll collection system, whose practical application was realized at an early stage in the transport systems field, has now developed into the Electronic Toll Collection (ETC) system with the progress of Intelligent Transport Systems (ITS). The toll collection system has been improved up to now by the addition of various functions. With the commencement of the ETC service, however, the system will be applied not only to toll collection but various other services as well.

Toshiba will respond to the needs for these applications by utilizing its know-how of toll collection system construction and continuously developing new technologies.

*Free-Flow Toll Collection System Applying ETC Technology

KIMURA Kenji

The Electronic Toll Collection (ETC) system, an automatic toll collection system that allows drivers using toll roads to make cashless toll payments without stopping, officially commenced operation in March 2001. Since then, the system has been steadily deployed throughout Japan. There are strong expectations that ETC will solve various problems related to transportation and the environment. The ETC is now shifting to the stage of offering new charging services, with services such as a limited-period discount service and prepayment discount service having already commenced in response to social demand.

Toshiba is widely engaged in the design and development of the ETC, from tollgate equipment to the settlement system. This paper introduces the ETC free-flow toll collection system, which commenced in July 2002 as a measure for protecting the environment of metropolitan areas. ETC also has the potential for other useful services, either by applying its own technology or in combination with traffic control and other systems. We will continue our efforts for the development of new toll collection services to add comfort and convenience to people's lives.

*Toshiba's Work Related to Expressway Traffic Control System and Future Prospects

ADACHI Toshiro WATANABE Yasuo KAWAMI Atsushi

Traffic control systems are required to provide drivers with accurate traffic information so as to ensure driver safety, maintain smooth traffic flow, and preserve the environment. The development of Intelligent Transport Systems (ITS) has been attracting attention in recent years, and they have now entered the practical phase. The Electronic Toll Collection (ETC) system has already been deployed at many locations, and the Advanced Cruise-Assist Highway Systems (AHS) is being demonstrated on highways.

With its abundant experience in the field of traffic control systems, Toshiba can economically construct Advanced Traffic Management System (ATMS) of high quality by integrating its system engineering capabilities and new technologies developed for ITS.

*Expressway Tunnel Ventilation Control System

KOYAMA Toshihiro YAMADA Yoshihiro SHINOHARA Masanori

Environmental protection and countermeasures against heavy traffic have recently become important problems for underground urban tunnels.

Using simulation technologies, Toshiba has developed a new tunnel ventilation control system that realizes safety for drivers by controlling the exhaust of polluted air.

*On-Road Demonstration Tests of Advanced Cruise-Assist Highway Systems

OKI Yoshiaki SEKI Yoshiro AZUKIZAWA Teruo

The Ministry of Land, Infrastructure and Transport is developing the Advanced Cruise-Assist Highway Systems (AHS), which is expected to reduce traffic accidents. Promoted by the Advanced Cruise-Assist Highway System Research Association (AHSRA), the development of the AHS is in the final stage of testing on public roads. Toshiba, as a member of AHSRA, has undertaken the role of organizing demonstration tests on the Tomei Expressway in the Osawagawa district, where a significant number of traffic accidents occur because of a succession of small-radius curves. The main purpose of the tests is to prove the effectiveness and acceptability of AHS support for the prevention of overshooting on curves, through questionnaires to test drivers. In addition, the safety and reliability of roadside-to-vehicle communications by dedicated short-range communication (DSRC) on highways with large numbers of trucks and buses is being measured to obtain ground data for the design of a commercially based AHS.

*Highway Power Supply Systems

MOCHIZUKI Toshiaki ADACHI Toshiro HAYASHI Kenichiro

High-standard trunk roads have been developed connecting roads in urban areas with regional cities in order to promote high-speed transportation. Road power systems supply power to the many road infrastructure facilities installed in the tunnels and interchanges of these trunk roads. With the diffusion of Intelligent Transport Systems (ITS), highly reliable power supplies, optimum power distribution, and energy-saving technologies for environmental protection have recently become increasingly important.

Toshiba has accumulated many system technologies and a great deal of know-how by having built a large number of road power supply systems. We believe that road infrastructure systems meeting social needs can be economically constructed by integrating the technologies for road power supply systems with the technologies developed for ITS.

*Personalized Tourist Information System for Pedestrians

SHIBATA Yasuhiro IKETANI Naoki

With the progress of mobile terminal and radio technologies, Intelligent Transport Systems (ITS) for pedestrians are expected to be used in various fields.

As part of this trend, we have developed an agent core engine that enables the personalization of information according to the dynamically changing tastes and conditions of users. This agent has been applied to a navigation system for pedestrians that can provide personalized data with easy operation.

*Security of Intelligent Transport Systems

UENO Hideki SUZUKI Katsuyoshi AOKI Megumi

With the expansion of Intelligent Transport Systems (ITS), security systems for personal data and settlement information are becoming increasingly important in the field of road transportation. Security systems have already been introduced in familiar fields such as the Electronic Toll Collection (ETC) system and pedestrian ITS.

Toshiba's original new cipher method has been highly evaluated in many countries. We will continue making efforts to respond to new services in ITS fields taking international standards into consideration.

*ITS Analysis and Evaluation Tool Using Microscopic Traffic Simulator

OHYA Junko HIRATA Yosuke UENO Hideki

Evaluation of the functions of Intelligent Transport Systems (ITS) with real vehicles is difficult because of its large scale. In order to overcome this problem, Toshiba is now developing an ITS analysis and evaluation tool as a fundamental technology using a microscopic traffic simulator based on molecular dynamics theory. This tool supports various activities including the planning of new systems and development of algorithms, the pre-evaluation of new functions, and feasibility studies of traffic control measures.

*Travel Time Prediction System Using Tollgate Data

OHBA Yoshikazu UENO Hideki KUWAHARA Masao

Travel time information has recently become very important in traffic control systems. There is a need for improved precision of travel time information during periods of traffic congestion, which is now calculated by sensor data such as traffic counter data. At the same time, active research in the field of Intelligent Transport Systems(ITS)has brought the Electronic Toll Collection(ETC)system to the level of practical application.

Considering these conditions, we have developed a high-precision travel time prediction system using tollgate data. Application of this new system makes it possible to provide travel time information without the installation of new sensors.

Feature Articles

*Fabrication Technology for High-Tc Superconducting Tape

YOSHINO Hisashi YAMAZAKI Mutsuki TRUONG Dinh Thanh

The YBa₂Cu₃O_x coated conductor has high performance in a magnetic field and is expected to be applied to various superconductive apparatus. Toshiba has developed a basic technology for fabricating a long coated conductor. This fabrication method was achieved by developing an in-plane aligned and strengthened Ag-clad tape, and optimizing the continuous deposition conditions of YBa₂Cu₃O_x superconducting film using the excimer laser deposition method. This fabrication process is simple, and the superconducting tape obtained has good electrical and thermal stability. The highest values for length and critical current density of this type of superconducting tape were obtained.

*"Patterned Media" Nanosize Magnetic Dot Arrays Patterned along Tracks

SAKURAI Masatoshi KAMATA Yoshiyuki HIEDA Hiroyuki

Hard disk drives (HDDs) have been showing a 100% annual growth rate in areal recording density. In order to maintain this rate in the future, it is necessary to overcome the thermal instability problem of high-density recording media.

Toshiba has developed "patterned media" offering thermal stability even at a high recording density, with a possible areal recording density of more than a terabit per square inch. In these patterned media, the magnetic dots are arrayed along the track by a self-assembly method.

*System Technology for Business Continuity

KOMATSU Kimikazu HARASHIMA Shuji

Information systems play the role of infrastructure in a company, supporting its business activities. Risk management of information systems is therefore a subject of prime importance. In particular, consideration of business continuity is one of the most significant issues in system design.

This paper introduces preventive measures using a storage area network (SAN). A SAN enables real-time data replication at remote sites and makes data recovery easy.

*Practical Ultraviolet Disinfection System for Sewage Effluent

KOBAYASHI Shinji HATANO Akinori HAYASHI Koji

The chlorine disinfection method has been used for sewage treatment. However, it has begun to be regarded as detrimental due to the harmful chemical effects on marine life and the problem of sub-products (trihalomethane, etc.). Recently, the use of ultraviolet (UV) radiation to directly work on DNA has been attracting attention as a disinfection method.

Key points in the development of such a system are a high-intensity UV light source and a disinfection system that realizes colon bacillus removal. The use of RF-frequency power circuit technology has made an input power of 500 W possible, realizing a high-intensity and high-power UV light source. Optimization of the water current path in the sewage effluent disinfection system has realized a colon bacillus removal rate of 99.9%.

*Development of Stationary PEFC Systems

MATSUDA Shohei SASAKI Hiromi KANO Akio TAKAHASHI Motohiro

Polymer electrolyte fuel cell (PEFC) systems are being aggressively developed for various applications due to their high power density and low operating temperature. Toshiba International Fuel Cells (TIFC) has developed two stationary systems: a hydrogen-fueled 30 kW system and an NG/LPG-fueled 5 kW system. The performance of the 30 kW system has been verified and it will be installed at a customer site. The 5 kW system is designed for worldwide applications, such as assured power and combined heat and power (CHP). TIFC will accelerate development of the 5 kW system for light commercial applications.

*Retail Facility and Office Air Conditioners Using R410A Refrigerant

HATTORI Hitoshi UENO Kiyotaka TAKAHASHI Isao

There has been an urgent need for the air-conditioner industry to develop products that protect the earth's environment and effectively use resources. Toshiba Carrier Corp. has already introduced the new refrigerant R410A in air conditioners ranging from the 2.2 kW residential type to the 16.0 kW office-use type. R410A is an earth-friendly refrigerant with zero ozone depletion potential and high efficiency.

We have now developed the large type 22.4 kW and 28.0 kW Super Power Eco BIGTM series retail facility and office air conditioners using R410A. These air conditioners far exceed the reference coefficient of performance (COP) effective in 2007 under the revised Energy-Saving Act.

Toshiba Technologies for the New Century

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