

Special Reports

Toward More Convenient Intelligent Transport Systems (ITS)

ITS Upgraded in the Second Stage

KUWAHARA Masao

Continuous Growth of ITS

SHIMADA Shigehito/SUZUKI Katsuyoshi/ADACHI Toshiro

The Electronic Toll Collection (ETC) system has become widely disseminated throughout the Japanese highway network and more than 60% of all vehicles now pass through tollgates without stopping. Intelligent Transport Systems (ITS), of which the ETC system is a part, evolved into the first stage, practical application, in the second half of the 1990s after progressing from the R&D phase. The field of ITS is now entering the second stage, the development stage, where technical development for various applications will be actualized. In this stage, onboard units, roadside equipment, and central processing units will cooperate to offer various services.

ITS can be considered to be a new social infrastructure system in the area of road networks. Close technical liaison between information technology for system construction and technologies for road equipment will be required to meet users' expectations for services that provide the optimum convenience, which will appear in the second stage.

New Toll Structure Utilizing Electronic Toll Collection System and Development of Central Computer System

NUKADA Sunao/KAWAMI Atsushi/KIMURA Kenji/IKEDA Hiromi

The Electronic Toll Collection (ETC) system commenced operation in March 2001. ETC is available at almost all tollgates and is used by a majority of vehicles passing tollgates in Japan. It enables not only cashless, nonstop payment at tollgates, but also flexible toll structures taking advantage of its information processing capabilities. Moreover, an advanced discount service according to the frequency of use was inaugurated last year.

We will continue to construct a system that meets social needs by fully utilizing our system building know-how accumulated since the introduction of ETC.

Opposing Lane Vehicle Information System

YAMADA Yoshihiro/NAGAI Takehiko/OKI Yoshiaki

The Ministry of Land, Infrastructure and Transport (MLIT) is furthering the development of the Advanced Cruise-Assist Highway Systems (AHS), which is expected to reduce traffic accidents. As a member of the Advanced Cruise-Assist Highway System Research Association (AHSRA), which has received the commission for this development from the National Institute for Land and Infrastructure Management, Toshiba has supplied an opposing lane vehicle information system taking the vicinity of the 97.1 kilometer post on National Highway 191 as the targeted section for providing the information service.

The opposing lane vehicle information system provides information on oncoming vehicles to car drivers via a road information board to draw their attention when they are approaching a curved section, after detecting vehicles that are advancing into the curved section in the opposing lane. The system is expected to have the effect of preventing or reducing car accidents and related damage.

New "System05" Traffic Control System for Tokyo Metropolitan Expressway

MURANO Takenori/WATANABE Tomohide/MURAKAMI Atsushi/TAGUCHI Hirokazu

The traffic control system for the Tokyo Metropolitan Expressway has been installed not only for the purpose of avoiding traffic congestion, but also to inform drivers of the details of accidents and disasters to minimize damage, ensure early recovery, and prevent the occurrence of secondary incidents in the case of accidents. The traffic control system is a vitally important social system that must be in operation 24 hours a day, 365 days a year, without any gaps, even when it is modified to cope with expansion of the route network or system upgrading and updating. The previous traffic control system has now been renewed as "System05," to offer drivers more useful and sophisticated traffic information.

Visible Light Communication System for Application to ITS

SUZUKI Katsuyoshi

Information communication technologies are an essential element of Intelligent Transport Systems (ITS). Toshiba has been studying the application of visible light communication (VLC) to ITS, as one such technology in which research has been progressing recently. VLC makes communication possible using visible light. For example, information can be transmitted by rapidly blinking light-emitting diodes (LEDs). As regards the use of this technology in the ITS field, possible applications include communication from roadside lights, information boards, and traffic signals to vehicles; vehicle-to-vehicle communication; and pedestrian information systems.

We have created a prototype system for experimental purposes and confirmed that VLC realizes the multiplex communication of information, which is completely different from the conventional provision of visible information by an information board.

Vehicle Detection System Using Rotation Vector Tracking Method

AIKAWA Tetsuro/SATOH Yoshinori/NAGAO Kazuchika

Sensors that detect dangerous traffic events have been introduced on highways to prevent accidents. In particular, visual sensors detect dangerous events by processing images obtained from cameras. Such sensors also allow road conditions to be observed via monitors and are often applied to surveillance systems in tunnels. However, the performance of conventional systems is easily affected by the quality of the images.

Toshiba has developed a vehicle detection system using a rotation vector tracking method, and confirmed the effective operation of this system even in difficult environments.

Microscopic Traffic Simulator Corresponding to Road Network

UENO Hideki/HIRATA Yosuke/OHBA Yoshikazu

Intelligent Transport Systems (ITS) are mostly large and complex, and evaluating their functions in experiments using real vehicles is very difficult. Traffic simulators are highly important and useful from this viewpoint.

Toshiba had previously developed a microscopic traffic simulator based on molecular dynamics simulation for use in the research and development of large traffic systems. However, its application was restricted to local areas. We have now developed a microscopic traffic simulator that corresponds to a road network.

JF-1000 High-Velocity Jet Fan

HAYASHI Kenichiro/NIIZEKI Yoshiki/I TOH Shoko

A tunnel ventilation fan is a compulsory ventilating system suspended on a tunnel ceiling that exhausts polluted air in the tunnel and takes outside fresh air into the tunnel. The average wind velocity of jet fans, which is a measure of their specified ventilation capacity, has been 30 m/s for many years. Recently, however, demand has arisen in the market for jet fans with a higher wind velocity of 35 m/s, in order to reduce the number of jet fans installed for economic reasons.

To satisfy this customer requirement, Toshiba has developed a lineup of high-performance jet fans that produce higher wind velocity but low noise. This paper introduces the JF-1000 model in our jet fan lineup, which features a 1,030 mm bore and is in high demand in the market.

Technologies for Road Power Supply Systems

OTSUKA Takashi/ADACHI Toshiro

Road infrastructure facilities have been expanding and progressing with the development and diffusion of Intelligent Transport Systems (ITS). Road power supply systems, which supply electric power to these facilities, must not only fulfill their original purpose of providing a stable supply of electric power, but are also now being required to offer added value in consideration of cost reduction and environmental preservation.

The construction of systems that conform with these market requirements without any deterioration in reliability and maintenance is therefore an important issue. Toshiba is tackling this issue using the latest technologies and long-accumulated know-how in this field.

Feature Articles

OH Radical Generator for Waste Water Treatment Containing Recalcitrant Organic Matter

IJIMA Takanori/MAKISE Ryutaro/MURATA Takaaki

Demand has been increasing in recent years for treatment of wastewater containing recalcitrant organic matter such as dioxins or agricultural chemicals, which has not been able to be treated by traditional treatment techniques using chlorine or ozone.

The hydroxyl (OH) radical is conventionally produced by the reaction of dissolved ozone. Hydrogen peroxide or ultraviolet light is used for decomposition of the dissolved ozone. However, the radical production efficiency of the conventional method is not high, as one OH radical is produced from three molecules of ozone. For this reason, a high-efficiency OH radical production technique for wastewater treatment is desired.

In response to this need, Toshiba is studying the development of a new treatment technique with high removal efficiency involving direct OH radical production by electric discharge.

Skill Digitizer_{TM} -- System for Visualization of Manual Welding Skill

SAKUMA Masatake/ASAI Satoru/USUKI Shoji

Toshiba has developed a system for visualizing a welder's behavior and evaluating the welder's skill, and commercialized the Skill Digitizer_{TM} system as a welder training and skill visualization tool offering various functions and easy operation. The system utilizes multiple visual sensors and image processing techniques to synchronously monitor and extract various parameters of the welding process.

This paper describes the basic concept and features of the system, which enable the skill of a manual welder in the workshop environment to be effectively visualized and assessed.

Method for Evaluating Crack Propagation in Slot-Dovetails of Aging Turbine-Generator Rotors

SAITO Kazuhiro/MATSUYAMA Koji/I TO Hiromichi

The propagation of cracks in slot-dovetails is a serious problem in the overseas maintenance of large turbine-generator rotors. Toshiba has established a shaft-wedge design to prevent the propagation of cracks in rotor slot-dovetails. However, it is generally difficult to estimate the behavior of such cracks because of the complex stress distribution around the area of contact. In the rehabilitation of turbine-generators in overseas markets, it is necessary to estimate the propagation of cracks in slot-dovetails in order to offer optimal solutions to power plant owners, who are facing various types of problems.

Toshiba has developed a method for evaluating crack propagation in slot-dovetails that uses finite element method (FEM) analysis and fracture mechanics, taking the stiffness of the rotor and thermal stress into consideration.

Culler-Facer-Canceller for La Poste of France

MIYAWAKI Hatsushii/ASARI Yukio/AKAGI Takuma

The new TSC-1000 culler-facer-canceller for Group La Poste of France separates non-machinable mail from the input mail flow, then recognizes the postal indicia on each machinable mail piece. The TSC-1000 uses this information to rearrange the direction that each mail piece is facing so that their addresses are all on the same side and can be read without rotating them. The indicia are next cancelled using an inkjet printer. The TSC-1000 also functions as an optical character reader (OCR) letter sorting machine, recognizing the postcode and address written on each mail piece, so that precise sorting is realized according to the detected indicia, postcode or address, mail size, or other criteria.

Toshiba developed the TSC-1000 as its standard model for the global marketplace, aiming for it to be the best machine of its type in the world in terms of throughput, available functions, and the performance of these functions. The first TSC-1000 has already been installed in La Poste, and is operating smoothly. The installation of at least 40 more of these machines is planned.

Frontiers of Research & Development

Contactless Magnetic Suspension System for Elevators to Ensure Smooth Ride

Evaluation Technology for Introduction of Renewable-energy Power Supply