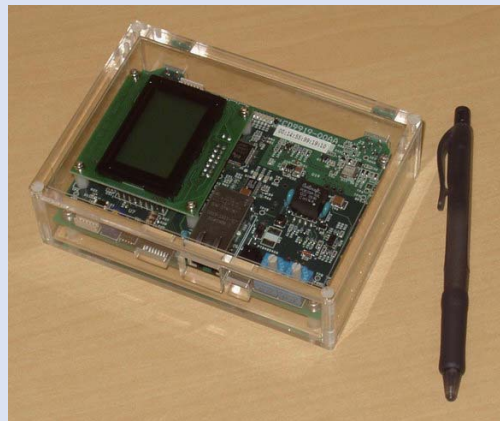


Network Spatial/Temporal Information-Distribution System, Spatial/Temporal Information-Distribution Equipment, Spatial/Temporal Information Receiver Terminal Equipment, and Network Spatial/Temporal Information-Distribution Method

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External view of NST server

Outline of technology

This invention relates to network spatial/temporal information-distribution equipment (referred to as the NST server) that distributes accurate temporal and positional information through networks. In particular, the invention improves on conventional temporal accuracy, from the millisecond order to the submicrosecond order. In addition, the system also enables distribution of three-dimensional positional data obtained from a GPS or similar source, providing a previously unavail-

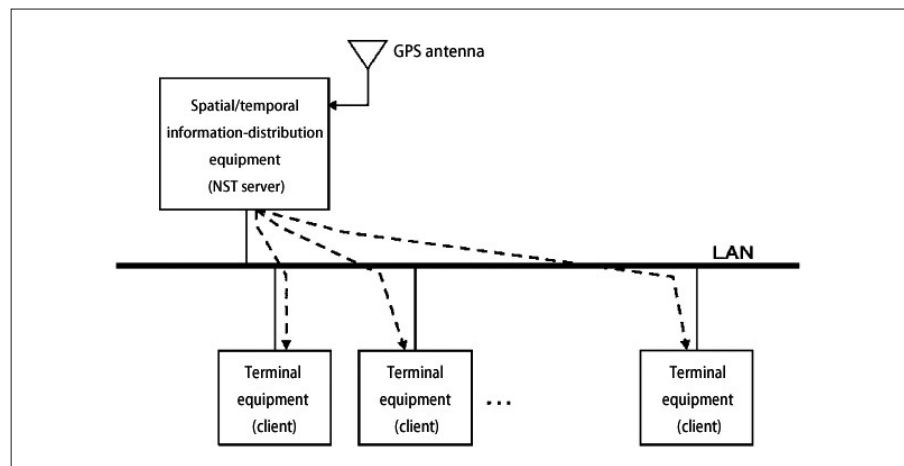


Fig.1 Example configuration of spatial/temporal information-distribution system

able service offering temporal information together with a new positional data service.

To distribute accurate time data, the spatial/temporal information distribution equipment sends spatial/temporal data packets to the client terminal equipment at certain intervals. The client calculates a time-conversion parameter based on the time data and time-synchronization data contained in the received packets. This parameter is then used to correct the time data in the spatial/temporal packets. For spatial information, positional data is obtained from a GPS. The obtained position data indicates the location of the GPS antenna. Positional information is then added to the spatial/temporal packets. Via the information on the relative positions of the antenna and client, the client location can be determined accurately.

Conventional systems assume that the NST server is located close to the clients. However, with the recent development of network technologies such as wide-area Ethernet and VPN, in some cases devices on the same network are significant distances apart. This distance leads to reduced time accuracy.

Application examples

GPS-based positional data services are spreading widely, centering on car navigation systems, but these services cannot be used in equipment located in buildings or underground facilities. One of the main features of the spatial/temporal server is its ability to distribute accurate temporal and positional data, and these two data types can be applied effectively to the examples discussed below. The NST server prototype (shown in the photo next to the article title) is compact and light-weight (see the specifications in Table 1), and easily installed in an ordinary home or shopping mall.

Table 1 NST server specifications

Size	130×100×40mm
Weight	333g
Time synchronization accuracy	Submicrosecond
Time synchronization protocol	PIA (Packet inter-arrival based time synchronization)
Synchronous packet	Ethernet
Network	Shared LAN, 100Base-TX
Client software	Linux

Even in an underground shopping mall, for example, a person with a mobile device with an equivalent client function (i.e., operable as a terminal) can determine the location of his or her mobile terminal through the mobile terminal base station. Using this system, the shopping mall's system can provide sales and other information on desired stores nearby, as well as additional local information (see Fig. 2). The user can also find his or her position on a map of the underground

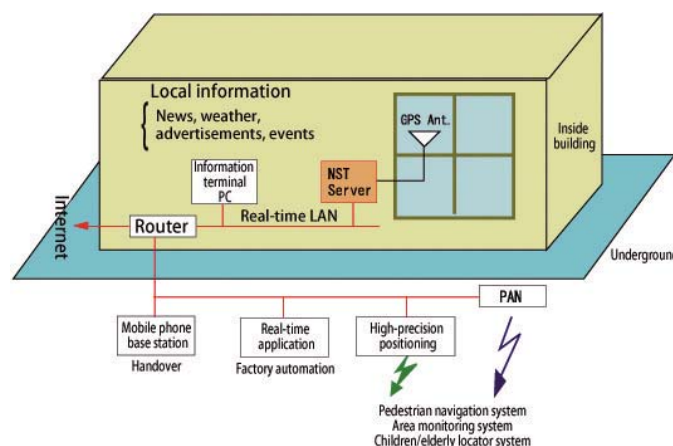


Fig.2 Example shopping-mall applications

shopping mall using the mobile terminal and determine the route to a desired store in the mall.

In an ordinary home, the spatial/temporal server can provide the accurate temporal and positional data essential in home automation, such as automatic synchronization of the clock in a video recorder, automatic channel setting based on the channel broadcasting area from the home's positional data, or automatic operation and control of cleaning robots and information-intensive home appliances, based on positional data of the individual rooms (see Fig. 3).

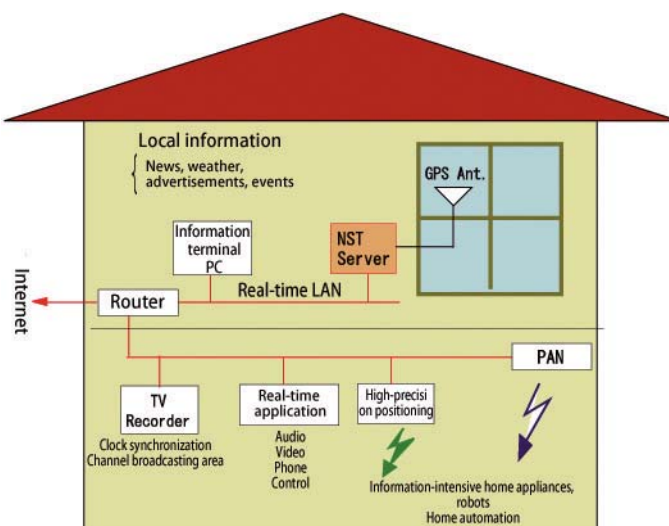


Fig.3 Example home applications

Commercialization

Spatial/temporal servers may take different forms and be incorporated into other products, some of which may not be visible as standalone server units. In the future, products equipped with spatial/temporal server functions may operate quietly in every home. Presently, a spatial/temporal server unit is available from Coder Electronics Corporation. You could have a spatial/temporal server in your home today!

(Article written by SAWADA Fumitake , Expert, Intellectual Property Management Group, Research Promotion Department)

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