Detour Guidance System for Passengers During a Disruption in Train Operations

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When train operations are interrupted by an accident, natural disaster or other incident, it is important to improve passenger satisfaction by giving them accurate information facilitating the rest of their journey. In Greater Tokyo, especially, with its complex rail network extending over a wide area, individual users need such information so that they can choose the best option to reach their own destination (see Fig. 1). We therefore developed a guidance system for users to determine whether they should wait for service to resume on the disrupted line, or take a detour route to their destination. Our system arrives at decisions after computing estimated travel times to specific stations in the area where train services are disrupted (see Fig. 2).

When developing the system, we first devised a simple model for estimating variables for the amount of time required to travel between stations in the disrupted area. We call this model the "required time variation model." We analyzed data obtained from past disruptions, then used the results of our analyses to establish parameters for the model. For the required time variation model that we have adopted, the time required to travel between stations when the schedule is disrupted is approximated by the linear function shown in Fig. 3. The linear function has four parameters:

ε = average travel time during normal schedule conditions,

α = elapsed time from the occurrence of the disruptive incident until operations resume (the time duration required for resumption),

β = elapsed time from the resumption of operations until the resumption of normal operations, and

γ = extent of train delay after services resume.

α and β are averaged values derived from data obtained from past disruptive incidents, classified according to the type of incident.

Fig. 4 shows a sample panel for passenger guidance. The panel is for indeterminate users at a station, and is an interface advising individual users whether or not it would be best to take a detour route to their destination station. Each station within the affected area is color coded with one of four colors. Colors give passengers advice on their best option to get to the station in question: "You should take a detour route;" "You should wait here;" "There is no detour route to your destination, so wait here;" and "Not affected by incident."

One can assume that when train services are disrupted, giving users information on alternative route options will greatly influence their travel behavior. To test this assumption we conducted a survey of the decisions passengers took as a result of such an information system, and found: (a) when train services are disrupted, the extent to which passengers are in a hurry is the determining factor in their choice of route; and (b) even though the information represents only possible scenarios, when users feel that the degree of certainty is at least 70%, they tend to take that option.

We are presently testing a system that lets users use their cell phones to learn their route options during a disruption in train services. Our studies are now finding that this system is effective — for example, we have found that approximately 70% of all users taking the advice arrive at their destination at the same time as, or earlier than, the time estimated by the system.

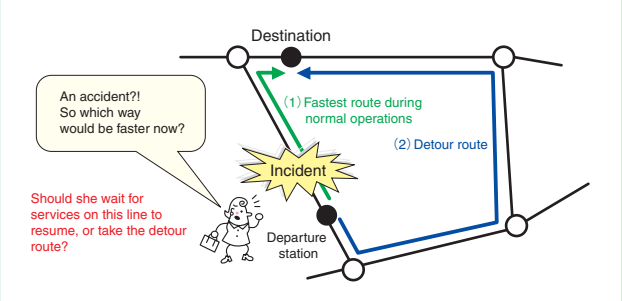

Fig.1. Choosing the best route option after interruption in rail service

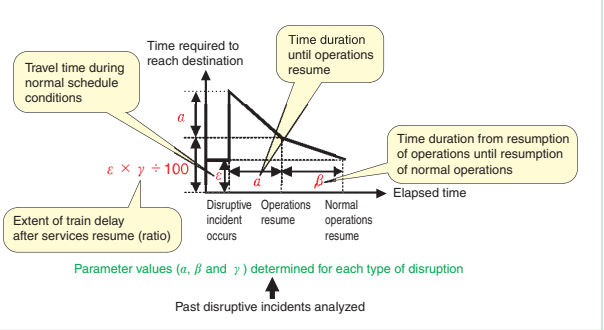

Fig.3. Required time variation model

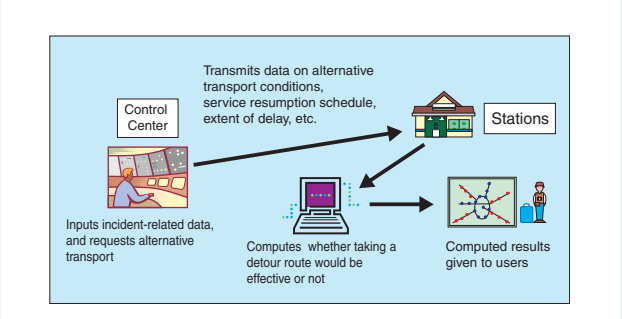

Fig.2. System operation

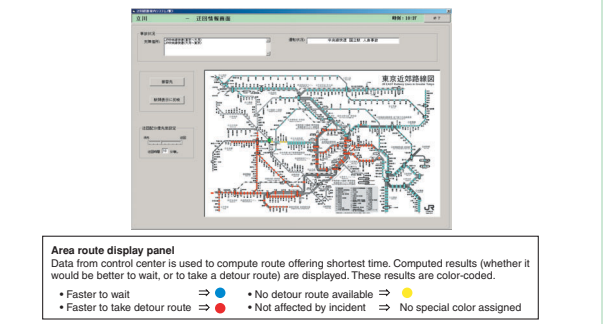

Fig.4. Guidance panel for indeterminate users at a station