Markup Language for Designing Layout of Bus Timetables

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Abstract—**Route bus system is the fundamental transportation device for aged people and students, and has an important role in every province. However, passengers decrease year by year, therefore the authors have developed the system called "Bus-Net" that has the major function for the shortest path searching as a web application to sustain the public transports. In Bus-Net, a function to print bus timetables is provided. Timetables of various layouts are wanted to create by this function. However, because old bus timetables are created by using TEX, it is difficult to design layout of bus timetables. Then, a markup language to design various layouts of bus timetable easily is proposed and it is applied to Bus-Net in this study.**
Keywords—**Route Bus, Timetable, Markup Language.**

I. Introduction

As is well known, Japan faces the problems of aging population, and these problems cover a wide range. Route bus is the important transportation for the people who don't have a car, but the number of passengers decrease year by year in provinces. We have developed the system that has the shortest path searching as the major function for maintaining route bus in provinces by improving convenience of route bus. This system is called Bus-Net[1], [2], [3], [4] and released to the public as a web-service. The average of accesses to the system is more than 50,000 per month. Taking into account of the current target area of the system is restricted, the number is very large and the importance of the system is confirmed. The system has many unique aspects such as an original path searching algorithm, however, they are not referred in this paper.

In Bus-Net, a function to print bus timetables is provided. In this old function, bus timetables create only one kind of layout. On the other hand, user need bus timetables of various layouts in accordance with their use. Therefore, bus timetables of various layouts are wanted create by this function. However, old bus timetable is created by using TEX. The generality of TEX is high, but it is necessary to use many commands to create bus timetables by TEX. Therefore, the code becomes complex, and it is difficult to design layout of bus timetables. Then, a markup language to design various layouts of bus timetable easily is proposed and it is applied to Bus-Net in this study.

This paper is composed of six sections. Section 2 is explained about the markup language for designing layout of bus timetables, and section 3 is explained the application of the proposed language to Bus-Net. Execution examples are shown in section 4. Finally, a concise conclusion of this paper is described in section 5.

II. Markup Language for Bus Timetables

Bus timetable is divided into each one independent square part of destination, line name, legend symbol to indicate some optional informations and departure time etc. In this proposed language, these parts are expressed with a tag and attributes. And these parts are brought together in a layer. In the proposal language, there is a feature that uses hierarchy structure. A layer is also treated as one part, so it's possible to add layers as the need arises. For example, firstly, there are many layers which gathered a departure time and a legend symbol. Secondly, these layers are gathered by the layer of each departure hour. Finally, these layers are gathered by the layer of each route. Because related parts can be brought together in a layer, it is easy to move parts gathered by the layer and to erase them in a lump. Moreover, the arrangement direction of parts in layer can be specified as the attribute of the layer. Therefore vertical axis and horizontal axis in the table are also easy to change by the proposed language.

Fig. 1 shows a sample code of the proposed language. The table as shown in Fig. 2 is made from this code. Fig.3 shows a framework of layers of this table. In Fig. 1 and Fig.3, The number of the layers which corresponds respectively is shown.

Fig. 1. A sample code of the proposed language.

Fig. 2.   A sample of timetable created by using the proposed language.

Fig. 3.   A framework of layers of the proposed language.

Fig. 4.   A bus timetable of A4 size created by the proposed language.

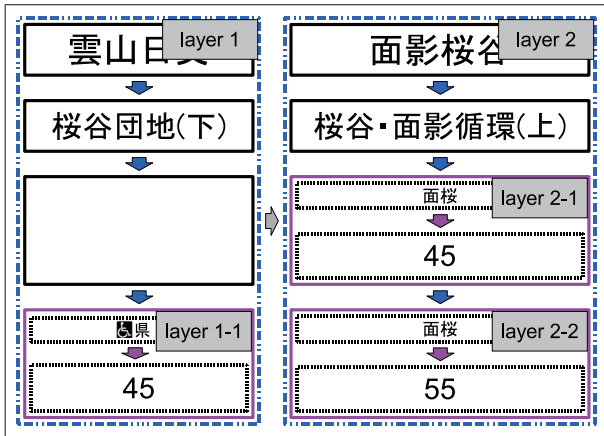Fig. 5.   A bus timetable of A3 size created by the proposed language.

III. APPLICATION TO BUS-NET

Bus timetables created from the function to print bus timetables are also assumed to be displayed in bus stops. However, official name of company, inquiry, legend of each company and day that timetables are revised are not indicated in old bus timetables. This is because there is no information in the database of Bus-Net. Then, these information add to the database, and an interface to edit these information add. In addition, a program that generates codes written in the proposed language is developed. It is possible to choose two kinds of the layout of bus timetables on the program. One layout is for A4 size and the other is for A3 size. Bus timetable PDF is generated from the code by the processing system of the proposed language. These layouts can be selected from the interface of the function to print bus timetables.

IV. EXECUTION EXAMPLES

Examples of timetable created by using the proposed language are shown in Fig. 4 and Fig. 5. There are cases that departure times of bus are different on weekday and holiday. Then, times of weekday and holiday are displayed at the same space in old bus timetables, but these are displayed separately in bus timetables created by the proposed language. For weekdays or for holidays is shown to a part in a black background on timetable. Moreover, it is possible to create bus timetable in A3 size collectively when there are a lot of numbers of routes because A3 size can be newly made. In Fig. 4, vertical axis is hour and horizontal axis is destinations and routes. In Fig. 5, vertical axis is destinations and routes and horizontal axis is hour.

V. CONCLUSION

We proposed the markup language which can design various layouts of bus timetables easily in this study. It becomes to be able to design layouts of bus timetable easily by using this language. And a function to print bus timetables of two kinds of layouts is implemented in Bus-Net as application of this proposed language. It becomes a foothold to create the timetable of various layouts in accordance with their use though there were only two kinds of timetables created now. It's necessary that the proposed language is created easier to use as future tasks.

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