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# **Improvement of Road Sign Data Utilization through Development of OpenAPI Linkage Function**

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**ABSTRACT:** The present study aimed to provide the OpenAPI service, which is used in the **Open Data Portal**, to improve the civil and other various utilizations of road sign data in conjunction with other information systems. To that end, this study analyzed the status of OpenAPI services and designed OpenAPIs applicable to the road sign system. The OpenAPIs were designed for road sign data in each situation including the attributes, locations, areas, administrative districts, and routes of road signs and the design result of each item is presented in XML format. Based on the results of this study, it will be possible to access and use road sign information in real time. In the follow-up research, the file data provision method will be developed additionally to further improve the utilization of road sign data.

**KEYWORDS:** OpenAPI, Roadsign, Data, Data connectivity.

## **I. INTRODUCTION**

Currently, the Government 3.0 Open Data Portal(<http://www.data.go.kr>) is providing file data and OpenAPI services for flexible information disclosure to other organizations. In the case of file data service, the target data of the information disclosure is created in a file format which can be downloaded to and used by other organizations and systems. The OpenAPI service is to process data in XML format so that the data can be transmitted in real time through HTTP communication and supplied to users.

The differences between these two methods are as follows. The file data method enables the provision of large data to users, but it is difficult to supply the data in real time because the file is stored on a server. On the other hand, the OpenAPI method provides the advantage of real-time data supply and can be used in systems that allow real-time communication such as Web and mobile systems. The OpenAPI-based information sharing platform is a representative technology of Web 2.0 and a user-oriented service that discloses and provides system information or applications so that they can be used in other information systems. In the past, users simply used the information, but today, they require various customized services, and systems are providing various mash-up services using OpenAPI. The road sign data also needs an OpenAPI-based connectivity method to respond to such information sharing and utilization paradigm. Therefore, this study developed an OpenAPI connectivity functions to improve the utilization of road sign data.

## **II. MAIN DISCOURSE**

OpenAPI refers to an API that is open to all and the road sign data and contents of the road sign system are disclosed through the OpenAPI to the outside to support the development of Web services and applications. This study analyzed the existing OpenAPI services and designed OpenAPI applicable to the road sign system.

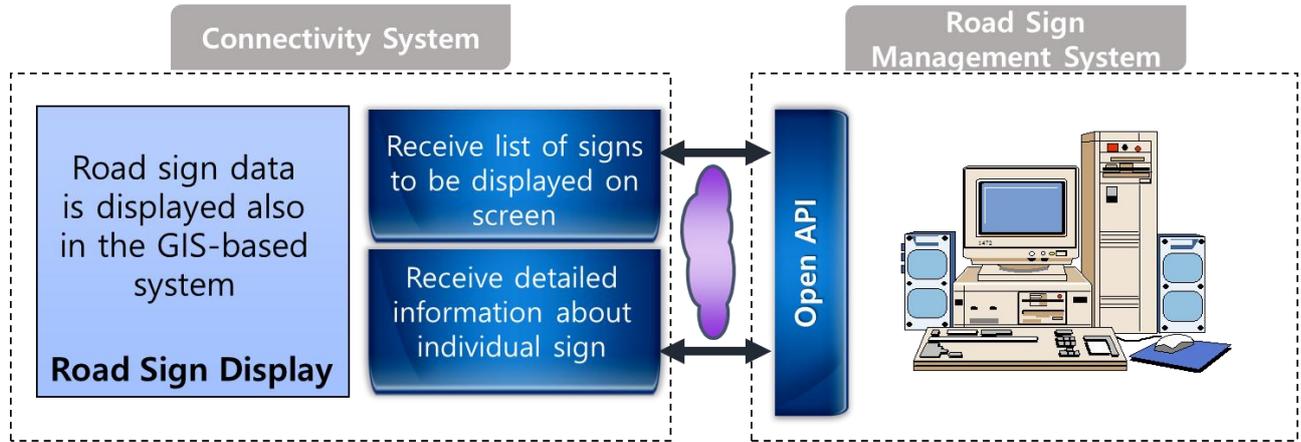


Fig. 1. Conceptual diagram of the OpenAPI-based connection of the road sign system

**A. OpenAPI Design to Acquire Road Sign Information**

The following table lists the OpenAPIs to be provided to enable the use of road sign data in each situation including the acquisition of the attributes of road signs, acquisition of the attributes of road signs installed around a specific place, acquisition of the attributes of the road signs installed inside a specific area, and acquisition of the attributes of road signs installed in a specific administrative district.

**Table 1:** Designs of OpenAPIs for acquisition of road sign data

No.	Item (Name)	Description
1	Road sign data	Provides the attributes of road signs
2	Road sign list(place)	Provides list of road signs installed around a specific place
3	Road sign list(area)	Provides list of road signs installed in a specific area (coordinate)
4	Road sign list(administrative district)	Provides list of road signs installed in a specific administrative district
5	Road sign list(by route)	Provides a list of road signs by route in a specific administrative district

The specifications of each interface of OpenAPI for acquisition of road sign data were set up as sample XMLs which define the request variables that set the data extraction condition, output result field expressing the data extraction result, and sample XML that defines the extraction results in a document form.

- Road sign data: provides the attributes of road signs.

**Table 2:** Sample XML result

```
<?xml version="1.0" encoding="EUC-KR" ?>
<rowset>
<row>
<id>25197818</id>
<id_road_kind>ER</id_road_kind>
<id_road_num>1</id_road_num>
<id_road_name>Gyeongbu Expressway</id_road_name>
<id_direction>U</id_direction>
```

```
<id_serial>1379</id_serial>  
<panelserial>ER-1[Gyeongbu Expressway]-Up-12</panelserial>  
<pj_name>2-way sign</pj_name>  
<x>208359.39</x>  
<y>411617.9</y>  
</row>  
</rowset>
```

- Road sign list (place): Provides a list of road signs that exist within a specific distance from a specific coordinate.

**Table 3: Sample XML result**

```
<?xml version="1.0" encoding="EUC-KR" ?>  
<rowset>  
<row>  
<id>25197818</id>  
<id_road_kind>ER</id_road_kind>  
<id_road_num>1</id_road_num>  
<id_road_name>Gyeongbu Expressway</id_road_name>  
<id_direction>U</id_direction>  
<id_serial>1379</id_serial>  
<panelserial>ER-1[Gyeongbu Expressway]-Up-1379</panelserial>  
<pj_name>2-way sign</pj_name>  
<x>208359.39</x>  
<y>411617.9</y>  
</row>  
<row>  
<id>25197819</id>  
<id_road_kind>ER</id_road_kind>  
<id_road_num>1</id_road_num>  
<id_road_name>Gyeongbu Expressway</id_road_name>  
<id_direction>U</id_direction>  
<id_serial>1399</id_serial>  
<panelserial>ER-1[Gyeongbu Expressway]-Up-1399</panelserial>  
<pj_name>2-way sign</pj_name>  
<x>208377.39</x>  
<y>411621.9</y>  
</row>  
<row>  
<id>9975</id>  
<id_road_kind>NR</id_road_kind>  
<id_road_num>1</id_road_num>  
<id_road_name>Gyeongsudaero</id_road_name>  
<id_direction>D</id_direction>  
<id_serial>42</id_serial>  
<panelserial>NR-1[Gyeongsudaero]-Down-42</panelserial>  
<pj_name>2-way warning sign</pj_name>  
<x>199983.57</x>  
<y>400761.01</y>  
</row>  
</rowset>
```

- Road sign list(area): Provides a list of road signs that exist in a specific area (coordinate).

**Table 4: Sample XML result2**

```
<?xml version="1.0" encoding="EUC-KR" ?>  
<rowset>  
<row>  
<id>25197818</id>  
<id_road_kind>ER</id_road_kind>
```



```
<id_road_num>1</id_road_num>
<id_road_name>Gyeongbu Expressway</id_road_name>
<id_direction>U</id_direction>
<id_serial>1379</id_serial>
<panelserial>ER-1[Gyeongbu Expressway]-Up-1379</panelserial>
<pj_name>2-way sign</pj_name>
<x>208359.39</x>
<y>411617.9</y>
</row>
<row>
<id>25197819</id>
<id_road_kind>ER</id_road_kind>
<id_road_num>1</id_road_num>
<id_road_name>Gyeongbu Expressway</id_road_name>
<id_direction>U</id_direction>
<id_serial>1399</id_serial>
<panelserial>ER-1[Gyeongbu Expressway]-Up-1399</panelserial>
<pj_name>2-way sign</pj_name>
<x>208377.39</x>
<y>411621.9</y>
</row>
<row>
<id>9975</id>
<id_road_kind>NR</id_road_kind>
<id_road_num>1</id_road_num>
<id_road_name>Gyeongsudaero</id_road_name>
<id_direction>D</id_direction>
<id_serial>42</id_serial>
<panelserial>NR-1[Gyeongsudaero]-Down-42</panelserial>
<pj_name>2-way warning sign</pj_name>
<x>199983.57</x>
<y>400761.01</y>
</row>
</rowset>
```

- Road sign list(administrative district): Provides a list of road signs that exist in a specific administrative district.

**Table 5:Sample XML result**

```
<?xml version="1.0" encoding="EUC-KR" ?>
<rowset>
<row>
<id>25197818</id>
<id_road_kind>ER</id_road_kind>
<id_road_num>1</id_road_num>
<id_road_name>Gyeongbu Expressway</id_road_name>
<id_direction>U</id_direction>
<id_serial>1379</id_serial>
<panelserial>ER-1[Gyeongbu Expressway]-Up-1379</panelserial>
<pj_name>2-way sign</pj_name>
<x>208359.39</x>
<y>411617.9</y>
</row>
<row>
<id>25197819</id>
<id_road_kind>ER</id_road_kind>
<id_road_num>1</id_road_num>
<id_road_name>Gyeongbu Expressway</id_road_name>
<id_direction>U</id_direction>
<id_serial>1399</id_serial>
```



```
<panelserial>ER-1[Gyeongbu Expressway]-Up-1399</panelserial>
<pj_name>2-way sign</pj_name>
<x>208377.39</x>
<y>411621.9</y>
</row>
<row>
<id>9975</id>
<id_road_kind>NR</id_road_kind>
<id_road_num>1</id_road_num>
<id_road_name>Gyeongsudaero</id_road_name>
<id_direction>D</id_direction>
<id_serial>42</id_serial>
<panelserial>NR-1[Gyeongsudaero]-Down-42</panelserial>
<pj_name>2-way warning sign</pj_name>
<x>199983.57</x>
<y>400761.01</y>
</row>
</rowset>
```

- Road sign list(by route): Provides a list of road signs installed in a specific route.

**Table 6:Sample XML result**

```
<?xml version="1.0" encoding="EUC-KR" ?>
<rowset>
<row>
<id>25197818</id>
<id_road_kind>ER</id_road_kind>
<id_road_num>1</id_road_num>
<id_road_name>Gyeongbu Expressway</id_road_name>
<id_direction>U</id_direction>
<id_serial>1379</id_serial>
<panelserial>ER-1[Gyeongbu Expressway]-Up-1379</panelserial>
<pj_name>2-way sign</pj_name>
<x>208359.39</x>
<y>411617.9</y>
</row>
<row>
<id>25197819</id>
<id_road_kind>ER</id_road_kind>
<id_road_num>1</id_road_num>
<id_road_name>Gyeongbu Expressway</id_road_name>
<id_direction>U</id_direction>
<id_serial>1399</id_serial>
<panelserial>ER-1[Gyeongbu Expressway]-Up-1399</panelserial>
<pj_name>2-way sign</pj_name>
<x>208377.39</x>
<y>411621.9</y>
</row>
<row>
<id>9975</id>
<id_road_kind>NR</id_road_kind>
<id_road_num>1</id_road_num>
<id_road_name>Gyeongsudaero</id_road_name>
<id_direction>D</id_direction>
<id_serial>42</id_serial>
<panelserial>NR-1[Gyeongsudaero]-Down-42</panelserial>
<pj_name>2-way warning sign</pj_name>
<x>199983.57</x>
<y>400761.01</y>
```



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```
</row>  
</rowset>
```

The acquired road sign data were provided in the XML format for each item. The OpenAPIs are provided so that users can use by connecting the required items with their system.

### III. CONCLUSION

This study applied the OpenAPI function for each road sign item to the road sign system in accordance with the data connectivity method provided in the Government 3.0 Open Data Portal and implemented services to allow other systems, organizations, and private companies to use them by connecting them with their systems. This provided the possibility to connect road sign data in real time and is expected to improve the utilization of road sign data.

Although the OpenAPI can be used to provide data in real time, it is difficult to provide a large amount of data due to the limitations in the performance such as server load and speed. To improve this disadvantage, additional service needs to be implemented to allow users to download the data in a file format.

### REFERENCES

- [1]. Road sign management system: <http://www.korearoadsign.go.kr/>
- [2]. Open Data Portal: [www.data.go.kr](http://www.data.go.kr)
- [3]. Je-Yoon Woo et al. (2016), "Road Sign Center Operation in 2016", Ministry of Land, Infrastructure and Transport