

Web-based Implementation for Marine Casualty Information on Google Map

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Abstract

Safety navigation of vessels is always the most important issue in maritime field. Recently, according to increasing the use of electronic equipment onboard, the requests for safety related information services have been growing up. To support this, International Hydrographic Organization suggests the concept of common maritime data structure. Since 2010, S-100 standard and relative product specifications have been defined as a part of that concept, covering the electronic navigational chart data and safe navigation related data. In this paper, we introduce an empirical application of S-100 standard, applied to marine casualty information. We analyze marine casualty cases reported in Korea for recent four years, make XML documents with schema design and then implement an application to present the marine casualty information on google map.

Keywords: Marine casualty information, S-100 standard, XML, web-based application

1. Introduction

In the most areas which are not relied on electronic equipment quite much, the capability of a person in charge is an important factor of the quality of work. Similarly, in the traditional vessel navigation using paper chart, the navigator's capability can make the voyage successful or not. According to increasing the use of electronic equipment onboard and improving the network capability between onboard and shore side, navigators as well as shore side stakeholders have needed the better service for safe navigation. Only several years ago, there were able to use just VHF and very expensive internet. Taking into account on this, IMO (International Maritime Organization) has introduced the concept of e-navigation in 2006, which organization is a United Nations maritime agency to develop the regulations of technical issues for vessels, operational issues for navigational affairs and training issues for the mariners. The definition of e-navigation [1] is as follows:

“e-Navigation is the harmonized collection, integration, exchange, presentation and analysis of maritime information onboard and ashore by electronic means to enhance berth to berth navigation and related services, for safety and security at sea and protection of the marine environment”

To realize the harmonized service as mentioned on the definition of e-navigation, not only computing techniques but also standardized protocols of the information service. In the case of the techniques and protocols related to navigational charts, these should be standardized to

provide consistent and exact services to navigational vessels. IHO (International Hydrographic Organization) has a role to develop the standards related to navigational chart, which is carried out in cooperation with IMO.

In 2009, the concept of CMDS (Common Maritime Data Structure) was defined as the data service protocol supporting the e-navigation. This means that a common structure would be designed to be use commonly, and then all the vessels which perform international voyages should comply with the structure in the near future. S-100 standard can be a starter to build the total common structure. It deals with the information of electronic navigational chart and the information related to safe navigation with registering product specifications. S-101 for electronic chart and S-102 for bathymetry have been registered so far. Various kinds of product specifications would be expected to be registered. These are specified as XML (eXtensible Markup Language) to be provided on the web [2].

This paper introduces an empirical application of S-100 standard, applied to marine casualty information. The analysis of marine casualty cases reported in Korea for recent four years and the creation of XML documents with schema design are processed before implementing the application to present the marine casualty information on google map.

2. Related works

2.1. S-100 Standard

IHO S-100 standard provides a contemporary hydrographic geospatial data standard that can support a wide variety of hydrographic-related digital data sources, aligned with the ISO 19100 series of geographic standards for the easier integration of hydrographic data and applications into geospatial solutions [2]. IHO S-100 standard contains how to define the information structure of electronic navigational charts and the related solutions as called a product specification. Figure 1 shows the relationship between S-100 and product specification. It describes the exact number will be assigned when the product specification is registered.

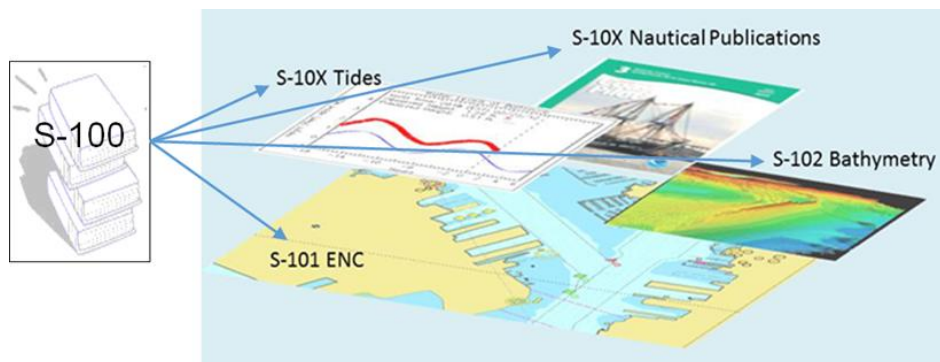


Figure 1. The Relationship between S-100 and Product Specifications

2.2. Previous Works

PPMS (Potentially Polluting Marine Sites) [3] is a research to provide the information of potentially polluting area to navigational vessels which are close to the reported area. After designing the schema of potentially polluting shipwrecks, dumping areas, pipelines and other pollution related information, PPMS geo-spatial database is created based on the schema. S-100 standard is considered to design the schema and to

create database using UML (Unified Modeling Language) and GML (Geographic Markup Language).

ICEMAR project [4] funded by EC (European Commission) has been performed for three years from 2011. One of goals of this project is to develop S-100 based product specification for delivering sea ice information to vessels operating in icy waters on ECDIS (Electronic Chart Display and Information System) on the bridge.

3. Analysis of Marine Casualty Information

KMST (Korea Maritime Safety Tribunal) has published casebooks of marine casualty information, called "the Casebook of KMST" every year. The book offers the detail information about marine casualty cases which are held in Korean territorial waters. This paper analyzes the marine casualty cases for recent four years from 2009 using UML [5-8].

Figure 2 shows the UML class diagram as the analysis result of the collision type of marine casualty cases. 'marine casualty information' class is correspondent to the 'ship' class which is for describing ship's condition, 'acctype' class for accident type. Also, a 'marine casualty information' class is aggregated with 'weather' class which is describing for weather condition, 'judgment' class for the result of judgment about the casualty, 'date_time' class for exact date and time, 'location' class for latitude and longitude and 'SEAARE' class for sea area.

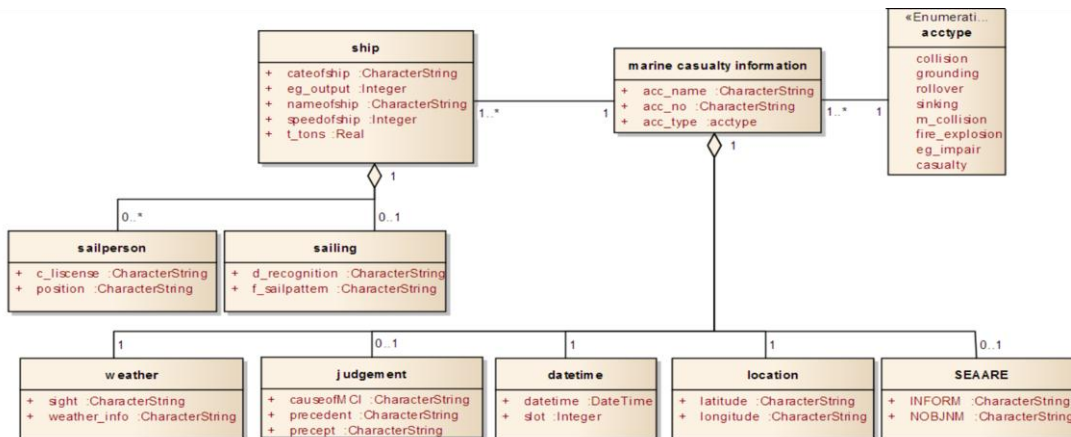


Figure 2. The UML Class Diagram for Marine Casualty Information

4. Implementation of Marine Casualty Application

This paper implements a web-based application to display the collision type of marine casualty information on google map. Followings are the steps for the implementation. In this paper, the design process of XML schema definition is not described in detail, however, Figure 3 is the XML schema definition translated from the design process.

- a. Create XML schema definition from the design for the collision type of marine casualty information. Figure 3 shows the XML schema definition of this implementation.
- b. Create XML documents of marine casualty information which is combined the schema definition to source data.

- c. Parse XML documents to identify position information such as the longitude value and the latitude value and the other part of casualty information to be displayed.
- d. Display the graphic market on the position of casualties.
- e. When users click or touch the specific market, the other part of casualty information is displayed using a small window.

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XSD_View
<?xml version="1.0" encoding="euc-kr" ?>
- <xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">
- <xs:element name="Accident_class">
- <xs:complexType>
- <xs:sequence>
- <xs:element name="Accident">
- <xs:complexType abstract="true">
- <xs:complexContent>
- <xs:extension base="ComplexType1">
- <xs:sequence>
<xs:element name="사건번호" type="xs:string" minOccurs="1" maxOccurs="1" />
<xs:element name="사건명" type="xs:string" minOccurs="1" maxOccurs="1" />
<xs:element name="사고일시" type="xs:string" minOccurs="1" maxOccurs="1" />
<xs:element name="위도" type="xs:string" minOccurs="1" maxOccurs="1" />
<xs:element name="경도" type="xs:string" minOccurs="1" maxOccurs="1" />
<xs:element name="선명a" type="xs:string" minOccurs="1" maxOccurs="1" />
<xs:element name="선명b" type="xs:string" minOccurs="1" maxOccurs="1" />
<xs:element name="선종a" type="xs:string" minOccurs="1" maxOccurs="1" />
<xs:element name="선종b" type="xs:string" minOccurs="1" maxOccurs="1" />
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>
</xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:schema>
    
```

Figure 3. XML Schema Definition of the Marine Collision Casualty

Table 1. The Specifications of Implementation

	Specifications of implementation	
Target of User Interface	Web browser	Internet Explorer 10.0
	Operating system	Microsoft Windows 7 Ultimate K
Implementing Environments	CPU	Intel Core i5-3570K 3.40Ghz 3.40Ghz
	Memory	8GB
	Operating system	Microsoft Windows 7 Ultimate K
	Programming language	HTML5, JSON, CSS
	Other techniques	Google api - Google Map Api

Table 1 shows the detail specification of implementation. The user interface environments are considered to be provided marine casualty information. Figure 4 shows a sample result of the web-based implementation displaying on google map.



Figure 4. A Result of Web-based Implementation

5. Conclusion

Recently, as the IHO S-100 standard has been issued to support common maritime data structure, the studies on various kinds of safe navigation related information have been increased. In this paper, we introduced an empirical application of S-100 standard, applied to marine casualty information. We performed the analysis of marine casualty cases reported in Korea for recent four years and the creation of XML documents with schema design and the implementation of the web-based application to present the marine casualty information on google map.

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