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Development of WA-DGNSS Reference Station Software

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요 약 : 본 논문에서는 준실시간 개념으로 개발 중인 광역보정시스템의 기준국 소프트웨에 대한 설계 및 구현 결과에 대하여 기술되어 있다. 기준국 소프트웨어는 유지보수 및 확장성이 용이하도록 객체지향 기법을 적용하여 설계 및 구현하였다.

핵심용어 : 광역보정시스템, 광역기준국 소프트웨어, 객체지향 설계

ABSTRACT : *In the paper, design and implementation results of the reference station software are described for the WA-DGNSS that is currently developed in pseudo-realtime concept. The reference software is designed and implemented by applying the object oriented methodology.*

KEY WORDS : *WA-DGNSS, Wide Area Reference Station Software, Object Oriented Software Design*

1. Introduction

WA-DGNSS system comprises WRS(Wide area Reference Station), WMS(Wide area Master Station)/GES, GEO satellite and User segment (Fig. 1).

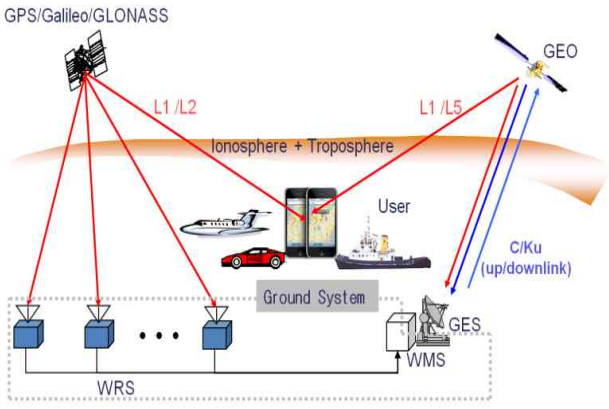

Fig. 1 WA-DGNSS System Schematics

WRS collects and processes the GPS navigation data, and calculates errors such as ionospheric delay, tropospheric delay, pseudorange residuals etc. Then WRS sends the calculated errors to WMS to generate the wide area differential correctin data[1,2].

This paper describes the design and implementation results of the WRS software obtained by applying the object oriented software methodology.

2. WRS Software Development

2.1 WRS Software Design

WRS software design is carried out by applying object oriented methodology. The design results include use case diagram, architecture diagram, activity diagram and class diagram. TCP/IP communication with WMS is also designed to send the generated data in WRS to WMS.

The WRS software is designed in modular concept for easy maintenance and extension: minimizing the effect to other components due to a component changes and system addition.

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Through preliminary design of WRS software[3], UML based use case diagram is designed, and software architecture design is followed. Consequently, Input, Processing and output are also defined for each component.

In detailed design[4], activity diagram required for carrying out WRS functions is designed, followed by the class diagrams design as the final step for WRS software design.

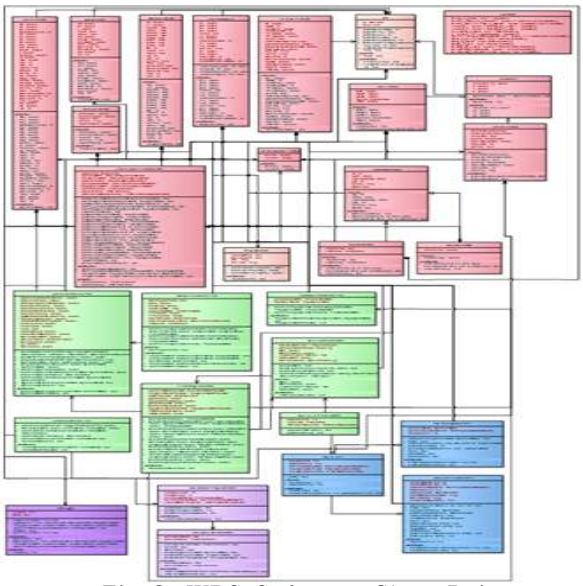

Fig 2: WRS Software Class Daigram

Fig 2 shows the WRS software class diagram that describe the static structure of the WRS software, and each class in the diagram has attribute, operation and relationship with other classes.

Class Diagrams of the WRS software comprise with four categories: Raw and Pre-processed Data Holder Classes, Data Processing Classes, Data Logging and Transmission Task Classes, Parsing RINEX Files Classes. As a results of class diagram desiagn, pseudocode of the WRS software is obtained.

2.2 WRS Software Implementation

WRS software is programmed by using OOP language C# that supports easy maintenance and extension. WRS software can be operated in post processing mode as well as realtime processing mode.

WRS software comprises component for interface with WMS, component for data preprocessing, and component for data parcing, processing, transmission to WMS and presentation. Fig 3 and Fig 4 show some of the implemented results of the WRS software. Fig 3 shows the processed clock data and ephemeris data. Fig 4 shows the processed data, namely pseudorange, pseudorange residuals, Ionospheric delay.

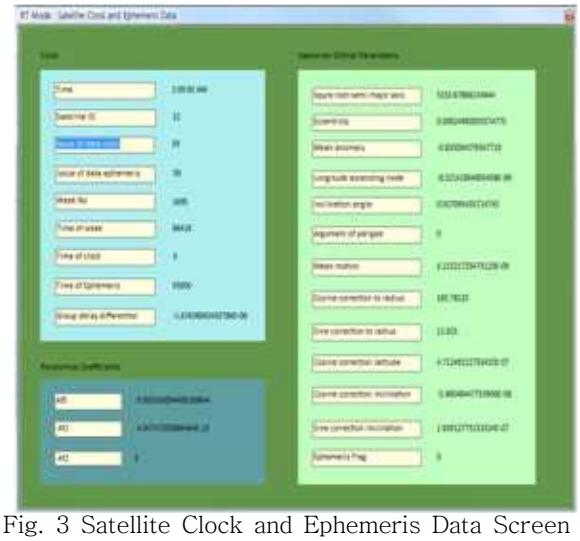

Fig. 3 Satellite Clock and Ephemeris Data Screen

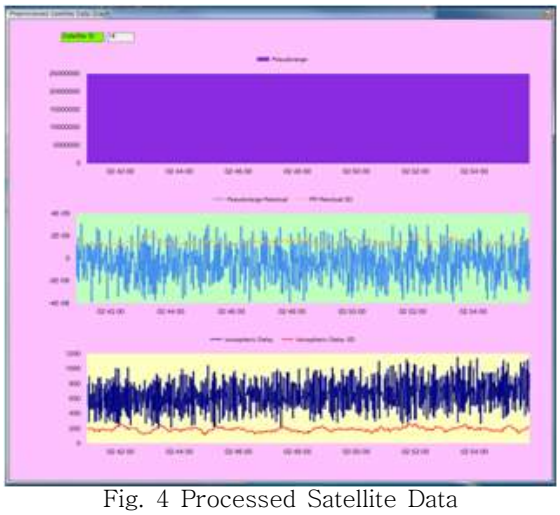

Fig. 4 Processed Satellite Data

5. Conclusions

In this paper, software design results of WA-DGNSS reference station is described obtained by applying object oriented methodology. Software implementation results are also described by showing figures that include processed clock data, ephemeris, pseudorange etc.

Validation of design and implementation will be followed in subsystem level as well as in integrated level, namely interface mode with the master station.

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References

[1] Uzair Ahmad, Choi Wan Sik, Changdon Kee, "Processing of WA-DGNSS Correction Messages: A Functional Perspective", The 18thGNSSWorkshop, PhoenixIsland, Jeju, Nov. 2011

[2] Changdon Kee, Ho Yun, Wan Sik Choi," Transmission Data Specification for GNSS(GPS) Wide area Reference Station", TTAK.KO-06.0266, Dec. 2011

[3] Wan Sik Choi, Shah Sayed Chhattan, Joong Eup Kye, Ho Yun, Changdon Kee, "Data Processing Design of Korean WA-DGNSS Reference Station", enc2012, pp. 25-27 April, Gdansk, Poland

[4] W.S. Choi, S.S. Chhattan, J. E. Kye, W.Y. Han, H. Yun, C. Kee, "Flexible Software Design of Korean WA-DGNSS Reference Station", Int J on Marine Navigation and Safety of Sea Transportation, Vol 7, No 1, Mar. 2013, pp. 75-78