COMS CADU DATA GENERATION FOR COMS IMPS TEST

Seok-Bae SEO and Sang-Il AHN

Korea Aerospace Research Institute
115 Gwahangno, Yuseong-Gu, Daejeon, Republic of Korea
E-mail : sbseo@kari.re.kr, siahn@kari.re.kr

ABSTRACT: The COMS IMPS (Communication Ocean and Meteorological Satellite IMage Pre-processing Subsystem) is developed for image pre-processing of COMS. For a test of the COMS IMPS, 7 support software are developed in KARI GS using simulated MI/GOCI WB (Wide-Band) data; COMS Fill Adder, MI (Meteorological Imager) CADU generator, GOCI (Geostationary Ocean Colour Imager) CADU generator, COMS CADU combiner, MI SD (Sensor Data) analyzer, GOCI SD analyzer, and COMS DM (Decomposition Module) test harness. This paper explains functions of developed support software and the COMS IMPS test using those software.

KEY WORDS: COMS, IMPS, Satellite Data, CADU, MI, GOCI

1. INTRODUCTION

COMS (Communication Ocean and Meteorological Satellite) has two imagers, MI (Meteorological Imager) and GOCI (Geostationary Ocean Colour Imager), that are formatted as CCSDS CADU data and are transmitted to GS (Ground Segment) in the MODCS (Meteorological and Ocean Data Communication Subsystem) of COMS.

DATS (Data Acquisition and Transmission Subsystem), one of COMS GS subsystem, receives CADU data and generates MI/GOCI Raw data for image processing in IMPS (IMage Pre-processing Subsystem). Generated MI/GOCI raw data are transmitted to MI/GOCI IMPS DM, respectively.

Because that COMS GS can receives real CADU data from COMS after its launch, simulated CADU are required for developments and tests of COMS GS software.

This paper explains COMS CADU generation method for the IMPS Test using developed software by KARI GS. Figure 1 shows data transmission from COMS to GS.
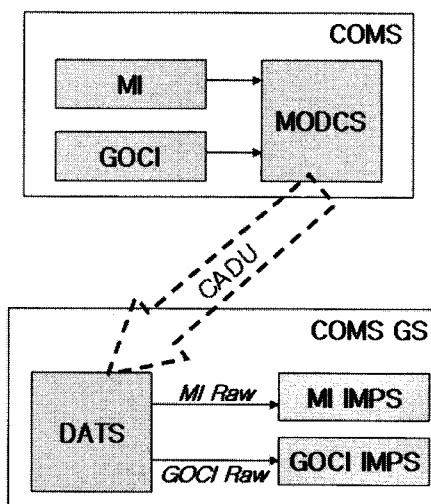

Figure 1. Data transmission from COMS to GS

2. SUPPORTING SOFTWARE

KARI GS already has the simulated MI/GOCI WB data, simulated data of two imagers; MI and GOCI, only CADU generation is required for developments and tests of COMS GS software. For the CADU generation, 7 support software are developed in KARI GS as followings. 6 software are developed for data generation and 1 for verification of the generated data, COMS CADU.

2.1 COMS Fill Adder

COMS Fill Adder has two main functions; MI/GOCI SD (Sensor Data) size calculation and MI/GOCI fill add. Where, SD means simulated MI/GOCI WB data. Before MI/GOCI fill add, MI/GOCI SD size calculation can use to estimate available fill data size for MI and GOCI SD. For the MI/GOCI fill data add, just select input file to add fill using [SD Open..] button, and put ratio of fill for front and end positions. If the front ratio is set to 100%, there is no fills in end of the input SD file. Figure 2 shows GUI of COMS Fill Adder.
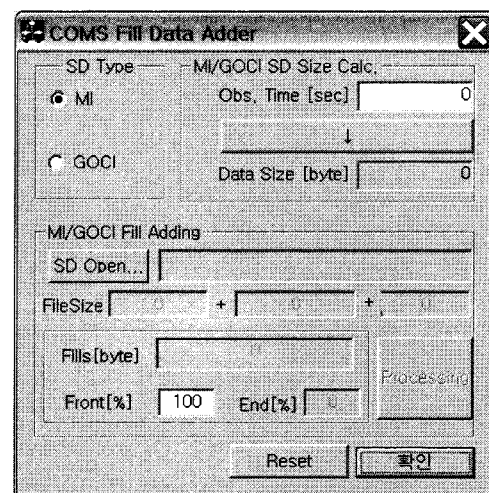

Figure 2. COMS Fill Adder

2.2 COMS MI CADU Generator

COMS MI CADU Generator has three steps for the MI CADU generation; MI SD open, Source Packet Generation, and CADU or Raw Data generation.

Source Packet is an intermediate product for CADU generation by CCSDS standard which is made using the SD, MI SD and GOCI SD. The final result of the software is CADU or Raw Data which generated using pre-generated source packet. Only CADU generation function is used for the purpose of this paper. Figure 3 shows GUI of COMS MI CADU generator.
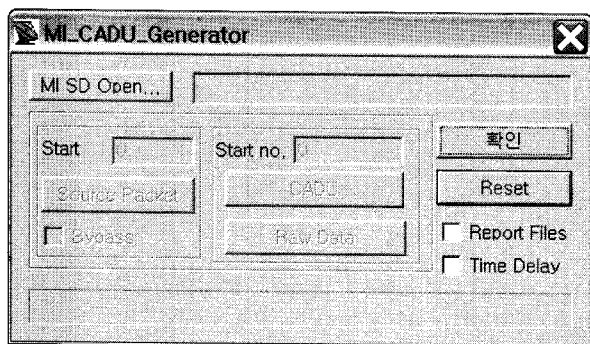

Figure 3. COMS MI CADU generator

2.3 COMS GOCI CADU Generator

Functions of COMS GOCI CADU Generator are similar with the COMS MI CADU generator except input file (GOCI SD) and source data format. Figure 4 shows GUI of COMS GOCI CADU generator.
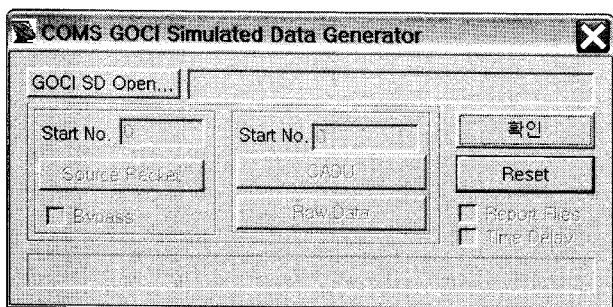

Figure 4. COMS GOCI CADU generator

2.4 COMS CADU Combiner

COMS CADU combiner makes the COMS CADU which is made up with MI and GOCI CADU one after the other.

If MI and GOCI CADU have different size, pre-generated fill CADU are added instead of shorter CADU. Furthermore, several number of pre-generated CADU can be added at front ad end of COMS CADU using edit boxes in the developed COMS CADU combiner. Figure 5 shows GUI of COMS CADU combiner.
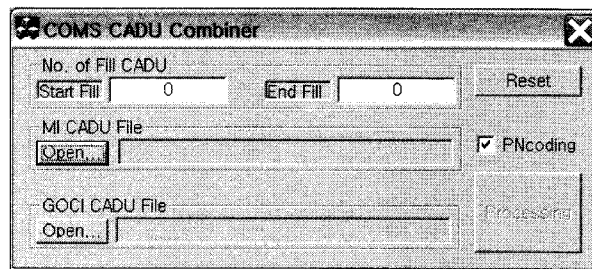

Figure 5. COMS CADU combiner

2.5 COMS MI SD Analyser

COMS MI SD analyser is made to analysis contents of the MI WB Data. Result of the software is 'csv file' (a kind of MS Excel file). Figure 6 shows GUI of MI SD Analyser.
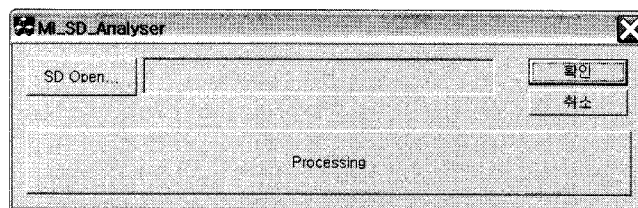

Figure 6. COMS MI SD analyser

2.6 COMS GOCI SD Analyser

Function of COMS GOCI SD Analyser is similar with the COMS MI SD Analyser except input file (GOCI WB data). Figure 7 shows GUI of COMS SD Analyser.
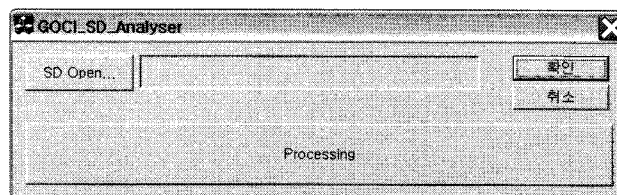

Figure 7. COMS GOCI SD analyser

2.7 COMS DM Test Harness

Though previous 6 software are developed for data generation, COMS DM Test Harness is made for analysis and verification for generated CADU and Raw Data.

COMS DM Test Harness has three main functions; CADU Analysis, Raw Data Analysis, and Comparison between Raw data and CADU. The last function can set ranges and number for comparison for convenience of test and verification. All of results of COMS DM Test Harness are text files. Figure 8 shows GUI of COMS MI DM test harness.
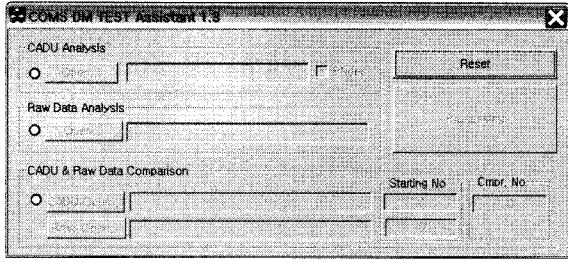
Figure 8. COMS DM test harness

3. COMS CADU GENERATION UISNG DEVELOPED SOFTWARE

This part explains process of COMS CADU generation in the order.

Before MI/GOCI CADU generation, verification of its input files is required using MI/GOCI SD Analyser.

3.1 Input WB verification using MI/GOCI SD analyser

Outputs of MI/GOCI SD analyser are 'csv file' which has different contents for MI and GOCI cases. For the results of MI, the 'csv file' has set of three information; end position of each data, accumulated WB data block number, and kind of WB data block. We can verify formats of input MI WB data using that information in the results file. Three results of GOCI SD analyser are same with MI ones, but the last contents are slot number instead of kind of WB data block in MI case. Figure 9 and Figure 10 show an example of analysis results of MI and GOCI SD analyser.

Figure 9. Input MI WB verification using MI SD analyser

Figure 10. Input GOCI WB verification using GOCI SD analyser

3.2 MI/GOCI fill adding using COMS Fill Adder

If fill WB (SD) are need for COMS CADU generation, COMS Fill Adding software can be used, respectively.

3.3 WB merge using DOS copy command

Copy command of DOS can be used to add up some files to one file. For example, if you want to make one file (WB_01.bin) from two files (WB_0.bin and WB_1.bin), you can use following command in DOS command windows of the Microsoft Windows system. Where, we assume that two input files are in the 'C:\' directory.

C:\> copy /-b WB_0.bin+WB_1.bin WB_01.bin

3.4 MI CADU generation using COMS MI CADU generator

MI WB data is made up with two files; WB_0.bin and WB_1.bin. So, before MI CADU generation, I make two MI WB data as one file (WB_01.bin) using DOS copy command. After that, MI CADU is generated using MI CADU CACU generator. Figure 11 shows an example of result for GUI of MI CADU generator.
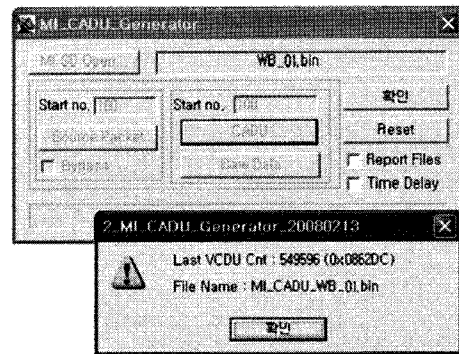

Figure 11. MI CADU generation using COMS MI CADU generator

3.5 GOCI CADU generation using COMS GOCI CADU generator

Steps of GOCI CADU generation are similar with MI ones. Figure 11 shows an example of result for GUI of GOCI CADU generator
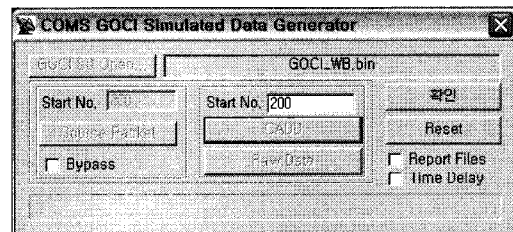

Figure 12. GOCI CADU generation using COMS GOCI CADU generator

3.6 COMS CADU generation using COMS CADU combiner

Figure 13 shows an example of COMS CADU generation GUI using COMS CADU Combiner. Each of front and end of COMS CADU data, 10 fill CADU are added.
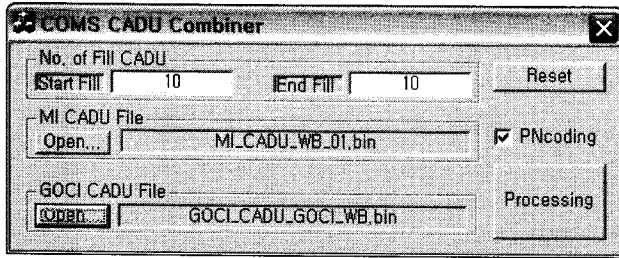

Figure 13. COMS CADU generation using COMS CADU combiner

Figure 14 shows overall process of COMS CADU generation. MI CADU and GOCI CADU are generated before the combining process. The first step for each CADU generation is the fill add using the COMS Fill Adding software for MI and GOCI case. After that filled MI/GOCI WB data are made to MI/GOCI CADU using MI/GOCI CADU generator. The final step for COMS CADU generation, COMS CADU combiner is used with setting of front and end fill number. Generated COMS CADU is used for IMPS tests.
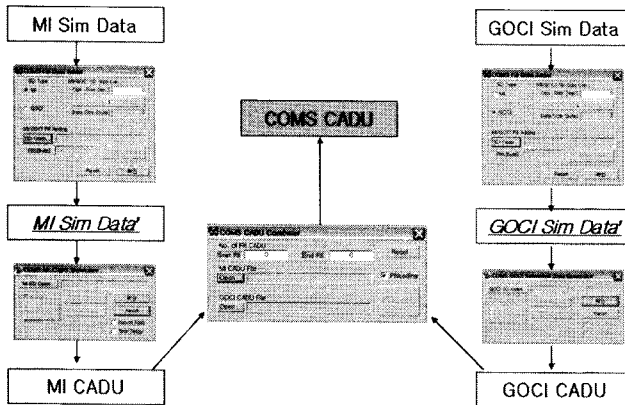

Figure 14. COMS CADU generation

4. GENERATED CADU VERIFICATION

Generated COMS CADU can be verified using the CADU analysis function of COMS DM Test Harness. Figure 15 shows an example of output of COMS DM Test Harness. In Figure 15, we can find out 3 important points for the verification of the generated CADU.

- At least, 10 fill CADU (0x783F, APID for fill CADU) are added to front of the COMS CADU.
- MI CADU (0x532A, APID for MI CADU) is generated with correct format.

- GOCI CADU (0x5332, APID for GOCI CADU) is generated with correct format too.
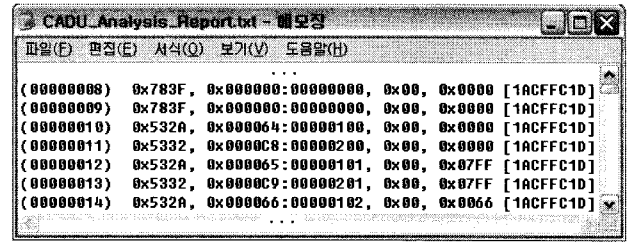- MI and GOCI CADU are mixed up one by one.

Figure 15. Generated COMS CADU verification using DM Test Harness

If COMS CADU has wrong format, we can see unexpected values in the output file of COMS DM Test Harness.

5. CONCLUSIONS

The paper explains the process of COMS CADU generation and verification. Developed 7 software are used for COMS IMPS development and its test and that software can be referred to a design of other satellite ground software developments and verifications.

REFERENCES

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