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CCD

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NSC 94 2212 E 032 011
2005 8 1 2006 7 31

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95 10 31

TUUSAT-1

Abstract

This paper focuses on the design and functional test of the imaging compression software for micro satellite TUUSAT-1. The functional requirements of the imaging compression software will be defined according to the mission requirements of TUUSAT-1. A JPEG format of image will be adopted as the algorism of imaging compression. The compression software is developed with C language and is stored in the onboard flight computer MPC-555. A weather image downloaded form NOAA satellite is compressed by the compression software in order to test the compression efficiency and to obtain the proper compression rate. The imaging control logic will be also developed and stored in the flight software of onboard computer.

Keywords: Microsatellite, imaging compression software

TUUSAT-1

1 1 1 1 2
1
2

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TUUSAT-1

1.

TUUSAT-1[4]
TUUSAT-1 34
137.5MHz

(piggyback)
600-800
TUUSAT

(2) (FOV)
1000
(3) 256
4km/pixel
TUUSAT Stanford
Sapphire Logitech Fotoman
CCD

2003
[1]

19200 8051
RS-232

2.

:
(1) :

3.

●

●

JPEG

●

(Data Stream)

FSW

FSW

Source Code

(DSP TMS320C6071)

32 CPU TUUSAT-1

32 MPC-555

μC/OSII

8 CPU

3.1 JPEG

JPEG

[3] JPEG

JPEG

JPEG

” ”

” ” JPEG

DCT

(Baseline)

DCT

3.2 JPEG

JPEG

[5] 3-1

JPEG

3-2

15%

JPEG

3.3

PC

PC

1Mbyte

640*480pixel 320*240pixel

3.3.1 PC

Intel Pentium4

3.0GHz 1G byte Windows XP

professional

PC

RS-232

9600bps 3-1,3-2 63.672
18.1KB
8.812
640*480 8.3KB 3-3
9600bps 10.18 640X480
6.89
:
MPC555
273.26
PC Visual C++ 6.89

37.282
PC 18.8Kb
CodeWarrior 241.813
320X240
3-4
3-4

3.3.2

PC
RS-232 I/O
:
: TUUSAT-1
Motorola MPC555 μC/OSII
1.5
MPC555 2
3-5
PC

PC
3-5
8bit bmp 640X480(30
) 320X240 pixel 600
RS-232 PC 445.785 367
PC 60 300
3-3

:
MPC555 48
5.5 **4.**

9600bps 11

TASK

4.1

:

1.
2.

3.
4.

4.2

4-1

4.3

JPEG [6]

(Inversed zig-zag scan)

DCT
(IDCT: Inverse DCT)

JPEG

30

TASK

RS-232

4.4

RS-232
[7]

4.4.1

RS-232

5.

1.

2.

3.

6.

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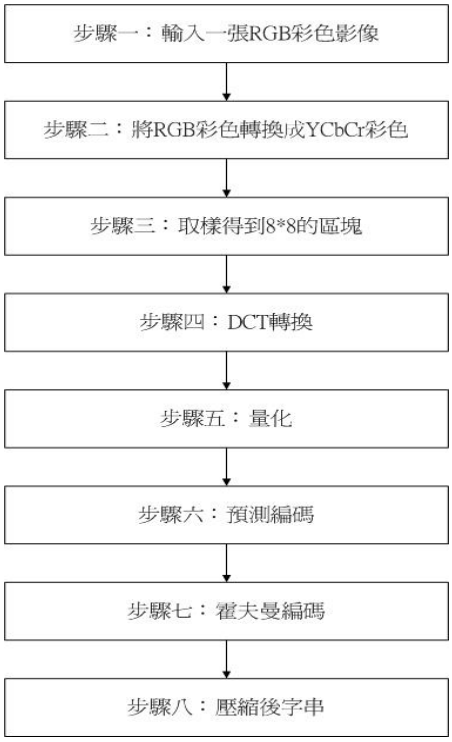
-011-

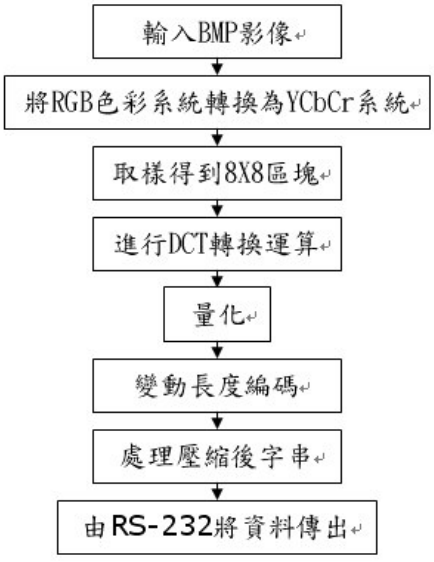
7.

1.
2004
2. TUUSAT-1A CCD
2005
3.
2002
4. Hong, Z. C., Lin, C. H., Lin, H. J. The Imagery Payload Design for Passive Magnetically Stabilized Micro-satellite AIAA Journal of Spacecraft and Rocket Vol.40,No.3,May-June 2003
5.
1988
6.
1994
7.
2004

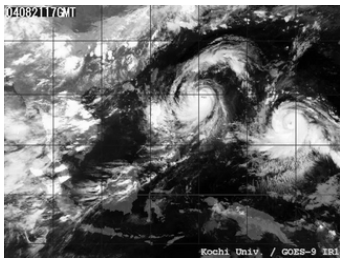
8.



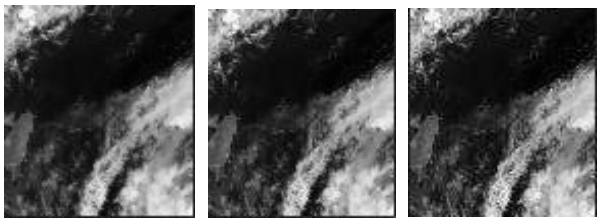
3-1 JPEG



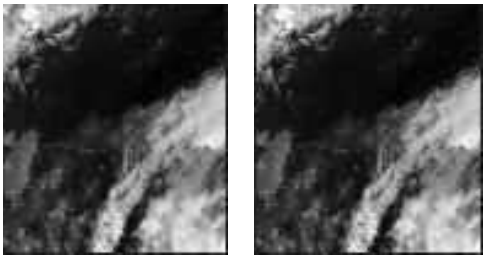
3-2 JPEG



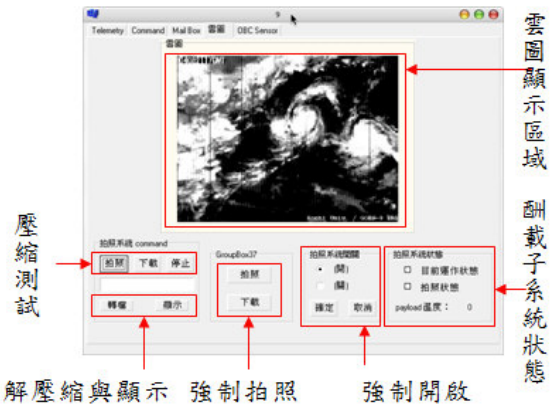
3-3



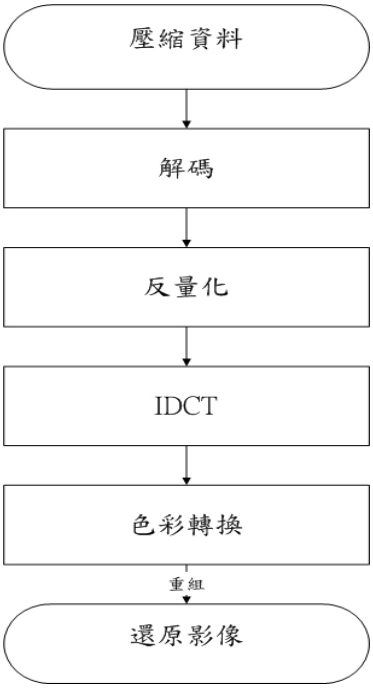
3-4



3-5 1.5 2



4-1



4-2

3-1 320*240 PC

量化比	檔案容量(KB)	平均壓縮時間(s)	壓縮後大小(KB)	壓縮率
高	77KB	14.921	14	5.5
中		19.218	18.1	4.25
低		28.031	26.4	2.92

3-2 640*480 PC

量化比	檔案容量(KB)	平均壓縮時間(s)	壓縮後大小(KB)	壓縮率
高	307KB	38.125	35.9	8.55
中		47.266	44.5	6.89
低		67.171	63.3	4.84

3-3 (320*240)

壓縮比	檔案容量 (KB)	平均壓縮時間 (s)	壓縮後大小 (KB)	壓縮率
高	77KB	59.375s	14KB	5.5
中		63.672s	18.1KB	4.25
低		72.484s	26.4KB	2.92

3-4 (640*480)

壓縮比	檔案容量 (KB)	平均壓縮時間 (s)	壓縮後大小 (KB)	壓縮率
高	77KB	59.375s	14KB	5.5
中		63.672s	18.1KB	4.25
低		72.484s	26.4KB	2.92

3-5

	(KB)	(s)	(KB)	
	307KB	241.813s	35.9KB	8.55
1.5		230.7	30.3KB	10.13
2		213.26	27.8KB	11

The Design of Onboard Imaging Compression Software for Microsatellite TUUSAT-1

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NSC Project No.:NSC-94-2212-E-032 -011

Abstract

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