

# UAV 가 HILSIM

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- 1. UAV(Unmanned Aerial Vehicle, Uninhabited Aerial Vehicle : )
- UAV 가
- UAV 가 (Off-line)
- 가 . UAV 가
- 가 가
- 가 가
- 가 가
- HILSIM (Hardware In the Loop SIMulation)
- 가
- 가
- 가
- UAV HILSIM

HILSIM HILSIM HILSIM

2. HILSIM

HILSIM

2.1 HILSIM

가

HILSIM

가

가

가

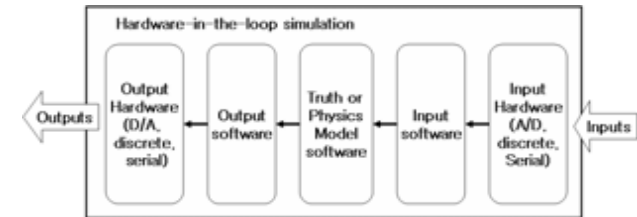
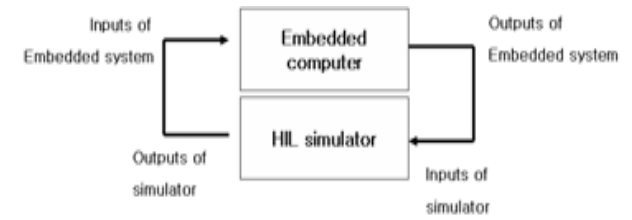
가

, UAV

가

가

가



1. HILSIM

HILSIM

( )

( )

HILSIM

HILSIM

1.( ) HILSIM

1.( ) HILSIM

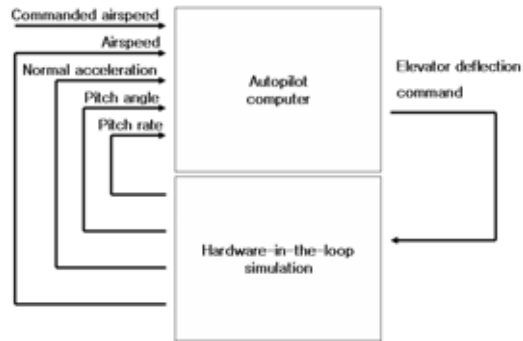
HILSIM

HILSIM

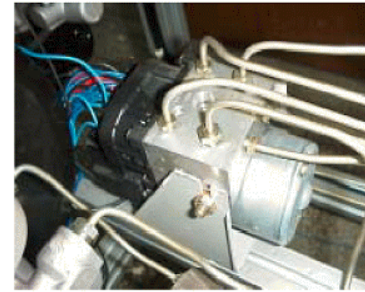
MIL-1553, ARINC-429, RS-422

box-to-box

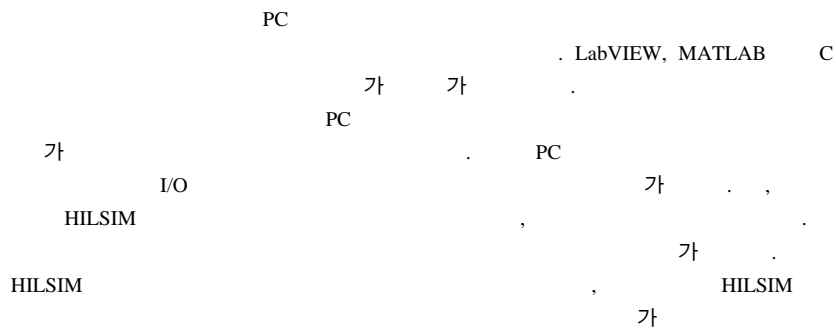
가



2. Autopilot being tested using a HILSIM



3. Integration module of ECU( ),  
Coupling of brake equipment with pressure sensor( )

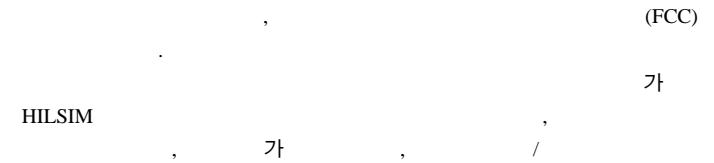
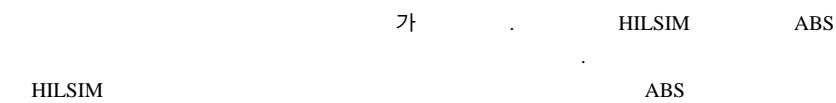


- Airship HILSIM system

2.2 HILSIM

- ABS HILSIM  
ABS(Antilock Brake System)

. ABS



4. HILS

(Transponder),

가

		Analog to digital converter
	/	RS-232, RS-422
		Digital input
	On/Off	Digital input

3 6 / 3

3. UAV HILSIM

UAV HILSIM

가 HILSIM 가

3.1

가



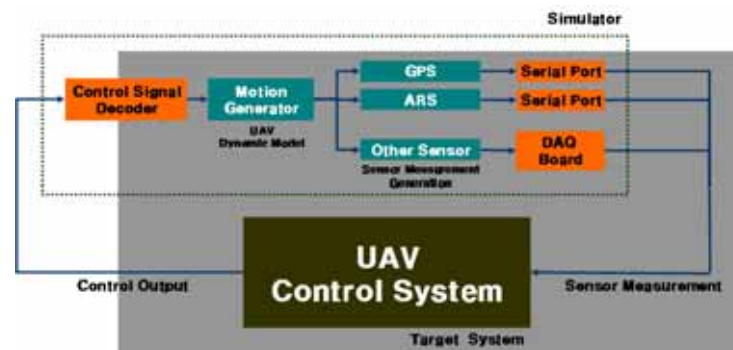
5.

HILSIM

1

3.2 HILSIM

HILSIM



6. HILSIM

HILSIM

가

1

1.

UAV 가

UAV

GPS, IMU

가 Serial Port, DAQ(Data Acquisition) Board

HILSIM



3. HILSIM S/W

			OS	
Simulink	가	C	Windows, Real-Time OS	
QNX	가	-	QNX	
Visual Studio		-	Windows	
LabVIEW	가	C, Simulink	Windows, Real-Time OS	

Simulink xPC Target dSPACE

C 가

Windows OS

Real-Time OS

QNX 가

Visual Studio Windows

가

NI LabVIEW PXI

가 C, Simulink

가 가 가

가

가

가

NI LabVIEW

5. HILSIM

HILSIM

5.1

가

HILSIM

20Hz 100Hz 6 LabVIEW  
 DLL C FORTRAN 가  
 4

4.

	Elevator	Aileron	Rudder	Flap	RPM	manifold Pressure	x-wind	y-wind	z-wind	x-wind	y-wind	z-wind
	V	$\alpha$	$\beta$	p	q	r	$\Phi$	$\theta$	$\Psi$	x	y	z

5.2

가

가

가 가

5

가

5.

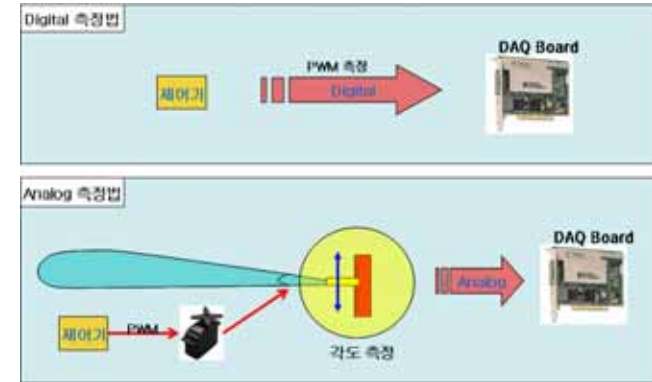
	-
	- random constant random walk
	-
	-
	-
	-

System) ARS (Attitude Reference System) AHRS (Attitude Heading Reference System)  
가 가 ,

-GPS  
GPS  
GPS RF GPS GPS  
가 가  
GPS  
GPS RS-232 RS-422 GPS  
GPS 가 GPS

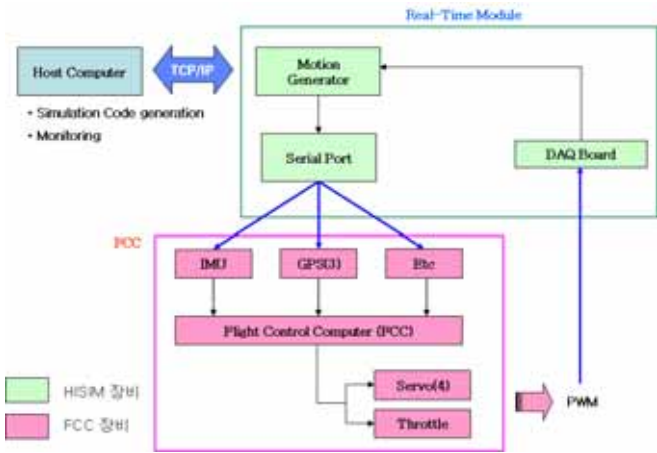
5.3  
HILSIM

가



7.

5.4 HILSIM  
8 HILSIM  
가



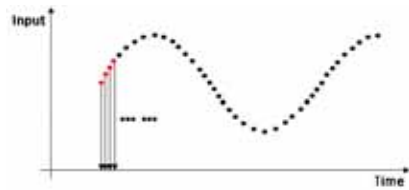
8. HILS

6. HILS

6.1

HILS

가  
가



9.

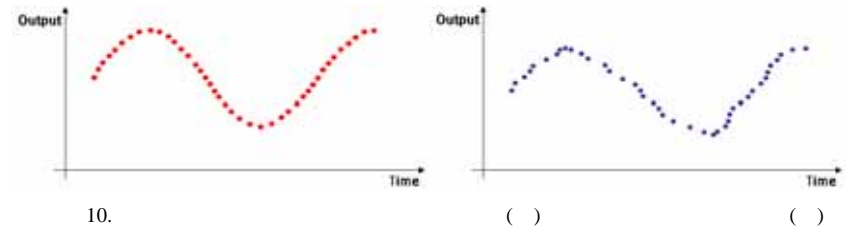
9  
(Time delay)

msec

가

9  
HILS

가  
10



6.2

HILS

가

GPS, IMU

sec

sec

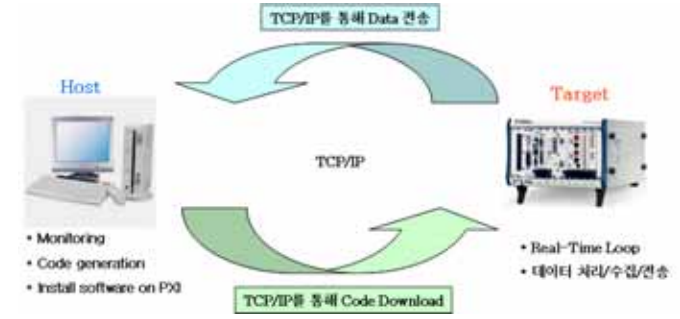
(Time delay)

HILS





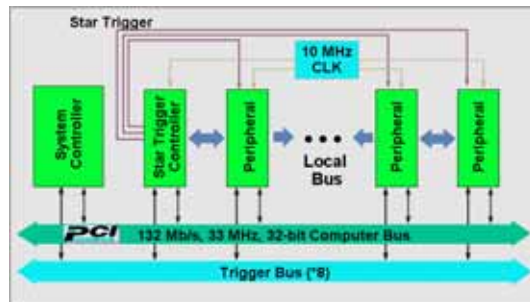
11. /



13.

6.3 PXI Module

NI PXI Real-Time Controller Data Bus Trigger Bus 가  
 . Data Bus Trigger Bus  
 , 가 가 HILSIM



12. PXI Real-Time Controller

LabVIEW Real-Time Module PXI  
 . LabVIEW PC(Host Computer)  
 TCP/IP PXI(Target Computer)  
 PXI가  
 가



14. OS CPU Clock

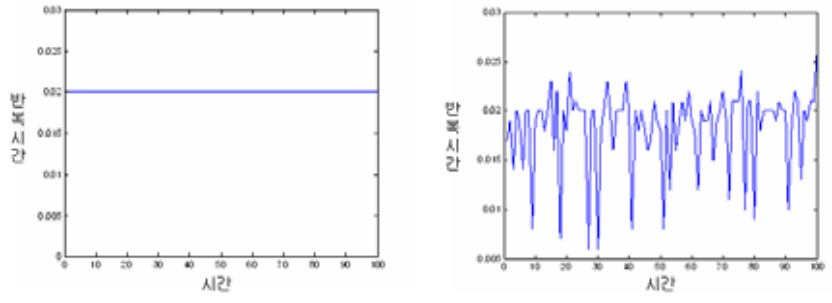
Windows OS 가  
 CPU Clock . Windows OS HILSIM  
 CPU Clock 가 Real-Time 가  
 Real-Time OS가 HILSIM  
 HILSIM / 가  
 OS /

6.

- |                 |     |
|-----------------|-----|
| 1. NI PXI       |     |
| 2. 0.02sec      | PXI |
| 3. Real-Time OS |     |
| 4. Windows OS   | 3   |
| 5.              |     |



15. OS



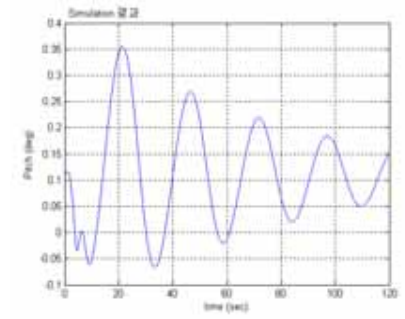
16. Real-Time OS( ) Windows OS( )

Real-Time OS  
Windows OS

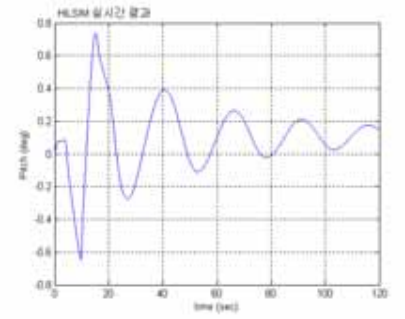
Windows OS  
Real-Time OS HILSIM

7. HILSIM UAV  
가 UAV 가  
DHC-2 Beaver

7.1 Open loop



(a)



(b) HILSIM

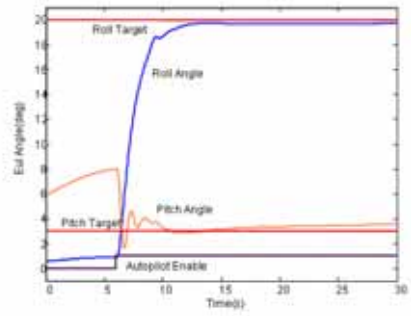
17. Beaver

Pitch

8  
peak-to-peak  
0.261 (rad/sec), HILSIM  
HILSIM 가  
HILSIM UAV

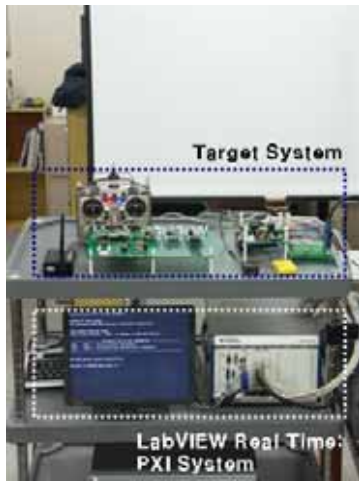
HILSIM  
가  
0.251 (rad/sec)

7.2 Closed loop



18. Roll Pitch (HILSIM)

9 Roll Pitch 20deg 3deg 가 Roll Pitch 가



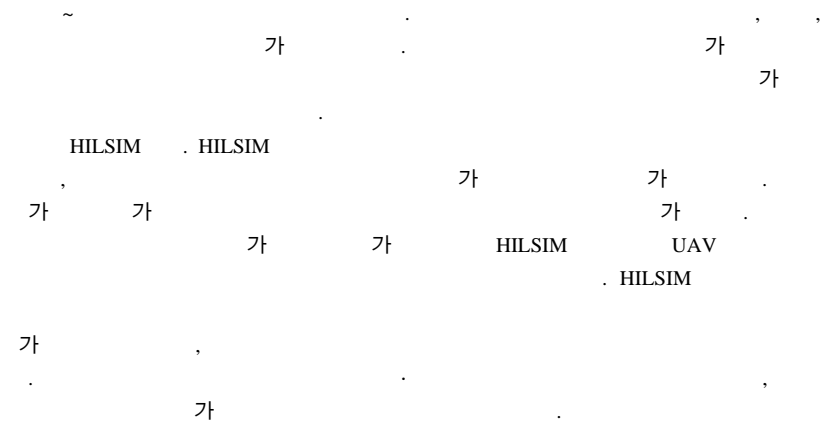
19.

8.

UAV

UAV

가



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- [7] “ ”, National Instruments
- [8] <http://www.ni.com/manual>
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