HYBRID FAULT DETECTION USING KALMAN FILTER AND NEURAL NETWORK FOR QUADROTOR MICRO AERIAL VEHICLE

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We hereby declare that we have checked this thesis and in our opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Master of Science.

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I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at University Malaysia Pahang or any other institutions.

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TABLE OF CONTENT

DECLARATION

TITLE PAGE

ACKNOWLEDGEMENTS **ii**

ABSTRAK **iii**

ABSTRACT **iv**

TABLE OF CONTENT **v**

LIST OF TABLES **viii**

LIST OF FIGURES **ix**

LIST OF SYMBOLS **xii**

LIST OF ABBREVIATIONS **xiii**

CHAPTER 1 INTRODUCTION **1**

1.1 Research Background 1

1.2 Problem Statement 3

1.3 Research Objectives 5

1.4 Scope and Limitations 6

1.5 Thesis Outline 6

CHAPTER 2 LITERATURE REVIEW **8**

2.1 Introduction 8

2.2 Review on UAV/MAV system & control 10

2.3 General on FD System 13

2.3.1 AI-based FD 14

2.3.2 Model-based FD 18

2.3.3 Hybrid FD 24

2.4 FD in Quadrotor 25

2.5 Summary 27

CHAPTER 3 METHODOLOGY 28

3.1 Introduction 28

3.2 Quadrotor system configuration & coordination 28

3.3 Kinematics model of quadrotor system 31

3.4 Dynamic model of quadrotor system 34

3.5 PD controller of design in quadrotor system 36

3.5.1 Inner Loop Controller 37

3.5.2 Outer Loop Controller 38

3.6 Kalman Filter and Fault Signature 41

3.7 Linearization of nonlinear quadrotor system 42

3.8 Residual Generation 46

3.9 Residual Classification using Artificial Neural Network (ANN) 47

3.9.1 Learning Phase 48

3.9.2 Neural Network Implementation 50

3.10 Fault type and condition 51

3.11 Summary 55

CHAPTER 4 RESULTS AND DISCUSSION 56

4.1 Introduction 56

4.2 Simulation procedure 56

4.3 Fault free condition 59

4.4 GPS sensor fault 60

4.5 GYRO sensor fault 68

4.6 Actuator fault in quadrotor model 79

4.7 Multiple faults detection 84

4.8 Chapter conclusion 88

CHAPTER 5 CONCLUSION 89

5.1 Conclusion 89

5.2 Future Research 90

REFERENCES 91

LIST OF PUBLICATION BY AUTHOR 96

APPENDIX A ADDITIONAL FINDING 97

LIST OF TABLES

Table 3.1	Detail of Quadrotor constant	32
Table 3.2	Main physical effects acting on a helicopter	34
Table 3.3	Parameter of the inner loop controller	38
Table 3.4	Parameter of the outer loop controller	40
Table 3.5	List of input	51
Table 3.6	List of output	51

LIST OF FIGURES

Figure 1.1	Illustration of restrictive real-life quadrotor operation	4
Figure 2.1	General classification of aircraft	11
Figure 2.2	Neural model reference control architecture Neural Network	16
Figure 2.3	Type of Learning dynamic network model	16
Figure 2.4	Process Flow of Dedicated Observer Scheme (DOS)	20
Figure 2.5	Family chart of fault detection, isolation, and recovery	26
Figure 2.6	Fault detection chart	26
Figure 3.1	Local and global coodinate system of quadrotor system	29
Figure 3.2	The direction of propeller's rotation	29
Figure 3.3	The positive turning of roll ($\emptyset$) in local coordinate	30
Figure 3.4	The positive turning of pitch (θ) in local coordinate	30
Figure 3.5	The positive turning of yaw (ψ) in local coordinate	30
Figure 3.6	Four control inputs generator by using the rotor speed quadrotor	33
Figure 3.7	The quadrotor dynamics and coordinate system.	35
Figure 3.8	Two stages PD controller in the quadrotor control archetecture	37
Figure 3.9	Shows the control scheme of the system.	40
Figure 3.10	Kalman filter in system dynamic.	41
Figure 3.11	Kalman Filter in connected in pallarelly to the quadrotor model	46
Figure 3.12	The ANN model.	48
Figure 3.13	Neural Network Diagram	49
Figure 3.14	Decision making by using the ANN model	50
Figure 3.15	An abrupt fault in Time-dependency	52
Figure 3.16	The incipient fault signal in drifting form	53
Figure 3.17	Intermittent fault type format	54
Figure 3.18	The fault injection in speed of rotation and sensor.	54
Figure 4.1	Flow of simulation procedure	57
Figure 4.2	Simulation on fault free condition (a) x position, (b) y position, (c) z position	60
Figure 4.3	The random fault signal on x position	61
Figure 4.4	The desired and the measured signal (a) Roll (ϕ), (b) Pitch (θ), (c) Yaw (Ψ), (d) Position x, (e) Position y and (f) Position z	62
Figure 4.5	The measured state conditiona signal and noise state condition signal on x position fault (a) Roll (ϕ), (b) Pitch (θ), (c) Yaw (Ψ), (d) Position x, (e) Position y and (f) Position z	64

Figure 4.6	The estimation signal and measured signal of quadrotor in fly mode. (a) Roll (ϕ), (b) Pitch (θ), (c) Yaw (Ψ), (d) Position x, (e) Position y and (f) Position z	65
Figure 4.7	Result of the residual generated signal	66
Figure 4.8	Result of the x fault situation from Kalman-ANN decision signal.	67
Figure 4.9	The random fault signal on Roll sensor	68
Figure 4.10	Measured signal and the desire signal during the flying mode the measured roll and desired roll, (a) Roll (ϕ), (b) Pitch (θ), (c) Yaw (Ψ), (d) Position x, (e) Position y and (f) Position z	69
Figure 4.11	The noise state condition are generated by using random signal (a) Roll (ϕ), (b) Pitch (θ), (c) Yaw (Ψ), (d) Position x, (e) Position y and (f) Position z	70
Figure 4.12	The estimated state condition signal and measure state condition signals (a) Roll (ϕ), (b) Pitch (θ), (c) Yaw (Ψ), (d) Position x, (e) Position y and (f) Position z	72
Figure 4.13	(a) The residual pattern of a Roll sensor fault (b) result of Kalman-ANN of a Roll sensor fault.	73
Figure 4.14	3D Flying map of quadrotor	74
Figure 4.15	Flying map of quadrotor (a) Top view, (b) Front view, and (c) Side view	75
Figure 4.16	The noise state condition of quadrotor system (a) Roll (ϕ), (b) Pitch (θ), (c) Yaw (Ψ), (d) Position x, (e) Position y and (f) Position z	76
Figure 4.17	The measure and estimated state condition is recoded when the Roll sensor fault signal is activated. (a) Roll (ϕ), (b) Pitch (θ), (c) Yaw (Ψ), (d) Position x, (e) Position y and (f) Position z	77
Figure 4.18	The Fault Severity Process	78
Figure 4.19	The Fault estimater from ANN subsystem. (a) residual signal, (b) Kalman-ANN output signal.	78
Figure 4.20	The incipient Rotor 1 fault to the situation of real fly failure in quarotor system.	79
Figure 4.21	Measure state condition signal and the Desire state condition signal during the flying mode (a) Roll (ϕ), (b) Pitch (θ), (c) Yaw (Ψ), (d) Position x, (e) Position y and (f) Position z	80
Figure 4.22	The measure state condition signal and the noise state condition signal. (a) Roll (ϕ), (b) Pitch (θ), (c) Yaw (Ψ), (d) Position x, (e) Position y and (f) Position z	81
Figure 4.23	Estimated signal and the measured signal when a actuator fault is injected (a) Roll (ϕ), (b) Pitch (θ), (c) Yaw (Ψ), (d) Position x, (e) Position y and (f) Position z	83
Figure 4.24	The actuator fault is identified by the Kalman-ANN at the 6.900 s. (a) the residual signal, (b) Kalman-ANN decision signal.	84

Figure 4.25 The measured state condition signal and noise state condition signal(a) Roll (ϕ), (b) Pitch (θ), (c) Yaw (Ψ), (d) Position x, (e) Position y and (f) Position z 85

Figure 4.26 The measured state condition and estimate state condition in Multiple fault (a) Roll (ϕ), (b) Pitch (θ), (c) Yaw (Ψ), (d) Position x, (e) Position y and (f) Position z 86

Figure 4.27 (a) the residual generated signal, (b) the Kalman-ANN decision signal result. 87

LIST OF SYMBOLS

ϕ	Roll
θ	Pitch
Ψ	Yaw
x	Location in x axis
y	Location in y axis
z	Location in z axis
$\dot{q}_i$	Generalized coordinate
Γ_i	Generalized force
V	Velocity
t	Time in second
Ω	Omega
τ	Torque
I_{xx}	Quadrotor moment of inertia around X axis
I_{yy}	Quadrotor moment of inertia around Y axis
I_{zz}	Quadrotor moment of inertia around Z axis
Jr	Total rotational moment of inertia around the propeller axis
b	Thrust factor
d	Drag factor
l	Distance to the center of the Quadrotor
m	Mass of the Quadrotor in Kg
g	Gravitational acceleration
c	Cosine
s	Sine
u	Control output
Re	Residual
Loc	Location

LIST OF ABBREVIATIONS

ANN	Artificial Neural Network
B	Body fixed frame
BP	Back-propagation
CoG	Centre of gravity
DC	Direct current
DES	Discrete-event system
DOF	Degree of Freedom
E	Earth fixed frame
FD	Fault diagnose
FDI	Fault Detection and Isolation
FDIR	Fault diagnosis, isolation, and recovery
KF	Kalman Filter
LOE	Loss of effectiveness
LQE	Linear quadratic estimation
NUVs	Network of unmanned vehicle
PD	Proportional–Derivative
PID	Proportional–Integral–Derivative
PWM	Pulse Weight Modules
TSKF	Two-Stage Kalman Filter
UAVs	Unmanned aerial vehicles