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(54) **Title:** SIGNAL A DRONE TO START LANDING

(57) **Abstract:** In this invention we signal the drone to start to descend for landing when there is a program error or a hardware fault. Here we use a watchdog timer which is an electronic timer to detect and recover from computer malfunctions. During normal operation, the computing system of the drone regularly resets the watchdog timer to prevent it from elapsing. If, due to a hardware fault or program error, the computing system fails to reset the watchdog, the timer will elapse and generate a timeout signal. The timeout signal is used to initiate corrective actions. The corrective actions here would include transitioning the drone into a state to begin descend for landing and triggering control actions for the same using a dedicated control unit for it. Also here we can use a proactive approach where different hardware sensors part of the drone predict component hardware failure beforehand or an error condition is passed to the computing system of the drone from a remote centralised controller system about a hardware or software failure, due to which the computing system of the drone will fail to reset the watchdog timer and a timeout signal will be generated to trigger descend of the drone for landing purposes.

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Signal A Drone To Start Landing

In this invention we signal the drone to start to descend for landing when there is a program error or a hardware fault. Here we use a watchdog timer which is an electronic timer to detect and recover from computer malfunctions. During normal operation, the computing system of the drone regularly resets the watchdog timer to prevent it from elapsing. If, due to a hardware fault or program error, the computing system fails to reset the watchdog, the timer will elapse and generate a timeout signal. The timeout signal is used to initiate corrective actions. The corrective actions here would include transitioning the drone into a state to begin descend for landing and triggering control actions for the same using a dedicated control unit for it. Also here we can use a proactive approach where different hardware sensors part of the drone predict component hardware failure beforehand or an error condition is passed to the computing system of the drone from a remote centralised controller system about a hardware or software failure, due to which the computing system of the drone will fail to reset the watchdog timer and a timeout signal will be generated to trigger descend of the drone for landing purposes.

Claims

Following is the claim for this invention:-

1. In this invention we signal the drone to start to descend for landing when there is a program error or a hardware fault. Here we use a watchdog timer which is an electronic timer to detect and recover from computer malfunctions. During normal operation, the computing system of the drone regularly resets the watchdog timer to prevent it from elapsing. If, due to a hardware fault or program error, the computing system fails to reset the watchdog, the timer will elapse and generate a timeout signal. The timeout signal is used to initiate corrective actions. The corrective actions here would include transitioning the drone into a state to begin descend for landing and triggering control actions for the same using a dedicated control unit for it. Also here we can use a proactive approach where different hardware sensors part of the drone predict component hardware failure beforehand or an error condition is passed to the computing system of the drone from a remote centralised controller system about a hardware or software failure, due to which the computing system of the drone will fail to reset the watchdog timer and a timeout signal will be generated to trigger descend of the drone for landing purposes. The above novel technique to signal a drone to start descend for landing is the claim for this invention.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2018/060673

A. CLASSIFICATION OF SUBJECT MATTER
G08G5/02 Version=2019.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G08G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DATABASES:- IPO INTERNAL, TOTAL PATENT ONE
KEYWORDS:- DRONE, UAV, TIMEOUT, ELAPSE, FAULT, FAILURE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US10049590 B2(AIRBUS DEFENCE & SPACE GMBH[DE]) 14 AUGUST 2018 (14-08-2018) LINES 51-60 of COLUMN 2, LINES 54-56 of COLUMN 4, LINES 1-12 of COLUMN 5, LINES 39-65 of COLUMN 5, LINES 4-7 of COLUMN 6; FIGURE 2	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

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Information on patent family members

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US 10049590 B2	14-08-2018	EP 2853973 A1	01-04-2015
		US 2016240091 A1	18-08-2016
		WO 2015043737 A1	02-04-2015