The data files have been generated from a simulink model that simulates a QuadRotor which is being controlled to track the set-points.

Below is a description of the data files and the data contained in them.

Data Description
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Each data file contains 27 columns in each row.
Each row corresponds to a new time stamp.
The names of the variable associated with the columns are listed below.
The variables are listed in the column order - left to right.
The units are mentioned in square brackets besides each parameter. For more description on the units refer to the notes section.
The number in paranthesis (besides each variable) indicates the number of columns associated with the variable / variable category.

Sampling Period \([Ts=0.01\text{sec}]\)
* Time \([s](1)\)
* Sensors Output (15) - Euler \([\text{counts}_e](3)\), Body Acceleration \([\text{counts}_ab]}(3)\), Omega \([\text{counts}_o]}(3)\), Position GPS \([m](3)\), Velocity GPS \([m/s]}(3)\),
* Controller Output (4) - Motor Thrust \([\text{Newton]}(4)\)
* Set-Points (7) - Position \([m]}(3)\), Velocity \([m/s]}(3)\), Yaw \([\text{radians]}(1)\)

Note
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1 \text{counts}_e = \frac{\pi}{(2^{15})} \text{ radians}\n1 \text{counts}_ab = \frac{(9.81 \times 7000)}{(1e3 \times (2^{15}))} \text{ m/s}^2\n1 \text{counts}_o = \frac{8500}{(1e3 \times (2^{15}))} \text{ radians/s}\n
Euler
Body Acceleration (about \(x, y, z\) axes) - Euler Angles (Roll, Pitch, Yaw)
omega (about \(x, y, z\) axes) - Body acceleration relative to body frame
Position GPS - Inertial Position (North East down frame)
Velocity GPS - Inertial Velocity (North East down frame)
Controller Output - Thrust to rotors (1, 2, 3, 4) See fig. 3 in the technical report.
Set point [Position/Velocity] - Inertial set points (North East down
File Description
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*nominal.txt       - nominal data.
*fault-1.txt       - fault-1 occurs through the data set.
*fault-1-abrupt.txt - fault-1 occurs abruptly during nominal operation.
*fault-1-inter.txt - fault-1 occurs intermittently during nominal operation.

*fault-2.txt       - fault-2 occurs through the data set.
*fault-2-abrupt.txt - fault-2 occurs abruptly during nominal operation.
*fault-2-inter.txt - fault-2 occurs intermittently during nominal operation.

*fault-3.txt       - fault-3 occurs through the data set.
*fault-3-abrupt.txt - fault-3 occurs abruptly during nominal operation.
*fault-3-inter.txt - fault-3 occurs intermittently during nominal operation.

Description on how the data was captured
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The data was captured using a Matlab/Simulink simulation of the entire system (Starmac + Passivity based Controller) as described in the technical report. The sampling rate is mentioned in the sections above.

* The nominal data (nominal.txt, nominal-1.txt nominal-2.txt, nominal-3.txt) are without any faults and -1/-2/-3 have different set-points.
* fault-1*.txt used the same set of set-points as in nominal-1.
* fault-2*.txt used the same set of set-points as in nominal-2.
* fault-3*.txt used the same set of set-points as in nominal-3.

* The faulty data sets were generated by introducing a fault in one of the three components

* fault-1  - GPS update problem (the rate at which it was updating the position was changed from its nominal to a larger value)
* fault-2  - Saturation component failure (Failed to apply saturation limits)
* fault-3  - Rate Limiter component failure (Failed to apply rate limits)

* In each of the scenarios described above, the simulink model had a nominal component and a faulty component. A manual switch was used to switch between the nominal and the faulty component.

* Complete fault -
  In the fault data sets described as fault-n.txt (n=1,2,3), the switch was pre-set at the beginning of the simulation to use the appropriate faulty component (n=1 => faulty GPS, etc.).

* Abrupt fault -
  In the fault data sets described as fault-n-abrupt.txt (n=1,2,3), the switch was pre-set at the beginning of the simulation to use the healthy component and then the manual switch was switched during the simulation to switch to the appropriate faulty component (n=1 => faulty GPS, etc.). So the system was working in a nominal mode for a while and then switched to the faulty mode for the remainder of the simulation.

* Intermittent fault-
  In the fault data sets described as fault-n-inter.txt (n=1,2,3), the switch was pre-set at the beginning of the simulation to use the healthy component and then the manual switch was switched during the simulation to switch to the appropriate faulty component (n=1 => faulty GPS, etc.). The manual switch was toggled a few times during the simulation to switch between the nominal and faulty states.

References
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