Calculation Procedure of Degree of Controllability

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I. INTRODUCTION

This file set is a supporting material for our paper [1]. In this paper, a new method is proposed to analyze the flight reliability of multicopters with different configurations. The whole paper studies the following three topics: i) reliability analysis for multicopters with different rotor number; ii) reliability analysis for hexacopters with different rotor configurations; iii) reliability/price ratio analysis for multicopters with different rotor number. All of these are analyzed based on a proper controllability theory [2]. Degree of controllability, which indicates how controllable a system is, is an important concept in controllability theory. According to the degree of controllability, the multicopter's reliability can be indirectly obtained. The calculation procedure of degree of controllability is detailed in this file set.

Please use Matlab to run all of the files in the file set. All the M-files have been checked availability on Matlab R2013a.

II. FILE LIST AND USAGE

1. "comput_doc.m": A function used for calculating the degree of controllability.

2. "example.m": An exemple that uses the function ("comput_doc.m") to calculate the degree of controllability is given.

Input: None

Output: TABLE I

III. NOTICE

Please read the specification in the files to get the further information. If you have any questions, then please feel free to contact Dongjie Shi (djshi@buaa.edu.cn) or Quan Quan (qq_buaa@buaa.edu.cn). If you use these files or results in your paper, please cite it as: Dongjie Shi, Binxian Yang, Quan Quan, "Calculation Procedure of Degree of Controllability", http://rfly.buaa.edu.cn/, February, 2016.

TABLE I

DEGREE OF CONTROLLABILITY

Configuration	Quadcopter	Hexacopter	Octocopter
Degree of Controllability	2.6836	3.7361	5.4882

REFERENCES

[1] D. Shi, B. Yang, Q. Quan, Reliability Analysis of Multicopter Configurations Based on Controllability Theory (Submitted).

[2] B. Yang, G.-X Du, Q. Quan, K.-Y Cai, The degree of controllability with limited input and an application for hexacopter design, in *32nd Chinese Control Conference*, 2013: 113-118. (in Chinese)