**Response letter**

**Reviewer 1**

1. The candidate needs to demonstrate some basic knowledges about control systems as this is an important part of the original contributions. This is the part that the candidate can overcome of the weaknesses of this thesis. The candidate has obtained a response curve, which can be easily converted into a transfer function model and a good PID controller can be designed. The overshoot in control system response is a well known problem and it could be overcome by choosing an implementation strategy. I suggest that the candidate has a look at my book on PID controller design to see how the problems can be solved nicely (book title: PID control system design and automatic tuning using MATLAB/Simulink, Wiley-IEEE Press, 2020).

*The anti-windup strategy has been applied in the proposed thermal control strategy. The overshot is further reduced to less than 0.5 Celsius, which is negligible compared to the target temperature of 400 Celsius. The improvement on the overshot depression is obvious by applying the anti-windup strategy. Please see the improvements on page 77, highlighted in Green and the comparison of the improvement on Figure 3.3.11*

2. The fuzzy logic control rules need to be clearer with the detailed parameter selections.

*The detailed parameters of the fuzzy controller have been added in Table 3.3.2. Please see the improvements on page 75. The improvements have been highlighted in Green.*

3. In developing the QA strategy, the candidate needs to write some mathematical equations to show the principles of CNN in order to demonstrate his in-depth understanding of this topic.

*The principles of CNNs have been added in chapter 5.2.1 with text description and mathematic equations. Please see the improvements from page 96 to 98 highlighted in Green.*

Small corrections:

1. The following sentence in Abstract is not complete: ‘needs to be researched in….’

*Please see the improvement in abstract highlighted in Green*

2. Table 3.2.3 looks strange and needs to be re-drawn

*The format of the table has been improved. The data in the row of Thermal Resistance is to show the thermal resistance between two adjacent parts on the proposed extrusion structure. For example, the 0.019 is the thermal resistance between the extruder and the heat bar. Please see the improvement on the table in page 62.*

3. Eq(5) in page 84 needs a variable.

*In the equation, t is the time of the operation, q is another variable represents the heat flow rate (w), C is the heat capacity. Please see the updates in page 63 highlighted in Green.*

**Reviewer 2**

Minor Points to address:

• The use of computer vision and CNN detection network is an interesting approach for the application. However, the results shown in chapter 5 is not comprehensive and are missing very important information required for validation. Such information includes sample sizes used for the experiments and comparisons, and the claim on the computational resources consumption (table 5.3.2). Although chapter 5 is important, the results section of the chapter is not properly represented.

*The information of sample size has been added to the Experiment setup section highlighted Green, please see the improvements in page 106.*

*The comparison on the storage memory cost has been added in the table 5.3.2. Please see the update on page 109 highlighted in Green.*

*The chapter 5.3 demonstrating the results has been reorganized as below:*

*5.3.1 Experiment setup (Page 106)*

*5.3.2 Experiment results (Page 108)*

*5.3.2.1 Detection performance (Page 108)*

*5.3.2.2 Computational resource consumption (Page 109)*

*5.3.2.3 Training methodology comparison (Page 109)*

*5.3.3 Discussion (Page 110)*

In chapter 7, work on fault tolerant design is highlighted. The chapter lacks an appropriate direction on what kind of fault tolerance is handled in the thesis. It appears to me that the chapter deals with faults in detection due to varying illumination. Radiation induced errors have been mentioned several times in the chapter, which is kind of misleading and confusing, as this is not addressed in the thesis. I suggest including an explicit definition of fault tolerance, as addressed by the thesis.

*The variation on the lighting condition is one of the factors considered in the thesis. The 3 networks trained with different lighting conditions are used in the proposed QA system to improve the detection results when lighting condition varies.*

*The illumination will affect the precision of the detection results. The fault tolerance method proposed in the thesis is to deal with the software computational errors caused by the radiation.*

*The proposed method uses the 3 networks for variable lighting conditions as the backup of each other to eliminate the affects resulted from the computational error. If one of the networks is affected, the designated backup network can complement and minimize the effects.*

• The title of chapter 7 needs to be revised.

*The tittle of chapter 7 has been updated to “Design of Fault Tolerance Neural Network for Space-based 3D Printing Quality Assessment” please see the improvement on page 122.*

• There are several cases in which the abbreviation in the text, present both the spelled-out version and the short form several times. The spelled-out version needs to be mentioned the first time only. Examples include CNN, AM, FDM, QA and AP.

*The spelled-out version of the terms below has been replaced by the abbreviation in the thesis. The improvements have been highlighted in Green in the pages as below.*

*CNN: Page 3, Page 43, Page 44, Page 50, page 52, page 95, page 126, page 138*

*R-CNN: page 43*

*AM: Page 9, 10,12,13,14,15,16,19, 21,25,26,27,29,30,32,33,34,36,37,38,40,41*

*FDM: page 3, 4,10,16,20,21,38,112,138,*

*QA: page 2, 95,111,118,138,139,*

*AP: page 48, 107,122, 126, 128, 139*

*ISS: page 1, 9,10,13,14*