Thesis: IMPLEMENTATION OF AN AUTONOMOUS STAR RECOGNITION ALGORITHM USING HARDWARE-SOFTWARE CO-PROCESSING APPROACH

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Overall, this thesis is good. Both background introduction and state-of-art techniques review are sufficient and detailed. After reviewing conventional methods used to determine satellites' attitude, the authors analyses weakness of these algorithms. Conventional star identification algorithms can cost a lot of time and storage in order to improve accuracy. Based on the drawbacks of existing star tracking algorithm, the author puts forward his own method to overcome the trade-off between accuracy and computational consumption such as storage and time. He proposes an adaptive algorithm based on the proposed algorithm that is suitable for the software-hardware co-processing implementation in the system. The author implements software-hardware co-processing experiment, and results show that the proposed algorithm in this thesis can reduce the time spent in centroiding algorithm significantly.

However, there are also some problems in this thesis that I would like to address here:

1. There are some obvious typos and format problems in the thesis. For example, in Page 7, the caption 'table 2.1' is written, but the whole table is given in Page 8. Please check and correct them.

2. In this thesis, the author shows some figures such as Fig. 2.2, 2.3 without any explanation. Please add some explanation to these figures in the thesis content.

3. In Chapter 3.3.1, the author applied thresholding technique in order to eliminate the noise and separate star clusters from the background. But the author did not explain how to choose the threshold.

4. The author claimed that the proposed prebuilt tree structured star pattern database (SPD) was able to reduce space complexity while maintaining high accuracy and robustness, so this optimized algorithm could be used for nanosatellites which have limited memory. However, there is no comparison between the SPD algorithm and traditional algorithm on accuracy, storage consumption, and robustness in this thesis.

5. In Chapter 4.2, the author compares runtime spent by traditional methods and the proposed method in this thesis. He lists specific software runtime and hardware – software co-processing runtime when the same image dataset is used. Details of images used in experiments are also provided. However, the author only lists tables and figures to show image specifications and runtime. He does not give even one word to explain or conclude his experiment results.

6. In Chapter 4.1, the author gives experiment results showing hardware consumption and power consumption when the proposed method is applied. But he does not give comparison on consumption between traditional methods and his own method, therefore, readers do not know how to evaluate his experiment results. If he could add experiment results about power and hardware consumption when traditional methods are used (under the same experimental conditions), and then give a comparison between traditional methods and his method, the advantages of his proposed method would be clearer.