Embedded Systems

Brushless Motor Control

Team Name: Friends

Report on findings

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Contents

1 Introduction

1.1 Brief

In this report is summarised the implementation of a brushless motor controller which performs additional lower priority tasks in an embedded system.

1.2 Specification

The system was designed to meet the following design criteria:

- Motor will spin for defined number of rotations and stop without overshooting with a precision of 0.5 rotations per number of rotations.

- Motor will spin at a defined maximum angular velocity 5-100 rotations per second, with a precision of 0.5 rotations per second.

- Perform Bitcoin mining task and test 5000 nonces per second. Matching nonces will be sent back to the host.

- Motor will play a melody while its spinning. The melody is a repeating sequence of notes in C4 octave with durations 0.125-1 seconds.

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2 Motor Control Implementation

2.1 Position and Velocity Measurements

2.2 Velocity Control

2.3 Position Control

3 Motor Melody Implementation

4 Tasks and Dependencies

4.1 Motor Control

4.2 Melody

4.3 Decoding Messages

4.4 Outputting Messages

4.5 SHA-256 Hashing

4.6 Dependency Graph

5 Timings and CPU Utilisation

5.1 Methodology

To ensure the system would meet the design criteria outlined in the introduction it was crucial that we measure and simulate the worst case performance.

5.2 Measure Results

Task	Initiation Interval (t)	Execution Time (T)	CPU Utilization (U)
ISR	0	0	0
Output	0	0	0
Motor Control	0	0	0
Decode	0	0	0
BitCoin Mining	0	0	0

Table 1: Task timing and resource utilization.

5.3 Critical Instant Analysis of the Rate Monotonic Scheduler

6 Highlighting and footnotes

You can make words **bold**, *italicise* them, <u>underline words</u> or **make them *stand out* regardless of the surrounding**. You can break a line
mid sentence and make footnotes like this [1].

---

[1]a footnote

7   Equations

7.1   As part of text

In total 85 distinct galaxies were identified in the Hubble Deep Field image provided, the list of which can be found in Appendix B at the end of this report. Poisson statistics states that the error in the number of galaxies counted (N_x) is simply the root of the count ($\sqrt{N_x}$), this can be represented as a percentage by the following equation, $N_x^2 + N^2$.

7.2   In the middle, not numbered

$$\alpha\beta \times \frac{2G}{x^2 B_n}$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} + \sin x$$

$$\text{mag} = 5 \times \log_{10}\left(\frac{D_l}{10}\right) + \text{M}_{\text{corr}}$$

7.2.1   And in the middle, numbered

$$A = bx + 24 \times F_x \tag{1}$$

8   Adding images

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there.

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8.0.1   Images side by side

9   Citing and referencing

9.1   Referencing figures and equations

Expression $4 \times 3 = G \times x$ naturally follows from Eq 1, and both of these things have a lot to do with Fig **??**.

9.2   Citing a paper

This statement has a citation at the end of it **?**, and this one has two **??**. A citation with parenthesis is sure to follow [**?**].