Pendulum Control System

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Abstract

A direct-drive pendulum motion control system is developed. The pendulum consists of a custom logo on the end of an arm that is rotated by an OTS mechanically commutated DC motor. The …

In this paper, Section 1 describes motor selection. Section 2 describes the mechanical design of the pendulum. Section 3 describes the electronics interfacing the micro-controller and motor. Section 4 describes how it is simulated using Simulink / Simulation-X co-simulation. Section 5 describes …

Nomenclature

OTS	Off-the-shelf
AL	Arm length (mm)
LR	Logo radius (mm)
SR	Shaft radius (mm)
COM	Centre of Mass (mm)
ϕ	Diameter

1. Motor Selection

The motor is customer-specified and is not a free design parameter. The specified motor is found on p. 86 of the Maxon™ Motor catalog [1].

The motor is a Maxon 32mm DC motor which may be mated with a GPX32 planetary gear-head. The motor is 72mm long x 32mm ϕ and has a 6mm ϕ output shaft. The 18V program has a maximum speed of 8630 RPM and a stall torque of 2.12 Nm.

The motor and gear-head are shown in Fig. 1.

Figure 1: Maxon Motor & Optional Gearhead

2. Pendulum Design

The pendulum is designed using SolidWorks and is comprised of a Yamaha™ logo on the end of a linkage. The dimensions of the pendulum are shown in Fig 2 where AL is the length between the joint and logo centre, LR is the logo radius, SR is the shaft radius, and COM is the distance between the joint centre and the centre-of-mass.

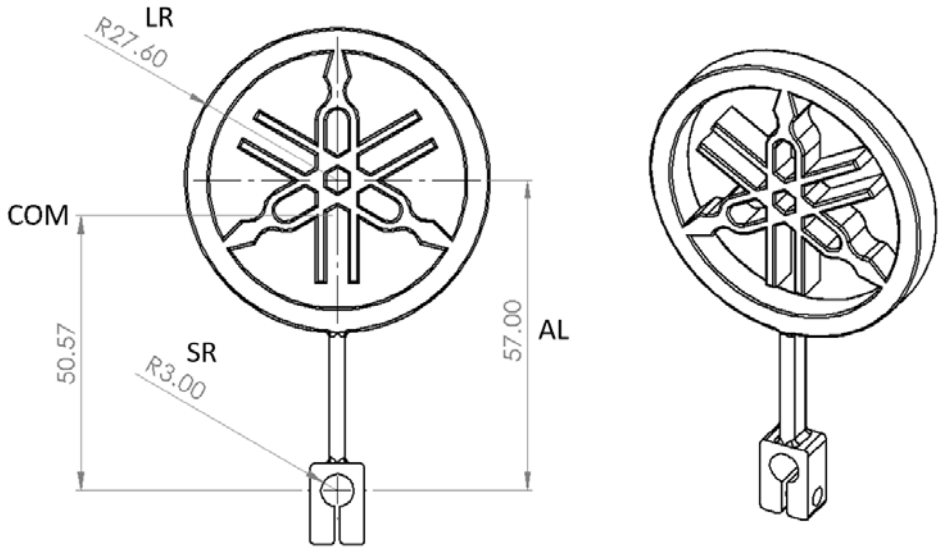

Figure 2: Pendulum Geometry

The pendulum is constructed from Kryptonite which has a material density …

References

[1] Maxon motor catalog, 2020/2021, https://online.flippingbook.com/view/1042987/

[2] …