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Can Nyan Cat Escape The Moon?

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Abstract
This paper discusses the possibility of Nyan Cat's capabilities to escape the moon. The dimensions and nutritional values, provided by the Kellogg's Company, of a Pop-Tart were used, and applied to the model of an average adult cat. It was concluded that Nyan Cat would not be able to escape from the moon. However, if the rainbow that he excretes has some magical powers that would provide him the extra 8.42×10^6J needed to escape the moon.

Introduction

Nyan cat is an animated cartoon *Felis catus* whose body consists of a Pop-Tart, and flies through space leaving a rainbow trail behind it. This paper addresses whether Nyan cat (modelled as an average sized cat), could escape from the moon to travel around space. A number of assumptions were made when calculating this.

Modelling the *Felis catus*

Typical values for the average adult cat:

Mass = 5kg
Height = 0.25m
Length = 0.45m
Tail length = 0.30m

Initial model:

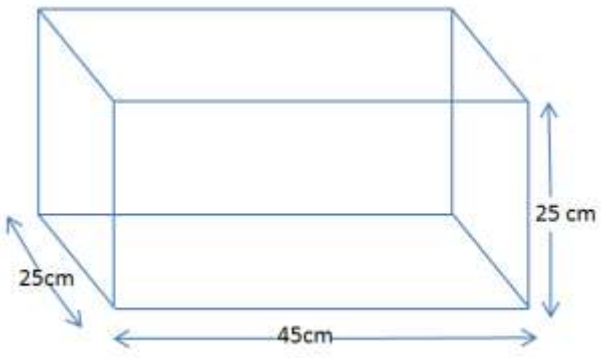

Figure 1: Initial Model of the *Felis catus* using a simplified shape, and typical values of an average adult cat. Assuming that the tail, legs and head exhibit negligible effects on this system.

This model was altered; as after more research was conducted it was discovered that Nyan Cat was in fact just one thin Pop-Tart as can be seen in Figure 2. Therefore the model was altered to take this into consideration.

Figure 2: An artistic representation of Nyan Cat[3].

Final Model:

Figure 3: The new model using the dimensions of a Pop-Tart, still using the assumptions that the tail, legs and head have a negligible effect on the system.

Pop-Tart Dimensions and Nutritional Values

Pop-Tarts are rectangular, pre-baked toasted pastries made by the Kellogg Company[2]. They exhibit a sugary filling, sealed between two layers of rectangular thin pastry crust, which is also frosted.
Nyan Cat is a strawberry Pop-Tart, therefore all of the nutritional values used, were based on this from the Kelloggs Company website.

Dimensions of a Pop-Tart

Figure 4: Dimensions of a Pop-Tart

Volume of a Pop-Tart: 93.75cm^3
Volume of Nyan Cat: 5625cm^3

$$\frac{5625}{93.75} = 60$$

$$2\ x\ Strawberry\ Pop-Tarts\ =\ 410\ Calories$$

The conversion of calories into Joules:

$$410\ \times\ 4.184\ =\ 1715.44\ Joules$$

Amount of energy per Pop-Tart:

$$\frac{1715.44}{2} = 857.72\ J\ PopTart^{-1}$$

Scaled up for a Nyan Cat sized Pop-Tart:

$$857.72 \times 60 = 51463.2\ J$$

Escape Velocity

The equation to calculate the escape velocity of the moon is as follows

$$v_e = \sqrt{\frac{2GM}{r}}$$

Equation 1

Where *M* is the mass of the moon, *7.35x10^{22} kg*, *r* is the radius of the moon, *1737.4 km* and *G* is the gravitational constant, *6.67x10^{-11} m^{3}kg^{-1}s^{-2}*.

$$v_e = \sqrt{\frac{2 \times 6.67 \times 10^{-11} \times 7.35 \times 10^{22}}{1737.4 \times 10^3}} = 2375.6 ms^{-1}$$

The mass of the Pop-Tart is 50g, to scale this up to be the size of Nyan cat this value was multiplied by 60 as explained previously in the paper, to give a value or 3kg to the total mass of Nyan Cat. Using this in conjunction with the calculated value of escape velocity, allows us to calculate the least amount of kinetic energy necessary for Nyan Cat to be able escape the moon.

$$KE = \frac{1}{2}mv^2$$

Equation 2

$$KE = 0.5 \times 3 \times (2375.6)^2 = 8.47 \times 10^6 J$$

Conclusion

From the assumptions made in this paper, Nyan Cat exhibits energy of 5.15x10^{4}J available from the Pop-Tart. This is assuming that the head, tail and legs have a negligible effect on the system. Assuming no loss of energy through dissipation of heat, or supplying enough energy to the muscles needed for the take-off, then Nyan cat still does not exhibit the 8.47x10^{6}J of energy that would be required to escape from the moon. Therefore this paper concludes that if Nyan Cat is in fact one Pop-Tart and the size of an average adult cat, then he would be stuck on the moon. The only possible way Nyan Cat could escape would be if the rainbow that he excretes has some magical powers that would provide him the extra 8.42x10^{6}J required to escape the moon.

References

[1] Tipler, P.A., & Mosca, G., (2008). *Physics for Scientists and Engineers.* W.H. Freeman.
[2] http://www.kelloggs.co.uk/en_GB/home.html [Accessed 01/06/2013]
[3] http://fc08.deviantart.net/fs70/f/2012/021/a/0/nyan_cat_by_dud1997-d4n430h.jpg [Accessed 01/06/2013]