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P3 3 Creeper Cataclysm for Lunar Destruction

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Abstract

We investigate the explosive power of a Creeper in the popular game of Minecraft and utilise it to calculate how many Creepers would be required to destroy the Moon. The explosive power of a Creeper and the blinding energy of the Moon were calculated to be 11.66 MJ and $U_{grav} = 1.24 \times 10^{29}$ J respectively. In order to blow up the Moon, 1.07×10^{22} Creepers would be needed.

Introduction

In the universe of Minecraft, players encounter a variety of creatures, each with unique abilities and characteristics. Among these, the notorious Creeper stands out due to its capacity to explode, creating a wave of destruction that can reshape landscapes in moments. This paper explores the theoretical application of harnessing the explosive power of Creepers to achieve the destruction of the Moon. By investigating the power behind the Creeper's explosive behaviour in terms of TNT, we can theorise methods to amplify this power on a lunar scale. Thus, finding the number of Creepers required to destroy the Moon.

Explosive Power of a Creeper

The C.W Lampson scaling law [1] relates crater diameter and the explosive energy required to create such a crater, using the equation:

$$\frac{D}{D_0} = \left(\frac{W}{W_0}\right)^{1/3} \tag{1}$$

Using the crater diameter and explosive power of a known crater (D_0 and W_0 respectively), one can calculate the explosive power (W) of a new crater if the diameter, D, is known.

Shown in Table 1, through a series of experiments carried out in Minecraft, the diameter of a crater caused by a Creeper (predominantly square-shaped) was determined to be D = 5 m, where a block in Minecraft is 1 m x 1 m x 1 m [2]. This experiment was carried out for 10 Creepers with the latter 5 also creating the same crater length and width. For the purpose of our investigation, we have assumed that the length of the first crater from Creeper 1 was an anomaly and therefore disregarded.

Creeper No.	Crater Length (m)	Crater Width (m)
1	6	5
2	5	5
3	5	5
4	5	5
5	5	5

Table 1: Table of Creeper crater experiment results with length and width.

1 gram of TNT has an explosive power of 4000 J [3]. Therefore, the explosive power of 1 kg of

TNT is calculated to be $W_0 = 4$ MJ.

Crater dimensions are directly proportional to the cube root of explosive weight [4]. The diameter of a crater produced by 1 kg of TNT can then be calculated using the equation:

$$R = kM^{1/3} \tag{2}$$

Where R is radius of the crater produced by the TNT explosion, k is a coefficient of proportionality dependent on the characteristics of soil medium, and M is the mass of TNT used (1 kg in this case).

Assuming such an explosion takes place in soil, and the materials in the Minecraft universe are analogous to that on Earth, the scaling factor for soft soil is k = 1.5-2.0 [5]. So, we take the midpoint and use k = 1.75.

The radius of the crater resulting from an explosion of 1 kg of TNT is therefore calculated to be 1.75 m. Then, the diameter $D_0 = 3.5$ m.

Rearranging equation (1) to isolate the explosive power of a Creeper, W, we substitute the known values for the explosive power of TNT $W_0 = 4$ MJ. The diameter of a crater resulting from a Creeper explosion is given as D = 5 m, and the crater diameter from 1 kg of TNT is $D_0 = 3.5$ m. Using these values, the explosive power of a Creeper is calculated to be W = 11.66 MJ, equivalent to the energy released by 2.92 kg of TNT.

Energy Required to Destroy the Moon

In order to destroy the Moon, the binding energy of the celestial body must be exceeded. The gravitational binding energy is the work needed to separate the mass of the Moon from itself, against the force of gravity. To destroy the Moon (i.e. to break it apart and disperse the fragments), enough energy would need to be provided to overcome the gravitational forces. Thus, to determine the energy required to destroy the Moon, the equation of gravitational binding energy can be used:

$$U_{grav} = \frac{3G{M_m}^2}{5R_m} \tag{3}$$

Where U_{grav} is the gravitational binding energy, G is the gravitational potential energy, M_m is the mass of the Moon and R_m is the radius of the Moon. Using known values of M_m (7.35×10^{22}) and R_m (1737 km), we calculate that the gravitational binding energy of the Moon is $U_{grav} = 1.24 \times 10^{29}$ J.

Number of Creepers Required

We have calculated the explosive power of a Creeper to be approximately 11.66 MJ. The gravitational binding energy of the Moon is $U_{grav} = 1.24 \times 10^{29}$ J. We can calculate the number of Creepers required to blow up the Moon using the equation:

$$\text{Number of Creepers} = \frac{U_{grav}}{\text{Energy of 1 Creeper}} \tag{4}$$

This gives an answer of 1.07×10^{22} Creepers at minimum, required to blow up the Moon.

Results

The explosive power of a Creeper was calculated to be 11.66 MJ, and the binding energy of the Moon was calculated to be $U_{grav} = 1.24 \times 10^{29}$ J. Therefore, in the hypothetical situation that the Moon was to be destroyed by Creepers, the minimum number of Creepers required to do so is determined to be 1.07×10^{22} Creepers.

References

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