The Music from Orbital Period of the Uranus's Satellites.

Miss.Nisachon Kumlue (grade 11), Mr.Montree Nanta (adviser)
[Srisawatwittayakarn School, Nan, Thailand]

Abstract

The purposes of this study were to find the orbital period of the Uranus's moon and convert into music. The study found that the orbital period of Umbriel, Titania and Oberon are 4.29 ± 0.15 days, 8.27 ± 0.42 days and 11.63 ± 1.58 days respectively. And create the musical notes of Umbriel as notes F4, Titania as F#3 and Oberon as C3. The note from the database for Miranda is D#6, Ariel is F5, Umbriel is G# 4, Titania is G#3 and Oberon is C3. We found that any planet with orbiting plane and each moon has a simple ratio of frequency can create a musical sound.

Research and Methodology

1. Capture the image of Uranus's moon to observe the orbital period for a total of 24 days from 21 November 2017 to 23 December 2017. Then find the Uranus's moon from image by skychart program.

2. Upload image from observed on www.astrometry.com in order to get the coordinate. Match the image by DS9 program to measure the coordinate in the x-axis of Uranus and the moon each day and then take the coordinate of the moon to remove the coordinate of Uranus. Bring the values obtained plot the graph between the distance of the moon on the x-coordinate and day to find the orbital period.

3. Apply the orbital period of each moon to find simple ratio using the orbital period in seconds and convert to frequencies from equation f = 1 / T.

4. Determine the frequency of the outermost moon is the frequency that humans can hear which equal to 130.81 Hz or C3. Calculate K constant from equation $f_m=Kf$ which f_m is the frequency that humans can hear, f is the frequency of the moon. The frequency of other moons can multiply by K constant that to find the frequency in which humans hear.

5. Compare the frequency obtained with the frequency from the database to find the musical notes of each moon.

6. Put each note in the Mixcraft 8 Recording Studio program according to the simple ratio that can be found in item 3. When the stars move around each other, they are represented by musical instruments as appropriate.

7. Follow according to article 3.-6. But use the period of orbit of the Uranus' moon from https://airandspace.si.edu. The music note of Uranus's moon from this study compare with database as shown in Table 1.

8. Follow according to article 2.-6. Using the orbital period of Jupiter' moon and Saturn's moon from https://solarsystem.nasa.gov/moons. The music note of Jupiter' moon and Saturn's moon as shown in Table 2 and Table 3, respectively.

Results and Discussions

Table 1: The music note of Uranus's moon from this study and database.

moon	Miranda	Arial	Umbriel	Titania	Oberon
Note from this study	-	-	F4 (349.2Hz)	F#3 (185.0 Hz)	C3 (130.8 Hz)
Note from database	D#6 (1244.5 Hz)	F5 (698.5 Hz)	G#4 (415.3 Hz)	G#3 (207.7 Hz)	C3 (130.8 Hz)

Table 2: The music note of Jupiter's moon from database.

moon	Io	Europa	Ganymede	Callisto
Note from database	D#6 (1244.5Hz)	D#5 (622.2 Hz)	D#4 (311.1Hz)	C3 (130.8Hz)

Table 3: The music note of Saturn's moon from database.

Satellite	Mimas	Enceladus	Tethys	Dione	Rhea	Titan
Note from database	C#7 (2217.4Hz)	G6 (1567.9Hz)	C#6 (1108.7Hz)	G5 (783.9Hz)	A#4 (466.1Hz)	C3 (130.8Hz)

Conclusion

The orbital period of Umbriel, Titania and Oberon are 4.29 ± 0.15 days, 8.27 ± 0.42 days and 11.63 ± 1.58 days respectively. And create the musical notes of Umbriel as notes F4, Titania as F#3 and Oberon as C3. The note from the database for Miranda is D#6, Ariel is F5, Umbriel is G# 4, Titania is G#3 and Oberon is C3. The moons of Jupiter are Io, Europa, Ganymede and Callisto, the notes are D#6, D#5, D#4 and C3 respectively. The moons of Saturn are Mimas, Enceladus, Tethys, Dione, Rhea and Titan, notes are C#7, G6, C#6, G5, A#4 and C3 respectively. When used in the Mixcraft8 program according to the simple ratio of the period, it makes the music beautiful and consistent.

Reference

Matiphon Tangmatitham. (2013). A Guide to Astronomy Workshops. 3rd edition Chiang Mai: Academic Service Office and Astronomy Seminar, National Astronomical Research Institute (Public Organization).

Note names of music [Online] Search from: http://www.sengpielaudio.com/calculatornotenames.htm (2 October 2017).

THE MOONS OF URANUS [Online] Search from: https://airandspace.si.edu/exhibitions/ exploring-the-planets/online/solar-system/uranus/moons.cfm (30 October 2017).

TRAPPIST Sounds: TRAPPIST-1 Planetary System Translated Directly Into Music [Online] Search from: http://www.system-sounds.com/trappist-sounds/ (2 October 2017).