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Music created by variable stars

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Abstract. We composed music using light curves of variable stars. We made a questionnaire about the feeling created by this music.

Keywords. stars: variables: other, techniques: miscellaneous

1. Introduction and purpose

During the invited lecture held in relation with the International Symposium on Space Technology and Science 2019 in Fukui City, Japan, Hitoshi Yamaoka introduced the "Star Chorus" project†, which is a series of sounds made from light curves of variable stars. We, the students of Takefu High School, hypothesised that "music composed with the light curves of variable stars has a relaxing effect."

We carried out research for the purpose of understanding how we can feel the stars only by using our ears, and getting adults and their children who are not concerned with the universe interested in stars. With this music, visually handicapped people can get close to astronomy, too.

2. Method

We composed three songs using three variable stars. The first one is Mira (*o* Ceti), a typical pulsating supergiant star. The second one is R Coronae Borealis (R CrB), which shows unexpected dimming due to concealment from carbon smog. The third one is CH Cygni, which is a symbiotic star consisting of a red giant and a white dwarf.

Each song was composed from graphs of brightness versus time, i.e. light curves. We used data from the VSOLJ Variable Star Observation database‡. We made the sheet music with the following standards:

1) One magnitude corresponds to one octave, and the higher tones correspond to brighter states.

2) One bar corresponds an specified time period (10 days for Mira, 1 year for R CrB, and 1 month for CH Cyg).

We played the three songs for first- and second-year students at Takefu High School, and had our participants answer a questionnaire to verify how these sounds are interacted with their mind. The questionnaire respondents chose their feeling from the following options: "Became relaxed", "became excited", "became sleepy", "became interested", and "other" (free writing: felt mysterious, be scared, became clear).

† https://www.starflyer.jp/campaign/2017/sc/
‡ http://vsolj.cetus-net.org/database-j.html

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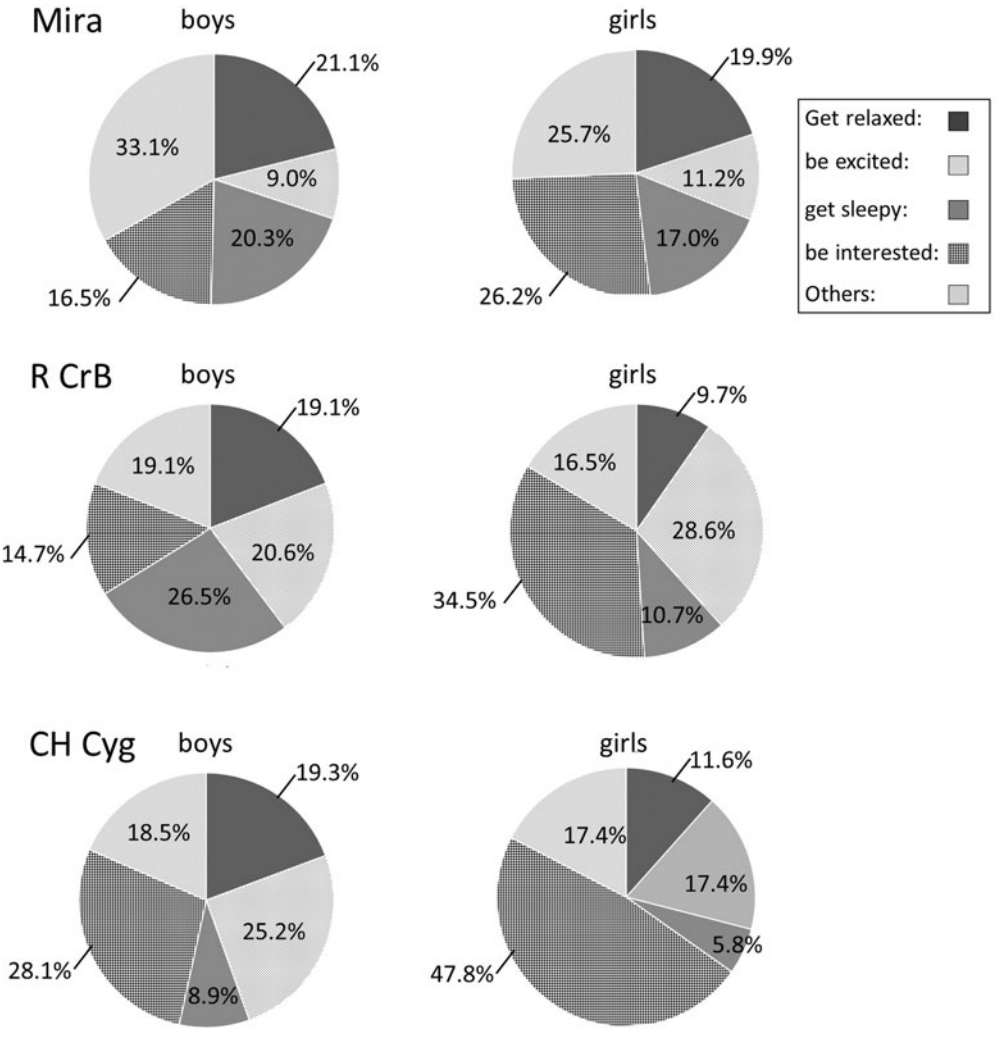


Figure 1. Results of questionnaire.

3. Results and discussion

The composed music was performed using piano or violin. They can be heard on YouTube at:

Mira: https://youtu.be/n8ypQhLVlCc
R CrB: https://youtu.be/aWX4OOKzuM4
CH Cyg: https://youtu.be/IeLIiVpqTAE .

As the result of a questionnaire, the most popular answer from the survey respondents was "became relaxed" for Mira, "got excited" for R CrB, and "be interested" for CH Cyg. There were various responses for the same song (Fig. 1).

From the result of the questionnaire, we noticed that music composed from variable stars makes us relaxed and can create other feelings. For the future, we hope to compose

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music with other variable stars and research the relation between the music and influence on human minds.

We would like to thank the VSOLJ Variable Star Observation database, composed of contributions by observers worldwide, for being available for use in this research.

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