Video Analysis of the Glimmer Synchronization of *Luciola parvula*

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Fireflies show various luminescence patterns depending on their species and sex. If we can quantitatively show the variation in luminescence patterns from time to time, it will lead to a better understanding of communication among fireflies.

Luciola parvula, a species endemic to Japan, are widely known for its luminescence synchronization phenomenon, in which multiple fireflies repeat flickering at the same time. Various models have been proposed for the mechanism of this luminescence synchronization, but the possibility or impossibility of such synchronization has not been addressed.

In this study, we decided to obtain quantitative data on the detailed time-series variation of the synchronization phenomenon and investigate the details of the phenomenon.

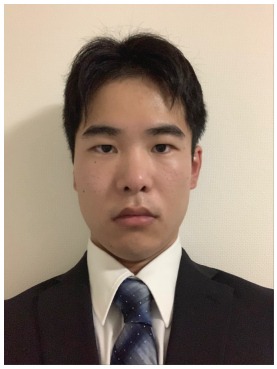
Luciola parvula fireflies emit light for approximately 0.1 second and repeat short, flash-type flickers. Therefore, it is very difficult to measure and compare them visually. In this study, we quantitatively analyzed the luminescence data by acquiring the luminescence in the video as luminance values for the luminescence phenomenon of fireflies recorded on video.

However, as can be seen from the short duration of luminescence, the exchange between fireflies is on the order of 1/100 of a second, so there is a good possibility that the frame rate exceeds the limit of what can be displayed on video.

Therefore, in this study, we applied parabolic regression to the time-series variation of luminance values of fireflies to make the digitally represented luminescence behavior closer to the original luminescence behavior, and calculated the luminescence time beyond the frame rate.

The obtained luminescence times were used to examine the variation of firefly luminescence cycles, and it was found that when multiple fireflies synchronize their luminescence, they repeat flickering with a shorter period than when they emit luminescence alone.

Short biography:



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