Development of an automatic observation and notification system for the meteor shower
~A signal detection and data output using Arduino~

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Introduction:

In general, radio meteor observation is conducted using a receiver with an antenna, which receives a specific radio wave frequency. Passing a meteor through the upper atmosphere causes ionization on the ionosphere. The ionized meteor trail reflects radio waves from the transmitters on the ground, and we observe the reflected radio waves as a meteor signal (HRO or FRO method). The observed data is obtained as a figure file by HROFFT software. The number of the meteor is counted by the meteor echo or Activity Level (the difference between the number of measured echoes and the mean value of echoes for the past two weeks). However, there are some issues in this method, for example, the huge uncertainties for measurement and the high expense for radio meteor observation (e.g., radio wave receiver and antenna). The objective of this study is to develop an automatic observation and notification system for the meteor shower in order to observe the meteors more readily.

Method:

Our developed system was organized by two sections: 1) radio meteor observation section using a radio wave receiver and a 2-element antenna, and 2) analysis section using a PC with Arduino. We focused on audio data (frequency and volume data, i.e., meteor audio data), which was collected during the radio meteor observation. The meteor audio data was analyzed by WaveSpectra software and Fast Fourier Transform (FFT) library in Arduino. Moreover, we developed a notification system of meteor signals.

Results and Discussions:

We compared the meteor audio data with published observation data (The International Project for Radio Meteor Observation). As a result, we found the meteor signal with a peak of 495 Hz. For detecting the meteor signals, the required sound volume was five times larger than the mean value of the obtained data. Besides, we developed a program that automatically detects the meteor signals and notifies them on a PC screen. Moreover, it was successful in transforming quantitative data of the meteor signal into numerical data, and then it compiled as a text file. Thus, the procedure through the observation, analyzing, and data output of radio meteor signals became automatic. This system allowed the quantitative and stable data collection.

Conclusion:

Our developed system succeeded in providing the new automatic method for radio meteor observation and meteor signal data output. It is necessary to develop the application for the public, which notifies the measured and analyzed meteor signals detected by our system. It will promote the opportunity of observing the meteor shower.

Keywords: radio meteor observation, automatic observation system, Arduino

