

bytran -| spectral calculations for portable devices using the HITRAN database

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The advances in electronics have made it possible to enable line-by-line calculations performed using the computation power of portable devices. We have developed a free, open-source and cross-platform graphical interface enabled application called bytran targeting portable electronics as well as desktop computers to perform line-by-line calculations using the HITRAN database [1] and based in part on selected HAPI source code [2]. To the best of our knowledge no other user-friendly application for line-by-line calculations deployed on portable electronics exists at the time of this writing.

Currently there are a number of free and subscription based user-friendly online [3-6] line-by-line calculation systems as well as commercial and shareware desktop programs [7-11] relying on HITRAN. These available applications usually have one or more of the following limitations: (1) Closed source code, (2) Commercial distribution, (3) Limited portability. In developing the bytran program we have attempted to address the above limitations.

The bytran program was developed using the Qt/C++ framework which enables write once compile everywhere architecture [12]. As such the bytran source code may be compiled to operate under mobile (Android, iOS, Windows RT), desktop operating systems (Linux, Mac, Windows) as well as a number of embedded Linux-based development boards including the Raspberry Pi [13]. Though the initial software implementation can be compiled to run on desktop computers, its interface was designed to target mobile platforms. As such the mobile specific interface should be modified to look better under desktop environment for better user-experience.

The developed application relies on the HITRAN database downloaded from hitran.org or a complete HITRAN database file manually placed on the mobile device. The initial version is limited to the horizontal path calculation mode with the slant path to be developed. Bytran offers a number standard features commonly offered by line-by-line modeling programs, including the usage of Voigt, Lorentz or Doppler lineshape profiles, instrument functions (ported from HAPI), built-in atmospheric models, sharing the results of the calculations, pinch zoom and several others [2, 14]. Current functionality and performance limitations compared to existing systems include the lack of continuum and aerosol calculations, as well as unavailability of advanced lineshape models.

Bytran may become particularly useful for in-the-field scientific evaluations as well as to university and high-school students and has the potential of further expanding the usage of the HITRAN database. Future improvements will likely include the usage of a range of satellite datasets available from NASA and other agencies for better models. The application is currently available in Beta under Android, Windows, Ubuntu Linux and OS X with iOS and Windows RT releases to follow soon. After the testing phase for all platforms is over the source code will be made available under the terms of the MIT license permitting commercial and/or open-source reuse. More information about the current state of the project is available at www.bytran.org [15].

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