Generating ITU-R P.452 Radio Propagation Contours on S.O.S.

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Problem

NASA has developed a software solution that implements the ITU-R P.452-15 recommendation. This recommendation is used to calculate the interference between ground transmitters and receivers. NASA's implementation of this algorithm requires about 36 days to execute. <u>NASA requires a reduction in the run-time of this implementation.</u>

NASA's research into remote sensing has many implications for the wireless communications industry. To illustrate the importance of this research to the public, <u>NASA would like to develop a dataset to display on the Science on a Sphere projection system.</u>

Objectives

To address the problems stated above, we have:

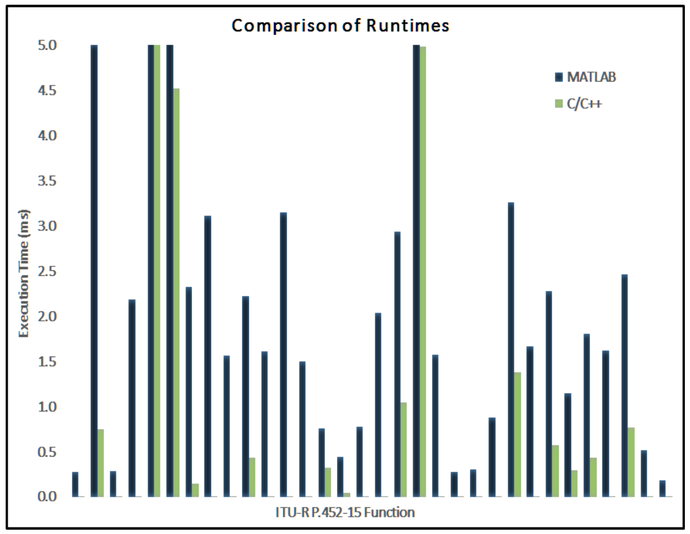
- **Transcribed NASA's existing implementation of the ITU-R P.452-15 algorithm from MATLAB to the C++ programming language.**
- **Implemented parallel processing techniques to reduce execution time.**
- **Developed a 4 minute video that illustrates NASA's continuing remote sensing research and its importance to the wireless communications industry on the Science on a Sphere projection system.**
- **Develop interference contours to help viewers understand the effects that atmospheric conditions and the geographical location can have on path losses.**

Software Development

The software development portion of this project was broken into 4 main development phases:

1. **Planning, research, and setup of development environment.**
2. **Transcription of existing 40 NASA MATLAB functions to C++.**
3. **Verification of the consistency between the MATLAB and C++ versions of the code.**
4. **Addition of multithreading techniques and code refactoring.**

Software Dev. Results



Average Speedup : ~777.666

SOS Dataset Development

The video script was developed to cover the following four major topics:

1. **The International Telecommunications Union and its ITU-R P.452-15 recommendation.**
2. **Remote sensing research and its applications.**
3. **Factors that affect ground communications.**
4. **Demonstration of path losses.**

SOS Dataset Results