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\documentclass{article}
\usepackage[utf8]{inputenc}
\usepackage{enumerate}
\usepackage{graphicx}

\title{Project 3 Analysis}
\author{Jack Jiang}
\date{April 8, 2021}

\begin{document}

\maketitle

\section*{Tasks}
\begin{enumerate}
  \item
  \begin{enumerate}[(a)]
    \item Number of trials ran per experiment was 3 for strong scalability study.
    \item Plots for strong scalability study:
    \begin{center}
    \includegraphics[strongrun]{waveStrongRun.png}
    Run-Time for Strong Scalability Study

    \includegraphics[strongsp]{waveStrongSpeed.png}
    Speedup for Strong Scalability Study
    \end{center}
    This problem has good strong scalability because in the run-time plot for strong scalability, the time average run-time can be observed to be decreasing as the number of processors increases, which is a good sign. My speedup plotting appears to be incorrect and this is highly likely due to having incorrect code for plotting speedup.
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\end{enumerate}

\item

\begin{enumerate}[(a)]

\item Number of trials ran per experiment was 3 for weak scalability study.

\item Plots for weak scalability study:

\begin{center}

\includegraphics[weakrun]{waveWeakRun.png}

Run-Time for Weak Scalability Study

\includegraphics[weaksp]{waveWeakSpeed.png}

Speedup for Weak Scalability Study

\end{center}

This problem does not have good weak scalability because from the run-time plot for weak scalability, it can be observed that as the number of processors increases, the average run-time increases at a faster and faster rate, which means it will take longer and longer as the number of processors and work per processor increases. Again, the speedup plot is incorrect due to incorrect implementation for coding the speedup.

\end{enumerate}

\item

Plot of results as a function of $N = n_x*n_y$:

\begin{center}

\includegraphics[task3plot]{Task3.png}

\end{center}

To run 100 iterations at $n=100000$ for $P=64$, it will take about 1.5-2 minutes. For $P=128$, it will take about 1-1.5 minutes. The times and estimates are far shorter than those obtained from the serial Python and the serial C experiments. I could not plot the lines for the 2 previous projects, however, I went back and looked at the data to make a conclusion.

\item I could not figure out how to get images.

\item I tried running my program for generating the time history of the error to measure it and I made a slurm job for it. However, it returned all 0s and so something about it was incorrect. Therefore, I did not plot it. The project spec claims that it oscillates so I think it would oscillate the way it does is because waves are always different and are rarely ever the exact same. I tried using 64 OpenMP threads.

\end{enumerate}

\end{document}