

# Description of Additional Supplementary Files

This document provides an overview of the supplementary materials accompanying this paper. The supplementary materials consist of Supplementary Data 1, which contains the benchmark input data used in the experiments, and Supplementary Movies 1 and 2, which demonstrate the TDMA scheduling system in navigation and benchmark modes, respectively.

## Supplementary Data 1

A dataset containing the benchmark input data used in this study. Supplementary Data 1 includes the random graph instances used for the MIS benchmarking in Fig. 4d and the precomputed TDMA scheduling instances used in Fig. 5e. A README file is also included, describing the file formats, naming conventions, directory structure, loading methods, and generation procedures of the dataset.

## Supplementary Movie 1

A movie showing the operation of the TDMA scheduling demo application for wireless multi-hop networks, navigating through the process of determining the scheduling step-by-step. A snapshot from the movie is shown in Supplementary Figure 1.

**From 0 to 15 seconds:** Starting with the number of wireless nodes ( $N = 100$ ) and communication radius ( $r = 0.2$ ), the placement of each node is randomly determined by triggering the “Generate” button. Subsequently, the “Placement” (distribution of nodes), “Unit Graph” (graph connecting nodes that can communicate with each other via edges), and “Route (Tree Graph)” (tree graph determined by a certain graph algorithm) are displayed sequentially. Simultaneously with the display of the tree graph, an interaction graph representing the relationships between nodes that cannot communicate simultaneously in the same time slot is also shown.

**From 15 to 25 seconds:** By triggering the “Manual” button, the nodes that can communicate simultaneously in the first iteration (time slot) are calculated. The calculation results are immediately displayed graphically. The solved MIS problem and the obtained solution (displayed in red) are shown in the upper right “MIS Problem being solved”, and the number of nodes communicating in this time slot is displayed in the lower right “Determined TDMA Scheduling”. On the main panel in the center, the nodes that are communicating are shown in red, and their communication range is shown in light red. Nodes in a receiving state are shown in green. It can be confirmed that the circles indicating the communication range do not overlap for nodes in the receiving state. By pressing the “Manual” button several times, the calculation results for the subsequent iterations are displayed.

**From 25 to 38 seconds:** For the remaining iterations, pressing the “Auto” button allows the calculations and display of results to be performed automatically. After the TDMA scheduling calculations are completed, it can be seen from the upper navigation area that the calculation time was 0.037 seconds and the total number of slots was 24.

## Supplementary Movie 2

A movie showing the operation of the TDMA scheduling demo application for wireless multi-hop networks, benchmarking the performance differences using the MIS solver. A snapshot from the movie is shown in Supplementary Figure 2.

**From 0 to 14 seconds:** Set the application to benchmark mode and generate the problem by triggering the “Generate” button with the number of wireless nodes ( $N = 800$ ) and communication radius ( $r = 0.1$ ). In benchmark mode, the generation up to the tree graph is performed automatically, displaying the same generated tree graph in the left “SB-based Ising machine” panel and the right “NetworkX” panel.

**From 14 to 38 seconds:** Pressing the “Start” button initiates the TDMA scheduling calculations. These calculations are performed simultaneously in separate processes for both “SB-based Ising machine” and “NetworkX”. The progress of the calculations is shown with a progress bar, and upon completion, the computational time and number of slots are overlaid on their respective panels. Here, it can be seen that “SB-based Ising machine” has a computational time of 0.465 seconds (with 49 slots), while “NetworkX” has a computational time of 16.935 seconds (with 51 slots).

**From 38 to 45 seconds:** Pressing the “Manual” button starts the playback of the calculation results. Similar to the navigation mode, the transmitting nodes are shown in red with their transmission range in light red, and the receiving nodes are shown in green. It can be observed that in the large network, many transmitting nodes are selected without any overlap of transmission ranges on the receiving nodes.

**From 45 seconds to 1 minute and 23 seconds:** Pressing the “Auto” button automatically plays back the calculation results for the remaining iterations.