CSR Matrix Calculator Instructions

1 Overview

The CSR Matrix Calculator allows users to work with sparse matrices in the CSR (Compressed Sparse Row) format. It provides functionality for matrix operations such as addition, subtraction, multiplication, and transposition, as well as printing matrix files.

2 Setup and Compilation

2.1 Requirements

Ensure the following are available:

- A C compiler (e.g., GCC).
- Source code files and a Makefile.
- Input matrix files in the ".mtx" format.

2.2 Compile and Clean with the Makefile

Follow these steps to compile and clean the code using the Makefile:

- **Compile:** Open the terminal in the directory containing the Makefile and type `make`. This compiles the code, and the output will display as:

```
gcc -c functions.c
gcc main.c functions.o -o main
```

- **Clean:** To remove the executable and intermediate files, type `make clean` in the terminal. The following command will run:

```
rm -f main *.o
```

3 Using the Program

3.1 Running the Program

The program supports the following operations:

1. **Printing a Matrix:** Run `./main <filename.mtx>` to print the contents of a matrix file.
2. **Transposing a Matrix:** Run `./main <filename.mtx> transpose <print option>`, replacing <filename.mtx>with the input matrix file and <print option>with 1 or 0 (1 to print matrices and CPU time, 0 for CPU time only).
3. **Matrix Operations:** Run `./main <file1.mtx> <file2.mtx> <operation> <print option>`, replacing:
   - <file1.mtx>and <file2.mtx>with the input matrix files (Matrix A and Matrix B).
   - <operation>with **add**, **subtract**, or **multiply**.
   - <print option>with 1 to print matrices and CPU time, or 0 for CPU time only.

3.2 Notes on Usage

- Ensure matrix dimensions are compatible for operations. For addition and subtraction, both matrices must have the same dimensions. For multiplication, the number of columns in Matrix A must equal the number of rows in Matrix B.
- Errors will be displayed if incompatible matrices are used.

4 Examples

4.1 Matrix Printing

To print the contents of a matrix file named `matrix.mtx`, use the following command:

```
./main matrix.mtx
```

4.2 Matrix Transposition

To transpose a matrix `matrix.mtx` and print the result, use:

```
./main matrix.mtx transpose 1
```

4.3 Matrix Addition

To add two matrices `A.mtx` and `B.mtx`, printing the result:

```
./main A.mtx B.mtx add 1
```

5 Troubleshooting

- Ensure all files are in the same directory.
- Verify input matrix dimensions for compatibility.
- Use `make clean` to remove object files and recompile if issues persist.