**Brief Overview:**

One of the main limitation in Magnetic Resonance Imaging (MRI) is its long scan time. To reduce the MRI scan time less amount of data is acquired from MRI scanner that results in aliasing of MR images. Sensitivity Encoding (SENSE) is a Parallel MRI reconstruction method that reconstructs the MR image from the aliased data acquired from scanner. The inputs of SENSE reconstruction are aliased data from MRI scanner and receiver coil sensitivity encoding matrices. The output of SENSE reconstruction is reconstructed MR image for clinical usage.

SENSE method requires to invert large number of small matrices that increases the computation time if they are calculated iteratively. This works presents GPU implementation of SENSE reconstruction that performs the tasks in parallel fashion hence reducing the computation time (one of the main limitation in MRI). The number of CUDA threads are launched as per required matrix inversions for SENSE reconstruction. The results show that the proposed GPU implementation of SENSE reconstruction is more than 10x faster than the respective CPU implementation.

**List of files:**

The matrices/files used is this work contains complex data, therefore, real part and imaginary part are stored in separate files and operations are performed accordingly. The input files used in this work are mentioned below:

* Coil1real.txt (real data of receiver coil 1 of size 256x256)
* Coil1imag.txt (imaginary data of receiver coil 1 of size 256x256)
* Coil2real.txt (real data of receiver coil 2 of size 256x256)
* Coil2imag.txt (imaginary data of receiver coil 2 of size 256x256)
* Im1real.txt (real data of aliased image 1 of size 128x256)
* Im1imag.txt (imaginary data of aliased image 1 of size 128x256)
* Im2real.txt (real data of aliased image 2 of size 128x256)
* Im2imag.txt (imaginary data of aliased image 2 of size 128x256)

The output of SENSE will be the reconstructed image of size 256x256. The output is stored in following files:

* Reconstructionreal.txt (real part of reconstructed image of size 256x256)
* Reconstructionimag.txt (imaginary part of reconstructed image of size 256x256)

“SENSE.cu” file contains the host and device code respectively to perform the SENSE reconstruction.