GPU BOOTCAMP
MINI CHALLENGE

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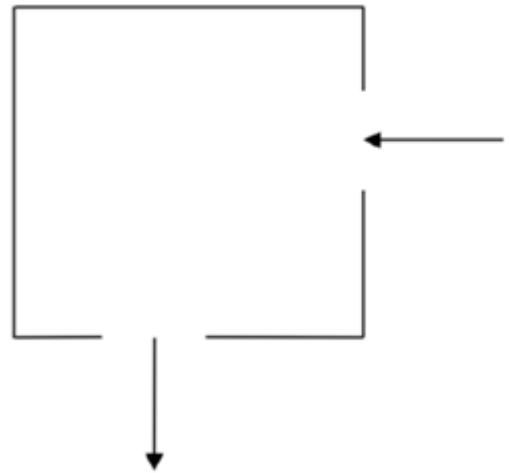
APPLICATION

Simple 2D regular-grid CFD simulation

```
set the boundary values for Ψ
while (convergence == FALSE)  do
    for each interior grid point do
        update Ψ by averaging with its 4 nearest neighbours
    end do

    check for convergence
end do

for each interior grid point do
    calculate ux calculate uy
end do
```



The objective of this exercise is not to dwell into the maths but to make use of different approaches to GPU programming to parallelize and improve the performance.

Pseudo Code

```
int main(int argc, char **argv) {
        initialization loop
        boundary calculation loop
        Jacobi loop
        swap array loop
}
```

- cfd.cpp
- boundary.cpp
- jacobi.cpp

MORE ABOUT CODE

- Uses Makefile
- To run the code ./cfd 64 500
  - Where ./cfd is application name
  - 64 is size of scaling
  - 500 is number of max iteration

Output:

... finished

After 500 iterations, the error is 0.00211211 -> Check this value to confirm your porting

Time for 500 iterations was 18.8579 seconds

Each iteration took 0.0377159 seconds

HINTS

- Divide different methods to port among team members
- Use profiler to check the hotspots and bottlenecks in your code
- Make use of compiler flag to cross check if indeed parallelization was done e.g. –Minfo
- Key files to look out having maximum loops:
  - cfd.cpp
  - jacobi.cpp
- Download and take backup

Acknowledgment

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