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USER	FRTRN90
JOB	BNCHMRK
FILE	TESTIN/TEST4.F90
PAGES	2
HOST	ACID
SYSTEM	LINUX 6.11.2-AMD64

```
1 PROGRAM LID DRIVEN CAVITY
2 IMPLICIT NONE
3 INTEGER, PARAMETER N = 50 GRID SIZE NXN GRID
4 REAL DX, DY, DT, RE GRID SPACING, TIME STEP, REYNOLDS NUMBER
5 REAL U N, N, V N, N, P N, N VELOCITY AND PRESSURE FIELDS
6 INTEGER I, J, STEP
7 REAL START TIME, END TIME, ELAPSED TIME
```

## PARAMETERS

```
10 DX 1.0 / N-1 GRID SPACING IN X DIRECTION
11 DY 1.0 / N-1 GRID SPACING IN Y DIRECTION
12 DT 0.001 TIME STEP SIZE
13 RE 100 REYNOLDS NUMBER
```

## INITIALIZE ARRAYS

```
16 U 0.0
17 V 0.0
18 P 0.0
```

## INITIALIZE THE TOP BOUNDARY LID VELOCITY

```
20 U N, 1.0
```

## START TIMING

```
24 CALL CPU TIME START TIME
```

## MAIN LOOP FOR TIME STEPPING

```
27 DO STEP 1, 1000
```

```
28 CALL COMPUTE VELOCITY U, V, P, DX, DY, DT, RE
```

```
29 CALL UPDATE PRESSURE P, DX, DY
```

## OUTPUT OR CHECK CONVERGENCE

```
32 IF MOD STEP, 100 0 THEN
```

```
33 PRINT *, STEP, STEP
```

```
34 END IF
```

```
35 END DO
```

## STOP TIMING

```
38 CALL CPU TIME END TIME
```

```
39 ELAPSED TIME END TIME - START TIME
```

```
40 PRINT *, ELAPSED TIME FOR CFD SIMULATION, ELAPSED TIME, SECONDS
```

## CONTAINS

## FUNCTION TO UPDATE THE VELOCITY AND PRESSURE FIELDS SIMPLIFIED

```
45 SUBROUTINE COMPUTE VELOCITY U, V, P, DX, DY, DT, RE
```

```
46 REAL, DIMENSION, , INTENT INOUT U, V, P
```

```
47 REAL, INTENT IN DX, DY, DT, RE
```

```
48 INTEGER I, J
```

## SIMPLE EXPLICIT METHOD FOR VELOCITY SIMPLIFIED

```
50 DO I 2, N-1
```

```
52 DO J 2, N-1
```

```
53 U I, J = U I, J - DT * ( U I, J * U I+1, J - U I-1, J / 2*DX
```

```
54 V I, J = V I, J - DT * ( V I, J+1 - V I, J-1 / 2*DY
```

```
55 END DO
```

```
56 END DO
```

## SIMPLE VELOCITY UPDATE FOR V SIMILAR

```
58 DO I 2, N-1
```

```
59 DO J 2, N-1
```

```
1      V I, J      V I, J - DT *      U I, J * V I+1, J - V I-1, J      / 2*DX
2      V I, J * V I, J+1 - V I, J-1      / 2*DY
3      END DO
4      END DO
5      END SUBROUTINE COMPUTE VELOCITY
6
7      FUNCTION TO SOLVE FOR PRESSURE SIMPLIFIED POISSON EQUATION SOLVER
8      SUBROUTINE UPDATE PRESSURE P, DX, DY
9      REAL, DIMENSION , , INTENT INOUT      P
10     REAL, INTENT IN      DX, DY
11     INTEGER      I, J
12
13     SIMPLE PRESSURE POISSON EQUATION JACOBI ITERATION
14     DO I      2, N-1
15         DO J      2, N-1
16             P I, J      0.25 *      P I+1, J + P I-1, J + P I, J+1 + P I, J-1
17         END DO
18     END DO
19     END SUBROUTINE UPDATE PRESSURE
20
21 END PROGRAM LID DRIVEN CAVITY
```