Particle trajectory and geometry 3D display system for EGS – CGVIEW –

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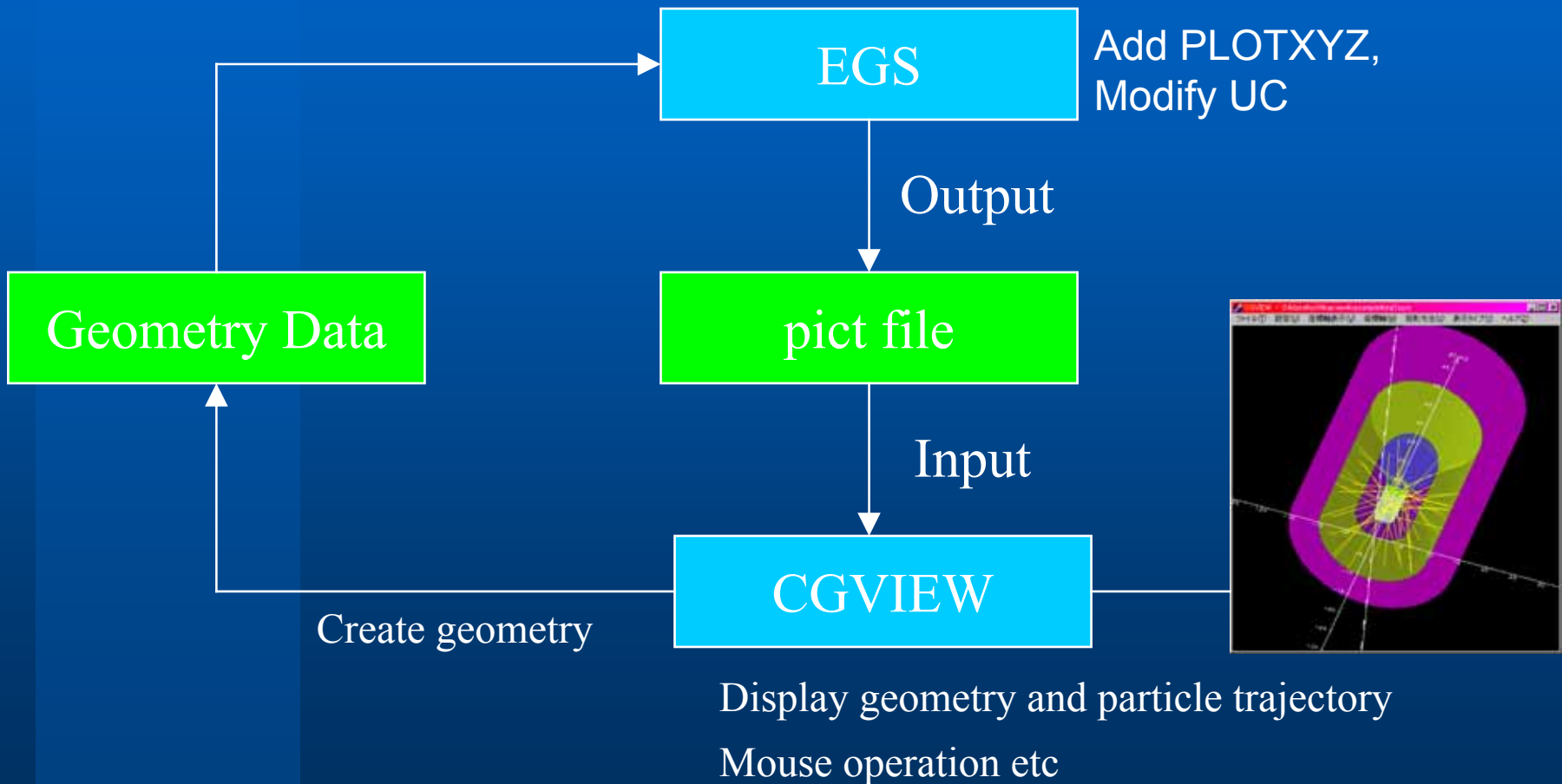
Develop Environment

- Language : Object Pascal
- Tool : Borland Delphi7

Run Environment

- Hard wear : PC/AT compatible
- ＯＳ : Windows98 or later
- Video card : Work for OpenGL

Relation of EGS & CGVIEW

Display geometry and particle trajectory

Mouse operation etc

Modification of EGS User code

Input of CGVIEW is created by EGS User code with following modifications.

PLOTXYZ for CGVIEW

PLOTXYZ: A subroutinr to output information of interaction points(Coordinate, Connection of points by line or not)

NPRECI	Cyl-slab	CG	Medium	Column #	Program
0	◎	×	×	21	PICT32
1	◎	×	×	30	PICT32
2	◎	◎	◎	64	CGVIEW

Mod of User Code for CGVIEW

- Add to non-execution part of Main
  COMMON/NFAC/FNORM, XMIN, XMAX, YMIN, YMAX, ZMIN, ZMAX, NPRECI   !PICT

- Add to STEP 2
  NPRECI=2
  OPEN(9,file='mortjob.pic',status='unknown')   !PICT

- Add just before CALL GEOMGT(IFTI, IFTO, IGMMAX, ITBODY)
  Output of CG Info
   IF(NPRECI.EQ.2)
     WRITE(9,900)
  900 FORMAT('CSTA'); !PICT
      IFTO=9
    END IF

- Add just after CALL GEOMGT(IFTI, IFTO, IGMMAX, ITBODY)
     IF(NPRECI.EQ.2)WRITE(9,901)
  901 FORMAT('CEND');   !PICT

- Add to STEP 2
  Output of Medium Info
  IF(NPRECI.EQ.2)
    WRITE(9,20) !PICT
20   FORMAT('MSTA')   !PICT
    WRITE(9,21)NREG
21   FORMAT(I4)   !PICT
    WRITE(9,22)(MED(I),I=1,NREG)
22   FORMAT(15I4)   !PICT
    WRITE(9,23)   !PICT
23   FORMAT('MEND')   !PICT
  END IF

- Add to Batch loop for Shower CALL in STEP 7 Output of Batch separator

```
   WRITE(9,91) NOFBAT
91 FORMAT('0',I5);                    !PICT
```

- Add to last part of Batch lool for Shower CALL in STEP 7

```
   WRITE(9,92)
92 FORMAT('9')                        !PICT
   CALL PLOTXYZ(99,0,0,0.,0.,0.,0.D0,0,0.)            !PICT
```

- Add to last part of STEP 7

```
   CLOSE(UNIT=9, status='keep')                  !PICT
```

- Add to AUSGAB Output of interaction point INFO

```
   CALL PLOTXYZ(IARG,NP,IQ(NP),X(NP),Y(NP),Z(NP),E(NP),IR(NP),
   WT(NP))                          !PICT
```

- Add SUBROUTINE PLOTXYZ

```
(Example of EGS Output file)
CSTA
    RCC    1  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  3.0000E+01  1.0000E+01 ⎫
    RCC    2  0.0000E+00  0.0000E+00  1.0000E-01  0.0000E+00  0.0000E+00  2.9800E+01  9.9000E+00 ⎬  Define Body
    RCC    3  0.0000E+00  0.0000E+00  5.0000E+00  0.0000E+00  0.0000E+00  1.5000E+01  5.0000E+00 ⎭
    SPH    4  0.0000E+00  0.0000E+00  2.0000E+01  5.0000E+00
    END
    Z1            1 OR    2                    ⎫  Define Zone
    Z2            1      -2 OR    3      -4    ⎭
    END
CEND
MSTA
    2                     ⎫  Define Material
    1    4                ⎭
MEND
0    1
4-8.501146E-01-8.673904E-01 7.670730E+00 1.330E+00    1 1.000E+00 ⎫
4-1.899843E+00 2.446280E-02 6.732404E+00 1.330E+00    2 1.000E+00 │
4-1.997129E+00 1.071181E-01 6.645442E+00 1.330E+00    3 1.000E+00 │
-1                                                                 │
4-6.575615E-01-1.743040E+00 7.418705E+00 1.330E+00    1 1.000E+00 ⎬  Particle Trajectory
4-6.479438E-01-1.786104E+00 7.448402E+00 1.330E+00    2 1.000E+00 │
-1                                                                 │
9   -1                                                             ⎭
```

Create Geometry by CGVIEW

Assist creating geometry for EGS calculation.

CG type geometry is assumed. It is possible to enter geometry for EGS calculation and display it on screen.

Define Body

Both English and Japanese version

Define Zone

Created data can be saved and used for EGS calculation. Example of saved file;

(Example of saved file)

RCC	1	0	0	0	0	0
		30	10			
RCC	2	0	0	0.1	0	0
		29.8	9.9			
RCC	3	0	0	5	0	0
		15	5			
RCC	4	0	0	5.1	0	0
		14.9	4.9			

Define Body

END

```
  Z1      6 OR    7
  Z2      5      -6 OR     8      -7     -5
  Z3      4      -5       -8 OR   9      -4
```

Define Zone

END

```
  1    4    2
```

Define Material

Mouse Operation

Mouse operation can be used for

- Expand/Diminish...Move mouse while pushing right button of mouse. Expand by moving downward, Diminish by moving upward.

- Move ··Move mouse while pushing both right and left button of mouse or center button.

- Rotation ··Move Mouse while pushing left button of mouse.

Display Geometry

1) Geometry system
- Spheres of co-center
- Cylinders of co-center
- XYZ planes
- CG(Combinatory Geometry)
   (Box, cylinder, sphere, cone, torus)

2) Display level
- Body・・ON/OFF and color specification for each Body
- Zone・・ON/OFF and color specification for each Zone
- Material・・ON/OFF and color specification for each Mat.

3)Display style of Geometry

- Display by Planes
- Display by lines

4)Cut out part of geometry

By input virtual BOX, it is possible to specify as "No-diplay" for spaces which overlap with virtual box.

Specify min and max of x,y,z of virtual box.

If not specified, values are assumed from displaying are

5)Moving Eye point

   Following 4 paters are supported;

- Z-Y・・Z-axis for rightward, Y-axis for upward
- Y-Z・・Y-axis for rightward, Z-axis for upward
- X-Z・・X-axis for rightward, Z-axis for upward
- X-Y・・X-axis for rightward, Y-axis for upward

6)Change colors

- Colors for background and character etc can be chabged.

7)Logical operation of bodies

Computer precision sometimes cause problem on logical operation between bodies. This leads to in-proper display of body or zone.
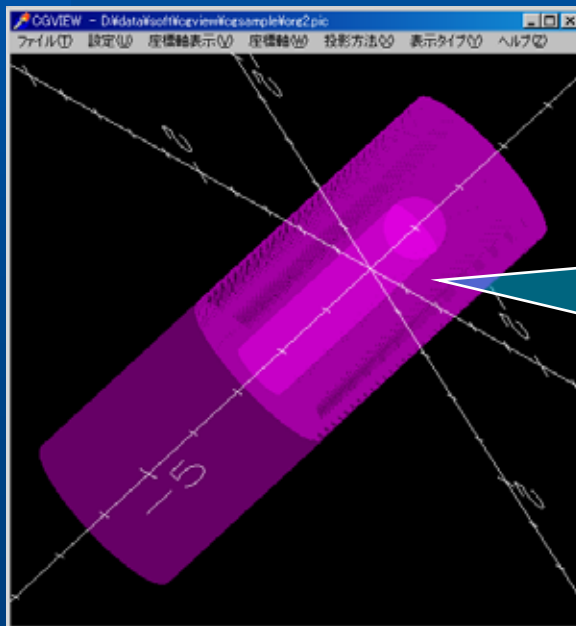
Cylinders and spheres tend to cause problem

Thus, subtracting body is expanded only hen logical subtraction is performed. Corrected size is calculated by;

Corrected size = Original size + Original size×correction factor+correction term
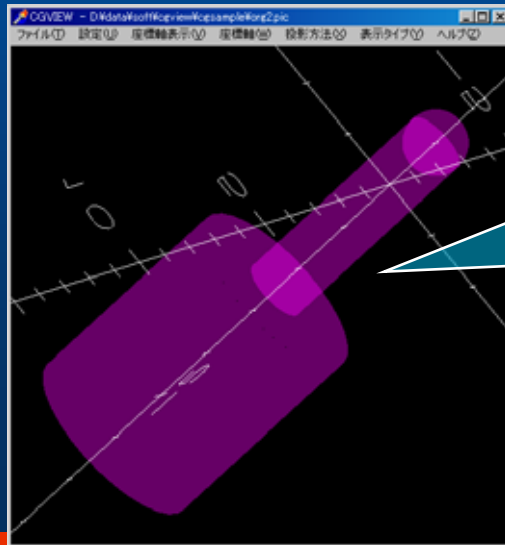
Properly subtracted after correction

Display particle trajectory

1)Display particle
- Photon(γ、x)
- Electron(e^-)
- Positron(e^+)

2)Condition for display trajectory

A) Range of history

Input upper and lower limit of history, then outside history is not displayed. If left blank, minimum and maximum history numbers are automatically assigned for lower and upper limit. Also, by specifying numbers (N) from last history, last N history from last history can be displayed.

B) Line color

  Line color can be specified for each kind of particles

C) Line type

  Line type can be specified for each kind of particles
  [Solid, dash, dot-dash, double dot dash]

D) Line width

  Line width can be specified for each kind of particles

E) ON/OFF

  ON/OFF can be specified for each kind of particles

F) Energy range

  By specifying particle energy range, no-display is
    specified for particles with outside energy range

3) WEIGHT

If WEIGHT data is included for each interaction point in input file, particle trajectory is displayed with line whose width= line width for each particle x WEIGHT. If WEIGHT data is not included, WEIGHT is assumed to be 1.

4) LATCH Function

If LATCH data is included for each history in input file, ON/OFF of the history can be controlled by LATCH data. Also, LATCH function can be switched on/off.

If Latch data in not included in input file, all the histories are displayed.

Other points

1) Details of axis can be specified
   - ON/OFF of displaying axis
   - Unit of scale
   - Interval of scale
   - Size of scale
   - Arrow size
   - Character size
   - Character interval

2) Title, memo box

   Title and memo box can be displayed
   Their position can be changed by mouse.

3)Displaying legend

Legend box with following Info can be displayed;
- History range for display
- Line type and color for each kind of particle

4)Printing Screen

Currently displayed window can be printed.

5)DOS window

By enable DOS window from main window, cgview and EGS can run semi-interactively.

6)Re-load

Data file can be re-loaded. Just after EGS calculation, output can be re-loaded and displayed.

7) Making screen shot

   It is possible to save displaying window as bit-map data.

8) Help function

   help functions are available.

Demo

New function of Ver.1.2

1) Linux version is available.
2) Geometry checker: It is possible to check geometry before MC calculations. Geometry setup becomes easier.

Future plans

1) Speed up
2) Specifying displaying area by mouse operation
3) Displaying geometry with No-transparent manner