Tools for checking & creating ***polydata.dat files

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1 Introduction

After RoboCup2001, instructive comments and ideas have been proposed. RoboCup Rescue Simulation League committee decided to invite such proposals to RoboCup2002 [1]. F. Matsuno, M. Hatayama and H. Takahashi proposed to a new map - virtual city map -.

At January, 2002, the virtual city maps were open. However, no collapse and road blockage occurred. This paper reports the causes and explains how to use checking & editing tools in the following order.

- GIS file
- ***polydata.dat files used in simulators
- Requirements among file
- Map display tool
- Map creation tool.

2 GIS file

Rescue GIS data consists of three binary files - `building.bin`, `road.bin`, `node.bin`

The file formats [2] are

```
file=building.bin
no  HexDump(4Byte)  unsigned       notes
0  05 00 00 00   5              the number in 19_s
1  10 2b e2 f6   -152950000     x offset in 19_s
2  50 38 1a 03   52050000       y offset in 19_s
3  73 01 00 00   371            # of buildings
```

[1] http://kiyosu.isc.chubu.ac.jp/robocup/Rescue/note2002.html
[2] refer to section 4.11, 7 in RoboCup-Rescue Simulator Manual V0-R4.

```
4  1a 00 00 00   26             size(4Byte) of 1st record
5  01 00 00 00   1              ID of 1st buildings
6  c8 21 07 00   467400         position.x
7  b4 68 0b 00   747700         position.y
8  03 00 00 00   3              floor number of this building
9  01 00 00 00   1              kind of this building

no  HexDump(4Byte)  unsigned      notes
10  00 00 00 00   0             ignition flag
11  00 00 00 00   0             fieryness, how much burnt
12  00 00 00 00   0             break-down, how much broken
13  01 00 00 00   1             # of connection
14  80 00 00 00   128           this building links note-128
15  01 00 00 00   1             ID of 1st buildings
16  92 2f 00 00   12178         1F area of this building
17  b5 8e 00 00   36533         total area of this building
18  00 00 00 00   0             attribute of this building
19  05 00 00 00   5             # of apexes of this building

no  HexDump(4Byte)  unsigned      notes
20  a8 37 07 00   473000        position.x of 1st apex
21  74 7b 0b 00   752500        position.y
22  4c 0c 07 00   461900        position.x of 2nd apex
23  74 7b 0b 00   752500
24  4c 0c 07 00   461900        position.x of 3rd apex
25  58 56 0b 00   743000
26  a8 37 07 00   473000        position.x of 4th apex
27  58 56 0b 00   743000
28  a8 37 07 00   473000        position.x of 5th apex
29  74 7b 0b 00   752500        the last apex coincide with 1st

no  HexDump(4Byte)  unsigned      notes
30  1e 00 00 00   30            size(4Byte) of 2nd record
31  02 00 00 00   2               30 + 30 - 1 = 59
32  b8 af 06 00   438200          the last # data of 2nd is 59.
33  64 b8 0b 00   768100
34  03 00 00 00   3
35  01 00 00 00   1
36  00 00 00 00   0
37  00 00 00 00   0
38  00 00 00 00   0
39  01 00 00 00   1

no  HexDump(4Byte)  unsigned      notes
40  77 00 00 00   119
41  02 00 00 00   2
```

```
42  2d 1b 00 00   6957
43  8a 51 00 00   20874
44  00 00 00 00   0
45  07 00 00 00   7              2nd building is consisted of
46  e8 c0 06 00   442600         6 apexes, 1st apex and the last
47  5c ca 0b 00   772700         are equal.
48  38 a3 06 00   435000
49  5c ca 0b 00   772700

no  HexDump(4Byte)  unsigned       notes
50  38 a3 06 00   435000
51  e8 a2 0b 00   762600
52  24 b7 06 00   440100
53  e8 a2 0b 00   762600
54  24 b7 06 00   440100
55  84 bb 0b 00   768900
56  e8 c0 06 00   442600
57  84 bb 0b 00   768900
58  e8 c0 06 00   442600
59  5c ca 0b 00   772700
:
-------to end of file. ---------------------------------------->
        layout of two buildings specified in  this file
      |
      |   1                      0,6
772700+   *----------------------*
      |   |                      |
768900+   |        + ID2  *------*
      |   |               | 4     5
762600+   *---------------*
      |   2               3               1             0,4
752500+                                     *-------------*
      |                                     |             |
747700+                                     |       + ID1 |
      |                                     |             |
743000+                                     *-------------*
      |                                     2             3
      :
      +..--+-------+-------+-------+-------+-------+------+----
 435800  438200  440100  442600  461900  467400 473000

file=node.bin
no  HexDump(4Byte)  unsigned       notes
0  05 00 00 00   5              the number in 19_s
1  10 2b e2 f6   -152950000     x offset in 19_s
2  50 38 1a 03   52050000       y offset in 19_s
```

```
3  a0 00 00 00   160            # of nodes
4  22 00 00 00   34             size of 1st record
5  01 00 00 00   1              ID of 1st node
6  bc 29 06 00   403900         position.x of this node
7  1c 9e 09 00   630300         position.y
8  04 00 00 00   4              # of connected with
9  24 00 00 00   36               object(road/building) ID36

no  HexDump(4Byte)  unsigned       notes
10  25 00 00 00   37               ID37
11  15 00 00 00   21               ID21
12  00 00 00 00   0                null ID (end?).
13  00 00 00 00   0              signal/traffic light
14  00 00 00 00   0              ShortcutToTurn:connection#0
15  00 00 00 00   0                             connection#1
16  00 00 00 00   0                             connection#2
17  00 00 00 00   0                             connection#3
18  00 00 00 00   0              PocketToTurn:#ofPocket*c.#0
19  00 00 00 00   0                          lengthofPoceket

no  HexDump(4Byte)  unsigned       notes
20  00 00 00 00   0                  #ofPocket:connection#1
21  00 00 00 00   0                  lengthOfPocket:     #1
22  00 00 00 00   0                                      #2
23  00 00 00 00   0                                      #2
24  00 00 00 00   0                                      #3
25  00 00 00 00   0                                      #3
26  00 00 00 00   0              signalTimingBlue:connect#1
27  00 00 00 00   0                          Yellow
28  00 00 00 00   0                          Red
29  00 00 00 00   0                          Blue        #2

no  HexDump(4Byte)  unsigned       notes
30  00 00 00 00   0                          Yellow
31  00 00 00 00   0                          Red
32  00 00 00 00   0                          Blue        #3
33  00 00 00 00   0                          Yellow
34  00 00 00 00   0                          Red
35  00 00 00 00   0                          Blue        #4
36  00 00 00 00   0                          Yellow
37  00 00 00 00   0                          Red
38  14 00 00 00   20             2nd record starts.
39  02 00 00 00   2              ID of 2nd node

no  HexDump(4Byte)  unsigned       notes
40  ac 98 06 00   432300         position.x of this node
```

```
41  1c 9e 09 00   630300          position.y
42  02 00 00 00   2               2nd node has 2 connections.
43  15 00 00 00   21
:

file=road.bin
no  HexDump(4Byte)  unsigned       notes
0  05 00 00 00   5              the number in 19_s
1  10 2b e2 f6   -152950000     x offset in 19_s
2  50 38 1a 03   52050000       y offset in 19_s
3  b5 00 00 00   181            # of roads
4  11 00 00 00   17             size(4Byte) of 1st record
5  01 00 00 00   1              ID of 1st road
6  0a 00 00 00   10             node ID of head/start
7  1f 00 00 00   31             node ID of tail/end
8  6c 6b 00 00   27500          length of this road
9  00 00 00 00   0              road Kind

no  HexDump(4Byte)  unsigned       notes
10  00 00 00 00   0               carPassToHead
11  00 00 00 00   0               carPassToTail
12  00 00 00 00   0               humansPassToHead
13  00 00 00 00   0               humansPassToTail
14  40 1f 00 00   8000            width of this road
15  00 00 00 00   0               blocked(collapsed)width
16  00 00 00 00   0               repairCost
17  00 00 00 00   0               has Separator or not
18  02 00 00 00   2               # of linesToHead
19  02 00 00 00   2               # of linesToTail

no  HexDump(4Byte)  unsigned       notes
20  00 00 00 00   0               withForWalker
21  11 00 00 00   17              start of 2nd record
22  02 00 00 00   2                 at 4 + 17 -1 =10
23  1f 00 00 00   31              1st record terminates.
24  91 00 00 00   145
25  90 1a 00 00   6800
:

.
```

3 Files used in simulators

Collapse simulator and blockade simulator calculate damages to buildings and roads. The damages are determined by how much buildings are shaken at

earthquakes. The power of earthquakes are stored in `galpolydata.dat` and `shindopolydata.dat`. The two files have the same format.

```
file=galpolydata.dat
226,12                  the numeber of (data, segments)
8,15                    1st segment    (magnitude, # of points)
23357100,3810900         point1 (x, y)
23426600,3866500                point2
23463700,3889700                point3
23491500,3880400                point4
23556300,3852600                point5
23574800,3783100                point6
23519200,3732200                point7
23672100,3690500                point8
23644300,3806300                point9
23588700,3912800                point10
23505400,3973100                point11
23352500,4019400                point12
23278400,4000900                point13
23208900,3936000                point14
23357100,3810900                point15 (coincides with point1.)
6,21                    2nd segment    (magnitude, # of points)
22838900,4481700                  :
          :
22838900,4481700 The last coincides with the first.
9,10                    3rd segment    (magnitude, # of points)
23408100,3722900
          :
5,13                    4th segment.
23818000,3390700
          :
5,15                    5th segment.
23458000,4232400
          :
8,21                    6th segment.
23088400,3292100
          :
6,11                    7th segment.
24000000,4480000
  :
7,18                    8th segment.
23236700,3398700
  :
4,7                     9the segment.
23349300,2904200
          :
```

```
6,36                    10th segment.
23804000,4268800
         :
7,38                    11the segment.
22699300,3389400
         :
5,9                     12th segment.
22270500,4308100
  :
22270500,4308100        End of file.
<------------------------------------------------------------------------>
15 + 21 + 10 + 13 + 15 + 21 + 11 + 18 + 7 + 36 + 38 + 9 = 214 points
                              214 points & 12 segments = 226 data
```

4 Requirements among files

GIS data is based on the 19 standard coordinate (19_s). 19_s is the coordinate used in Japan Geographical Survey Institute. The transformations from (x, y) coordinate to (x19, y19) in 19_s are

$$x19 = (x + A2)/1000, \quad (1)$$

$$y19 = (y + A3)/1000, \quad (2)$$

$$where A2 = -152950000, A3 = 5205000. \quad (3)$$

The values, position.x, position.y, in files - `building.bin`, `road.bin`, `node.bin`, , `galpolydata.dat` and `shindopolydata.dat` - are (x, y). The area specified in `galpolydata.dat` and `shindopolydata.dat` must be overlapped the area specified in GIS files.

Two programs check and edit the files.

check.java This program outputs left-bottom point and right-top point of area specified in GIS files. As a figure drawn after the execution list, Kobe city area and virtual city are completely separated .

check_data.java Data in the original `galpolydata.dat` and `shindopolydata.dat` are set overlap Kobe city map [3] . The area is shown in a figure drawn after the execution list. To virtual city maps, it is necessary to shift.

This program transforms data in `galpolydata.dat` & `shindopolydata.dat` into other area by specifying the original point & ratio.

```
------------- check.java ------------------
*** for building.bin for virtual city 1/1
$java check
```

[3] Applying these ***polydata.dat to virtual city causes no collapse, because there is no overlap between ***polydata.dat and virtual city.

```
FIGURE ID:5
OFFSET =(-152949999,52050000)
#Objects:1271
# id pos.x pos.y pos19.x pos19.y
0 1 443200 561400 -152506 52611
1 2 642500 604100 -152307 52654
                :
1270 1271 802300 711300 -152147 52761
min 415400 425300 -152534 52475
max 806000 814700 -152143 52864
dif 390600 389400

*** for building.bin for virtual city 1/4
$java check
FIGURE ID:5
OFFSET =(-152949999,52050000)
#Objects:371
# id pos.x pos.y pos19.x pos19.y
0 1 467400 747700 -152482 52797
                :
370 371 434900 626700 -152515 52676
min 415400 625800 -152534 52675
max 605100 814700 -152344 52864
dif 189700 188900

*** for building.bin for virtual Kobe 1/10
$java check
FIGURE ID:5
OFFSET =(-152949999,52050000)
#Objects:740
# id pos.x pos.y pos19.x pos19.y
0 1 22865900 3563300 -130084 55613
                :
739 778 23122800 3529400 -129827 55579
min 22748100 3507200 -130201 55557
max 23164600 3821400 -129785 55871
dif 416500 314200
<-------------------------------------------------->

       |
3821400+                                *-----------*
       |                                |           |
       |                                | Kobe 1/10 |
       |                                |           |
350720+0                                *-----------*
       |
```

```
 814700+    *-------*-------*
        |    |  1/4  |       |
 625800+    *-------*       |
        |    | Virtual C.1/1 |
 425300+    *---------------*
        |
        :
        +..--+-------+-------+-----------+----------+-----
           415400  605100  806000     22748100   23164600


----------- check_data.java ----------------
*** for galpolydata.dat
$java check_data
[2]tokens ->    226[0, 0]226    12[0, 1]12
[2]tokens ->    8[1, 0]8        15[1, 1]15
[2]tokens ->    23357100[2, 0]23357100  3810900[2, 1]3810900
          :
2nd path *****   x       y
        min     22095200        2900000
        max     24000000        4484300
        dif     1904800 1584300
3rd path *****   x       y
        Map_min 415400  625800
        dis     0       0
        ratio   0.2     0.2
226,12
8,15
667780,807980
          :

*** for shindopolydata.dat
$java check_data
[2]tokens ->    407[0, 0]407    12[0, 1]12
[2]tokens ->    2[1, 0]2        33[1, 1]33
[2]tokens ->    23500500[2, 0]23500500  3675300[2, 1]3675300
          :
2nd path *****   x       y
        min     22100000        2900000
        max     24000000        4480000
        dif     1900000 1580000
3rd path *****   x       y
        Map_min 415400  625800
        dis     0       0
        ratio   0.2     0.2
407,12
```

```
2,33
695500,780860

<------------------------------------------------------------>
 Area: Original galpolydata.dat & shindopolydata.dat specify

4484300*                              +==================+
3821400+                              |  *-----------*   |
       |                              |  |           |   |
       |                              |  | Kobe 1/10 |   |
       |                              |  |           |   |
3507200+                              |  *-----------*   |
2900000*                              +==================+
 814700+    *-------*-------*
       |    |  1/4  |       |
 625800+    *-------*       |
       |    | Virtual C.1/1 |
 425300+    *---------------*
       |
       :
       +..--+-------+-------+--------*--+----------+--*--
          415400  605100  806000     22748100   23164600
                                 22095200          24000000
```

check_data inputs the data from a file named `m_map.data`, transforms them according to parameters specified in a file - `check_transform.data` -, and outputs to a file name `t_map.data`

```
$ more check_transform.data
415400 625800  # left-down point of virtual city Map 1/4
605100 814700   # right-up point
300.0 300.0  # ratios for x, y
$
```

5 Map display tool

Section 3 describes file format. The points in a segment are apexes of polygons. The polygons are areas where an earthquake has the same power. **check_draw** displays the areas (Fig. 2). Four figures over a picture are coordinates of min.(left-down) [4] point and max.(right-up) point.

```
usage 1: default file_name is galpolydata.dat.
$java check_draw
```

[4] In Java, the origin of coordinates is left-up corner. **check_draw** draws min. point at left-up corner and max. point at right-down corner.

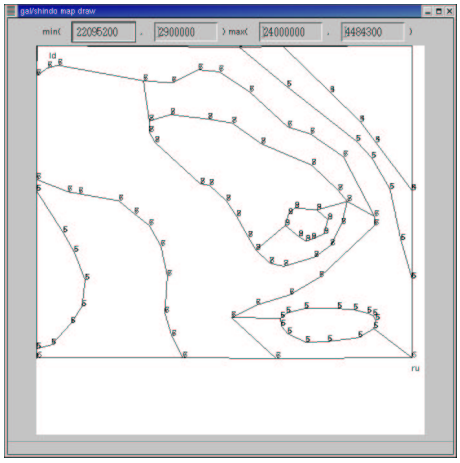

Figure 1: Display of galmap

```
usage 2: specify file_name to display.
$java check_draw shindopolydata.dat
```

6 Map creation tool

create_data creates `**polydata.dat`. Fig. 2 shows the interface, - repeat the followings

- input magnitude in a window over a white canvas,
- input a polygon by clicking a sequence of apexes. (the last apex coincides with the first one.)

and terminate by clicking (right-up) window-closing button. A file - `m_map.data` - is created. The area size specified in `m_map.data` are 600×600. It is necessary to transform the area size with using **check_data**.

7 acknowledgments

Thanks to Yoshitaka Kuwata for his comments and programs, to Michinori Hatayama, Fumitoshi Matsuno, and Hironao Takahashi for providing virtual city maps.

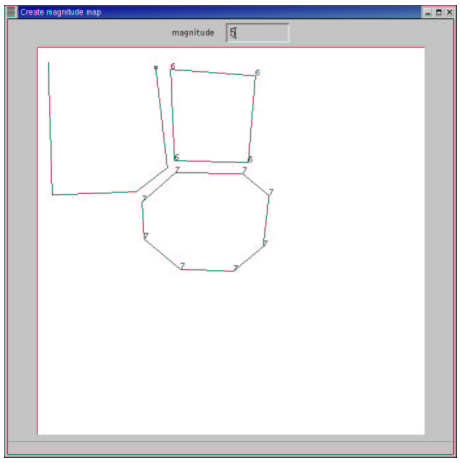

Figure 2: Display of Map creation