QGIS Application - Bug report #5239
TIN interpolation causes crash

2012-03-26 03:48 PM - Giovanni Manghi

Status:	Closed		
Priority:	High		
Assignee:	Marco Hugentobler		
Category:	C++ Plugins		
Affected QGIS version:	master	**Regression?:**	No
Operating System:		**Easy fix?:**	No
Pull Request or Patch supplied:	Yes	**Resolution:**	
Crashes QGIS or corrupts data:	Yes	**Copied to github as #:**	14974

Description

Tested on master and 1.7.4 on both linux and windows.

The attached layer "3763" causes qgis to crash if interpolating (with the "Z" column) with the "interpolation" plugin and the TIN method. Works fine with IDW.

Strangely enough, the very same layer saved in another CRS (attached here) does not cause the tool to crash qgis.

In both cases the project CRS was set as the same as the layer being processed.

Related issues:

Related to QGIS Application - Bug report # 6654: QgsTINInterpolator.interpola...	**Closed**	**2012-11-07**
Related to QGIS Application - Bug report # 9505: qgis crash on TIN interpolat...	**Closed**	**2014-02-06**
Duplicates QGIS Application - Bug report # 2482: Interpolation plugin causes ...	**Closed**	**2011-07-25**
Duplicated by QGIS Application - Bug report # 9539: Interpolation Plugin cras...	**Closed**	**2014-02-11**

History

#1 - 2012-03-30 01:49 PM - Thomas Arnold

- File DualEdgeTriangulation.cc.diff added

- File DualEdgeTriangulation.h.diff added

Hi,

could anybody check this solution?
I think it was a numerical problem. The value of the leftOfTresh was too small. So the case "p is in a line with p0 and p1" could not detect.

Thomas

#2 - 2012-03-31 12:37 AM - Giovanni Manghi

- Pull Request or Patch supplied changed from No to Yes

#3 - 2012-04-15 10:00 AM - Giovanni Manghi

- Target version changed from 35 to Version 1.8.0

#4 - 2012-04-16 04:25 AM - Giovanni Manghi

probably duplicate of #2482

#5 - 2012-05-25 01:37 AM - Tristan Allouis

- File test2.xyz added

Same problem: Segmentation fault using the "interpolation" plugin and the TIN method on a xyz dataset (Z interpolation).
I checked the patch but it bit not fix the problem.

According to my tests, qgis crashes when the points to interpolate are too close (too dense dataset).
I enclose a dataset that causing qgis to crash. Use the SCR ID 10090.

Please can you test this dataset and report if it crashes or not ?

Thanks!

#6 - 2012-05-25 04:15 AM - Salvatore Larosa

Reverting the patch does not work! (tested w/test2.xyz)

below the backtrace, if it can you help:

```
Program received signal SIGSEGV, Segmentation fault.
0x00007ffff4220c79 in MathUtils::triArea(Point3D*, Point3D*, Point3D*) ()
   from /usr/local/lib/libqgis_analysis.so.1.8.0
(gdb) bt
#0  0x00007ffff4220c79 in MathUtils::triArea(Point3D*, Point3D*, Point3D*) ()
   from /usr/local/lib/libqgis_analysis.so.1.8.0
#1  0x00007ffff421f74a in MathUtils::inCircle(Point3D*, Point3D*, Point3D*, Point3D*) ()
   from /usr/local/lib/libqgis_analysis.so.1.8.0
#2  0x00007ffff420a1ef in DualEdgeTriangulation::checkSwap(unsigned int) ()
   from /usr/local/lib/libqgis_analysis.so.1.8.0
#3  0x00007ffff420a768 in DualEdgeTriangulation::doSwap(unsigned int) ()
   from /usr/local/lib/libqgis_analysis.so.1.8.0
#4  0x00007ffff420a204 in DualEdgeTriangulation::checkSwap(unsigned int) ()
   from /usr/local/lib/libqgis_analysis.so.1.8.0
#5  0x00007ffff420a768 in DualEdgeTriangulation::doSwap(unsigned int) ()
   from /usr/local/lib/libqgis_analysis.so.1.8.0
#6  0x00007ffff420a204 in DualEdgeTriangulation::checkSwap(unsigned int) ()
   from /usr/local/lib/libqgis_analysis.so.1.8.0
#7  0x00007ffff420a768 in DualEdgeTriangulation::doSwap(unsigned int) ()
   from /usr/local/lib/libqgis_analysis.so.1.8.0
#8  0x00007ffff420a204 in DualEdgeTriangulation::checkSwap(unsigned int) ()
   from /usr/local/lib/libqgis_analysis.so.1.8.0
#9  0x00007ffff420a768 in DualEdgeTriangulation::doSwap(unsigned int) ()
   from /usr/local/lib/libqgis_analysis.so.1.8.0
#10 0x00007ffff420a204 in DualEdgeTriangulation::checkSwap(unsigned int) ()
   from /usr/local/lib/libqgis_analysis.so.1.8.0
#11 0x00007ffff420a768 in DualEdgeTriangulation::doSwap(unsigned int) ()
   .....................
```

loop till to the end, alterning doSwap and checkSwap!

#7 - 2012-05-30 05:24 AM - Giovanni Manghi

- Status changed from Open to Closed

merging this with #5239

#8 - 2012-05-30 05:25 AM - Giovanni Manghi

Giovanni Manghi wrote:

> *merging this with #5239*

see also #2482

#9 - 2012-05-30 05:38 AM - Giovanni Manghi

- Status changed from Closed to Reopened

#10 - 2012-06-01 12:15 AM - Thomas Arnold

- File 0001-5239_v1.patch added

Hi,

the mean problem is the recursiv call checkSwap<->doSwap. I don't know the precise reason why the recursion sometimes never ends. But how about the simple strategy to limit the recrusiv deep? I know that is not ideal. But this prevent that qgis crashes.

Thomas

By the way I used the "git format-patch" command to create this patch. I hope it is ok.

#11 - 2012-06-07 06:12 AM - Tristan Allouis

Hello,
Thank you for the patch Thomas, it works well !

#12 - 2012-06-07 12:21 PM - Marco Hugentobler

I agree the numerical stability of the triangulation code is not rock-solid (and if there are volunteers for maintaining the triangulation code, that would be great).

As Thomas points out, limiting the recursive depth of the swaping is not optimal (in extreme cases, one point insertion could swap all the existing edges in a triangulation). Therefore, I'm not applying that patch to the git repo.

#13 - 2012-09-04 11:53 AM - Paolo Cavallini

- Target version changed from Version 1.8.0 to Version 2.0.0

#14 - 2012-10-05 02:24 PM - Giovanni Manghi

- Status changed from Reopened to Closed
- Resolution set to fixed

Tested again on master and it works fine, no more crashes.

#15 - 2012-11-07 02:23 PM - Salvatore Larosa

- Status changed from Closed to Reopened
- Resolution deleted (fixed)

Still persists ! (at least under Linux)

#16 - 2012-12-26 11:11 AM - Giovanni Manghi

- Status changed from Reopened to Feedback

Salvatore Larosa wrote:

> *Still persists ! (at least under Linux)*

tested now on linux (ubuntu) and qgis master and seems to work ok. Salvatore, still a crash for you?

#17 - 2012-12-26 02:07 PM - Salvatore Larosa

Giovanni Manghi wrote:

> *tested now on linux (ubuntu) and qgis master and seems to work ok. Salvatore, still a crash for you?*

Hi Giovanni,
yes, it still happens here with a similar backtrace (as above):

```
Program received signal SIGSEGV, Segmentation fault.
0x00007ffff3fb29a0 in MathUtils::triArea (pa=0x60f94a0, pb=0x6455cc0, pc=0x63f7a00)
    at /home/sam/pacchetti_gis/Quantum-GIS/src/analysis/interpolation/MathUtils.cc:503
503       double deter = ( pa->getX() * pb->getY() + pb->getX() * pc->getY() + pc->getX() * pa->getY() - pa->getX() * pc->getY() - pb->getX() *
pa->getY() - pc->getX() * pb->getY() );
(gdb) bt
#0  0x00007ffff3fb29a0 in MathUtils::triArea (pa=0x60f94a0, pb=0x6455cc0, pc=0x63f7a00)
    at /home/sam/pacchetti_gis/Quantum-GIS/src/analysis/interpolation/MathUtils.cc:503
#1  0x00007ffff3fb07ff in MathUtils::inCircle (testp=0x63f7a00, p1=0x6454620, p2=0x60f94a0, p3=
    0x6455cc0) at /home/sam/pacchetti_gis/Quantum-GIS/src/analysis/interpolation/MathUtils.cc:266
#2  0x00007ffff3f95aab in DualEdgeTriangulation::checkSwap (this=0x645fa00, edge=359)
    at /home/sam/pacchetti_gis/Quantum-GIS/src/analysis/interpolation/DualEdgeTriangulation.cc:692
#3  0x00007ffff3f96024 in DualEdgeTriangulation::doSwap (this=0x645fa00, edge=909)
    at /home/sam/pacchetti_gis/Quantum-GIS/src/analysis/interpolation/DualEdgeTriangulation.cc:735
#4  0x00007ffff3f95ac0 in DualEdgeTriangulation::checkSwap (this=0x645fa00, edge=909)
    at /home/sam/pacchetti_gis/Quantum-GIS/src/analysis/interpolation/DualEdgeTriangulation.cc:694
```

#5 0x00007ffff3f96024 in DualEdgeTriangulation::doSwap (this=0x645fa00, edge=483)
    at /home/sam/pacchetti_gis/Quantum-GIS/src/analysis/interpolation/DualEdgeTriangulation.cc:735
#6 0x00007ffff3f95ac0 in DualEdgeTriangulation::checkSwap (this=0x645fa00, edge=483)
    at /home/sam/pacchetti_gis/Quantum-GIS/src/analysis/interpolation/DualEdgeTriangulation.cc:694
#7 0x00007ffff3f96024 in DualEdgeTriangulation::doSwap (this=0x645fa00, edge=689)
    at /home/sam/pacchetti_gis/Quantum-GIS/src/analysis/interpolation/DualEdgeTriangulation.cc:735
#8 0x00007ffff3f95ac0 in DualEdgeTriangulation::checkSwap (this=0x645fa00, edge=689)
    at /home/sam/pacchetti_gis/Quantum-GIS/src/analysis/interpolation/DualEdgeTriangulation.cc:694
#9 0x00007ffff3f96024 in DualEdgeTriangulation::doSwap (this=0x645fa00, edge=359)
    at /home/sam/pacchetti_gis/Quantum-GIS/src/analysis/interpolation/DualEdgeTriangulation.cc:735
#10 0x00007ffff3f95ac0 in DualEdgeTriangulation::checkSwap (this=0x645fa00, edge=359)
    at /home/sam/pacchetti_gis/Quantum-GIS/src/analysis/interpolation/DualEdgeTriangulation.cc:694
#11 0x00007ffff3f96024 in DualEdgeTriangulation::doSwap (this=0x645fa00, edge=909)

Tested with the attached dataset (3763.shp)

#18 - 2013-06-02 09:08 AM - Giovanni Manghi

- Priority changed from High to Severe/Regression

#19 - 2013-06-02 11:35 PM - Marco Hugentobler

- Priority changed from Severe/Regression to High

This wasn't working in 1.8 too, so shouldn't be a blocker.
Btw., it obviously is something related to numerical stability of the TIN generation. Therefore it is more likely in degree coordinate system than in meters.

#20 - 2014-01-26 10:24 AM - Giovanni Manghi

- Target version changed from Version 2.0.0 to Future Release - High Priority
- Status changed from Feedback to Open

Marco Hugentobler wrote:

> *This wasn't working in 1.8 too, so shouldn't be a blocker.*
> *Btw., it obviously is something related to numerical stability of the TIN generation. Therefore it is more likely in degree coordinate system than in meters.*

still crashes qgis, now I see just

Segmentation fault (core dumped)

#21 - 2014-02-12 03:09 AM - Martin Dobias

The numerical stability issues are apparent especially in cases when points are forming rectangles, ending up swapping edges infinitely (well, until QGIS runs out of stack and crashes).

For short term solution I would propose using Thomas Arnold's patch to limit the recursion depth. The numerical errors are IMHO not easy to resolve,

especially because there are two ad-hoc thresholds involved (one for point-in-circle test, other one for which-side-of-line test). Marco's point about possible sub-optimal triangulation are valid, but I think mostly theoretical (if the recursion level is great enough, e.g. 1000). After all, we do not need a perfect Delaunay triangulation for the interpolation - much more important is not to crash!

For longer term solution we should use a proven implementation where we do not need to deal with such issues. An obvious choice can be GEOS (support Delaunay triangulation since 3.4 release) or qhull.

#22 - 2014-02-13 11:32 AM - Giovanni Manghi

Martin Dobias wrote:

> *After all, we do not need a perfect Delaunay triangulation for the interpolation - much more important is not to crash!*

agree!

#23 - 2014-02-17 12:11 AM - Marco Hugentobler

- Status changed from Open to Closed

Since I didn't have time to look at the triangulation code, I just upplied the patch now.

> *An obvious choice can be GEOS (support Delaunay triangulation since 3.4 release) or qhull*

Do they support constrained triangulations? qhull says it does not and for geos, I didn't find it mentioned in the documentation.
Also, it would be cool to have a library which supports very large datasets (current implementation unfortunately loads everything into virtual memory).

Files

MoBatimIST_shp.zip	104 KB	2012-03-26	Giovanni Manghi
3763_shp.zip	156 KB	2012-03-26	Giovanni Manghi
DualEdgeTriangulation.h.diff	1.54 KB	2012-03-30	Thomas Arnold
DualEdgeTriangulation.cc.diff	346 Bytes	2012-03-30	Thomas Arnold
test2.xyz	2.73 MB	2012-05-24	Tristan Allouis
0001-5239_v1.patch	6.54 KB	2012-05-31	Thomas Arnold