STEP Reduce

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Motivation

- STEP files are the default 3D interchange
Large 3D libraries

- KiCad provides a comprehensive 3d library
  - In exchange for a mere 5.8GB

- DIPTrace (commercial) 3d library
  - 4.7GB

- Manufacturer models
  - High Density → Too large to e-mail
Content Redundancy
After Reduction

- No repeated commands
Example result

- QFN-68 from DIPTrace 3d model library

```
seth@shop-laptop % ls -SrgG ~/$Downloads/DIPTrace_Models
-rw-r--r-- 1 536941 Jan 31 18:50 qfn-68_10x10x0.5-small.step
-rw-r--r-- 1 1055488 Jul 13 2016 qfn-68_10x10x0.5.step
```

- QFN-68 from KiCad 3d model library

```
seth@shop-laptop % ls -SrgG ~/$Downloads/KiCad_Models
-rw-r--r-- 1 663069 Jan 31 18:55 QFN-68-1EP_8x8mm_P0.4mm_EP5.2x5.2mm-small.step
-rw-r--r-- 1 1795107 Jan 31 18:55 QFN-68-1EP_8x8mm_P0.4mm_EP5.2x5.2mm.step
```
What about STPZ?

- STPZ is great... BUT
  - Layers zlib on STEP files
  - Window context compression
- Huffman windows only deal with first order representation diffs

- DIFFERENT COMPRESSION METHODS
Combine
STEPZ/STEPReduce

```
seth@shop-laptop % ls -lGg

total 1844
-rw-r--r-- 1 536941 Jan 31 18:50 qfn-68_10x10x0.5-small.step
-rw-r--r-- 1 107343 Jan 31 18:50 qfn-68_10x10x0.5-small.stpz
-rw-r--r-- 1 1255488 Jul 13 2016 qfn-68_10x10x0.5.step
-rw-r--r-- 1 176651 Jul 13 2016 qfn-68_10x10x0.5.stpz
```

```
seth@shop-laptop % ls -lGg

total 2820
-rw-r--r-- 1 663069 Jan 31 18:55 QFN-68-1EP_8x8mm_P0.4mm_EP5.2x5.2mm-small.step
-rw-r--r-- 1 136432 Jan 31 18:55 QFN-68-1EP_8x8mm_P0.4mm_EP5.2x5.2mm-small.stpz
-rw-r--r-- 1 1795107 Jan 31 18:55 QFN-68-1EP_8x8mm_P0.4mm_EP5.2x5.2mm.step
-rw-r--r-- 1 283911 Jan 31 18:55 QFN-68-1EP_8x8mm_P0.4mm_EP5.2x5.2mm.stpz
```
3D comparison

• Compression doesn’t matter if the model is not accurate
3D comparison

- Compression doesn’t matter if the model is not accurate
- OpenCascade allows for easy, binary verification

```cpp
BRepAlgoAPI_Cut() [3/4]
BRepAlgoAPI_Cut::BRepAlgoAPI_Cut ( const TopoDS_Shape & S1,
                                   const TopoDS_Shape & S2
                                  )
```

Constructor with two shapes <S1> -argument <S2> -tool <anOperation> - the type of the operation
3D comparison

- Compression doesn’t matter if the model is not accurate
- OpenCascade allows for easy, binary verification

Gives NULL result to within face-level FUZZY setting
Net Reduction

- KiCad STEP library
  - STEP Reduce + STPZ
  - 5.8GB → 1.50GB

- Critically, 60+MB, full board 3d model reduces to 12MB → Fits through most mail servers!
Questions?

• Try it out yourself:

https://gitlab.com/setthillbrand/stepreduce