VRM????

?? VRM ??? GLB ????

`导出的VRM文件大小` => `glb 的大小`

`glb` => ` json + binary`

json ????????????1MB?

??????????????

`image` ? `mesh`?

?????5?????5?????????????????????

Image

Image ????`Texture(纹理)`???????????`缩略图`?? VRM ????????????????????? PNG?JPG???????

> ? v0.56 ???????????? 4096x4096??????????????????????????? 1024x1024 -> MaxSize??????
> v0.58 ????????

https://github.com/vrm-c/UniVRM/issues/502

Mesh

????????Index Buffer????????Vertex Buffer??

??????Index Buffer?

??????????Int????

??????5?????????

`50000 x 4(Int = 4字节) x 3(三角形的3个顶点) => 使用0.6MB 的容量。`

> ??GLTF?????????????unsigned short???UniVRM?????????????????65536??????????50000?????

??????Vertex Buffer?

???????????

```
{
    float3 Position; // 頂点位置 4(floatサイズ) x 3(xyz) => 12byte
```

```
    float3 Normal; // 頂点法線 4(floatサイズ) x 3(xyz) => 12byte
    float2 TEXCOORD_0; // 頂点UV 4(floatサイズ) x 2(xy) => 8byte
    short4 JOINTS_0; // 頂点BoneIndex 2(shortサイズ) x 4(4boneまで) => 8byte
    float4 WEIGHTS_0; // 頂点Weight 4(floatサイズ) x 4(4boneまで) => 16byte
}
```

> ??????????????? UV?????????????????????

> ? UniVRM ?????float4???? Unity ?????????? GLTF ??????????? UV????? MIKK T Space ???????

??????5???????

`50000 x (12 + 12 + 8 + 8 + 16) => 2.8MB` ??????

????

????????????? `总图像大小 + 索引缓冲区 + 顶点缓冲区`??? 50k ???? 50k ????????????? `3.4MB + 总图像大小`?????????? BlendShape ??????????????????????

BlendShape?MorphTarget????

```
// ブレンドシェイプ頂点
{
    float3 Position; // 頂点位置 4 x 3 => 12byte. 必須
    float3 Normal; // 頂点法線 4 x 3 => 12byte. オプション
    float3 Tangent; // 頂点Tangent 4 x 3 => 12byte. 記録しない
}
```

??BlendShape?????? `50000 x (12 + 12) => 1.2MB`?

???20?BlendShape???????? `50000 x (12 + 12) x 20 => 24MB`?

???60?BlendShape???????? `50000 x (12 + 12) x 60 => 72MB`?

????????

- ????? BlendShape
- BlendShape ??????? BlendShape ?????????

???????????????BlendShape??????

> ?????
> ?????K??

??BlendShape?????

???????????BlendShape??????????

????

???? BlendShape ????????? `ReduceBlen dshape` ? `ReduceBlendshapeClip` ????????no errors???????? `UseSparseAccessor` ????? VRM loaders??????UniVRM loader ????????????UniVRM-0.53?????????? `OnlyBlendshapePosition` ????????

ReduceBlendshape???BlendeShape?

??BlendShapeClips???BlendShapes???????????????

ReduceBlendshapeClip???BlendeShapeClip?

??Preset.Unknown?BlendShapeClip????????ReduceBlendshape?????

UseSparseAccessor????????)

?GLTF????????????????????BlendShape???
????????BlendShape?????????????????

> ????????GLTF???????????UniVRM?????????

```
// ブレンドシェイプ頂点
{
    int Index; // 有効なブレンドシェイプの index => 4
    float3 Position; // 頂点位置 4 x 3 => 12byte. 必須
    float3 Normal; // 頂点法線 4 x 3 => 12byte. オプション
    float3 Tangent; // 頂点Tangent 4 x 3 => 12byte. 記録しない
}
```

`BlendShape的有效顶点数 x (12 + 12 + 4) => ?MB`

- ??????????

OnlyBlendshapePosition????BlendeShape Position?

??? BlendShape ? Normal ? Tangent?????????

> ????UniVRM-0.53 ???????????????

MESHUTILITY????/??BlendShape???

????????????50k???????10k????BlendShape?????40k????BlendShape??????

???????BlendShape????`10000 x (12 + 12) => 0.24MB`

???????BlendShape???`50000 x (12 + 12) => 1.2MB`

> ??????????????????????????????Draw????????

Mesh Utility??????????

??

???? VRM ???????????? BlendShape?????????????

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