space_time_para_4.1.2.wxm

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An application document for Geometric Algebra using wxMaxima

Ref: The Survey, para.4.1.2,

investigate the use of the fourth axis, g4 = e4 to imitate G(1,3)

Initialization

```
(%i42) ext:["wxm"]$
       file_type_maxima:append(ext,file_type_maxima)$
       batchload("initialize_fns")$
```

the pseudoscalar and its inverse
the lowest useable dimension pseudoscalar should be {e1,e2} i.e. Plen = 2
e.g. for four dimensions edit Pseudos:{e1,e2,e3}$ to Pseudos:{e1,e2,e3,e4}$

```
(%i1) Pseudos:{e1,e2,e3,e4}$
      Pvar:listofvars(Pseudos)$
      Plen:length(Pvar)$
      I:Pseudos$
      ni:(Plen-1)*Plen/2$
      Ii:(-1)^ni*I$
      kill(ni)$
      ldisplay(Pvar)$
```


```
(%i9) batchload("initialize_lsts")$
```

end of Initialization

set derivabbrev:false$

```
(%i12) derivabbrev:false$
```

The Survey, ref. para 4.1.2
investigate the use of the fourth axis with g4 = e4

in order to imitate G(1,3) use these gammas

```
(%i13) g1:%i*{e1}$
       g2:%i*{e2}$
       g3:%i*{e3}$
       g4:{e4}$
```

allocate the inner products to definite axes for G(1,3) using g4 as the time axis

```
(%i17) g1&.g1;
       g2&.g2;
       g3&.g3;
       g4&.g4;
```

the spacetime coordinate vector using these gammas

```
(%i21) x:x1*g1+x2*g2+x3*g3+t*g4;
```

examine a spacetime split using g4 = e4

```
(%i22) x&^g4$
       space:collectterms(%,%i);
```


```
(%i24) time:x&.g4;
```

now specify some "sigma" bivectors (printed bold although they are bivectors)

```
(%i25) s1:g1&^g4;
       s2:g2&^g4;
       s3:g3&^g4;
```

b(old)x space using the sigmas

```
(%i28) x1*s1+x2*s2+x3*s3$
       bx:collectterms(%,%i)$
       is(equal(bx,space))$
       ldisplay(%,bx)$
```

typical sigma products

```
(%i33) s1&*s1;
       s2&.s3;
```


```
(%i35) s1&*s3;
       s3&*s1;
```

using the spacetime coordinate vector, x from above;
compute...to find the spacetime interval used in para.4.1.2;

```
(%i37) x&*x;
```

so the above coordinate vector, x could be used to imitate G(1,3)
with g4 as the worldline tangent vector
