Re: Unitary matrix. − Rotation matrix

Source: http://sci.tech−archive.net/Archive/sci.math/2004−10/7673.html

---

From: Roger Bagula (*tftn_at_earthlink.net*)
Date: 10/26/04

```
Date: Tue, 26 Oct 2004 20:45:10 GMT
```

Dear JEMebius,
I'm just an old quantum chemist
and using quaternoins (upward) or octonions (downward) seems
the really hard way to me.
And SO(4) type real 4d electromagnetic field has energy density
like (M=SO(4) group sum: F(u,v)=a*M, a= scale)
T(em)=(1/4)*F(u,v)*F(u,v)^(−1)
I don't see any singularities since this gives a nice diagonal matrix.
A better approach is possibly F(u,v)=a*g(u,v)*M for a Lorentz Minkowski
geometry,
but it still gives a nice diagonal matrix.
The representation of SO(3) is such that that (x,y,z) in a sphere surface
In
Mso3={{0,x,−z},{−x,0,y},{z,−y,0}}
give
Mso3^2
such that the new coordinates are a projective plane (Steiner Roman
surface)
which is basically a tetrahedral torus type.
I think these may be the "singularities" you are seeking
to avoid which have their root in the spherical vibrations (Legendre,
etc.).
These are only higher energy Hilbert space states.
Can avoid Hilbert spaces in Quantum mechanics by using higher symmetry
derivations?
It is possible to define an Dirac like intermediate between the
quaternoins and octonions
but is isn't a "nice" set of equations in my experience.
I can dig up those matrices for you if you like,
since I had to prove to myself a Clifford algebra could be made for a
Dirac like
symmetry.
I'm sorry I got carried away by this answer, ha, ha...

If we all knew everything we could all stop struggling to understand.

For the rotation matrices I gave are good for this kind of rotations.
Here are the checked matrices (all unitary) and their product is unitary

as the original question asked for.
(I did may some typing mistakes)
m1 = {{Cos[a], Sin[a], 0, 0}, {−Sin[a], Cos[a], 0, 0}, {0, 0, 1, 0}, {0, 0, 0, 1}}

m2 = {{Cos[b], 0, −Sin[b], 0}, {0, 1, 0, 0}, {Sin[b], 0, Cos[b], 0}, {0, 0, 0, 1}}

m3 = {{1, 0, 0, 1}, {0, Cos[c], Sin[c], 0}, {0, −Sin[c], Cos[c], 0}, {0, 0, 0, 1}}

m4 = {{Cos[d], 0, 0, −Sin[d]}, {0, 1, 0, 0}, {0, 0, 1, 0}, {Sin[d], 0, 0, Cos[d]}}

m5 = {{1, 0, 0, 0}, {0, 1, 0, 0}, {0, 0, Cos[e], −Sin[e]}, {0, 0, Sin[e], Cos[e]}}

m6 = {{1, 0, 0, 0}, {0, Cos[f], 0, Sin[f]}, {0, 0, 1, 0}, {0, −Sin[f], 0, Cos[f]}}

Simplify[Det[m1]]

Simplify[Det[m2]]

Simplify[Det[m3]]

Simplify[Det[m4]]

Simplify[Det[m5]]

Simplify[Det[m6]]

M = m1 . m2 . m3 . m4 . m5 . m6

M={{Cos[a] Cos[b] Cos[d] + Cos[a] Cos[b] Sin[d], Cos[f] (Cos[c] Sin[a] + Cos[a] Sin[b] Sin[c]) − (Cos[e] (Cos[a] Cos[b] Cos[d] − Cos[a] Cos[b] Sin[d]) − (−Cos[a] Cos[c] Sin[b] + Sin[a] Sin[c]) Sin[e]) Sin[f